**Hilton chapter 6**

**Answers to Assigned End of Chapter Exercises, Problems, Cases**

# ANSWERS to Review Questions

6-1 Cost behavior patterns are important in the process of making cost predictions. Cost predictions are used in planning, control, and decision making. For example, cost budgets are based on predictions of costs at various levels of activity. Cost control is accomplished by comparing actual costs against budgeted costs, which are based on cost predictions. Cost predictions are also important in decision making, since the desirability of various alternatives often depends on the costs that will be incurred under those alternatives.

6-2 a. Cost estimation is the process of determining how a particular cost behaves.

b. Cost behavior is the relationship between cost and activity.

c. Cost prediction is the forecast of cost at a particular level of activity.

Cost estimation determines the cost behavior pattern, which is used to make a cost prediction about the cost at a particular level of activity contemplated in the future.

6-3 a. Hotel: Percentage of rooms occupied or the number of occupancy-days, where an occupancy-day is defined as one room occupied for one day.

b. Hospital: Patient-days, where a patient-day is defined as a one-day stay by one patient.

c. Computer manufacturer: Number of computers manufactured, throughput, engineering specifications, engineering change orders, or number of parts in the finished product.

d. Computer sales store: Sales revenue.

e. Computer repair service: Repair calls or hours of repair service.

f. Public accounting firm: Hours of auditing service provided by each classification of personnel (partner, manager, supervisor, senior accountant, and staff accountant).

* 1. Graphs of the cost behavior patterns are as follows:

Cost

Cost

Activity

Activity

Cost

Cost

Activity

Activity

Cost

Cost

Activity

Activity

a. Variable

b. Step-variable

c. Fixed

d. Step-fixed

e. Semivariable

f. Curvilinear

6-5 As the level of activity (or cost driver) increases, total fixed cost remains constant. However, the fixed cost per unit of activity declines as activity increases.

6-6 A manufacturer's cost of supervising production might be a step-fixed cost, because one supervisor is needed for each shift. Each shift can accommodate a certain range of production activity; when activity exceeds that range, a new shift must be added. When the new shift is added, a new production supervisor must be employed. This new position results in a jump in the step-fixed cost to a higher level.

6-7 As the level of activity (or cost driver) increases, total variable cost increases proportionately and the variable cost per unit remains constant.

6-8 a. A semivariable cost behavior pattern can be used to approximate a step-variable cost as shown in the following graph:

Activity

Semivariable

approximation

Step-variable

cost

A semivariable cost behavior pattern can be used to approximate a curvilinear cost as shown in the following graph:

Cost

Cost

Activity

Curvilinear

cost

Semivariable

approximation

b.

6-9 (a) Annual cost of maintaining an interstate highway: committed cost. (Once the highway has been built, it must be maintained. The transportation authorities are largely committed to spending the necessary funds to maintain the highway adequately.)

(b) Ingredients in a breakfast cereal: engineered cost.

(c) Advertising for a credit card company: discretionary cost.

(d) Depreciation on an insurance company's computer: committed cost.

(e) Charitable donations: discretionary cost.

(f) Research and development: discretionary cost.

6-10 The cost analyst should respond by pointing out that in most cases a cost behavior pattern should be limited to the relevant range of activity. When the firm's utility cost was shown as a semivariable cost, it is likely that only some portion in the middle of the graph would fall within the relevant range. Within the relevant range, the firm's utility cost can be approximated reasonably closely by a semivariable cost behavior pattern. However, outside that range (including an activity level of zero), the semivariable cost behavior pattern should not be used as an approximation of the utility cost.

6-11 A learning curve shows how average labor time per unit of production changes as cumulative output changes. In many production processes, as production activity increases and learning takes place, there is a significant reduction in the amount of labor time required per unit. The learning phenomenon is important in cost estimation, since estimates must often be made for the level of cost to be incurred after additional production experience is gained.

6-12 Appropriate independent variables for several tasks are as follows:

a. Handling materials at a loading dock: Weight of materials handled.

b. Registering vehicles at a county motor vehicle office: Number of registrations processed.

c. Picking oranges: Volume or weight of oranges picked.

d. Inspecting computer components in an electronics firm: Number of components inspected.

6-13 An outlier is a data point that falls far away from the other points in the scatter diagram and is not representative of the data. One possible cause of an outlier is simply a mistake in recording the data. Another cause of an outlier is a random event that occurred, which caused the cost during a particular period to be unusually high or low. For example, a power outage may have resulted in unusually high costs of idle time for a particular time period. Outliers should be eliminated from a data set upon which cost estimates are based.

6-14 Fixed costs are often allocated on a per unit-of-activity basis. For example, fixed manufacturing-overhead costs, such as depreciation, may be allocated to units of production. As a result, such costs may appear to be variable in the cost records. Discretionary costs often are budgeted in a manner that makes them appear variable. A cost such as charitable donations, for example, may be fixed once management decides on the level of donations to be made. If management's policy is to budget charitable donations on the basis of sales dollars, however, the cost will appear to be variable to the cost analyst. An experienced analyst should be wary of allocated and discretionary costs and take steps to learn how the amounts are determined.

6-15 In the first step of the visual-fit method of cost estimation, data points are plotted on graph paper to form a scatter diagram. Then a line is drawn through the scatter diagram in an attempt to minimize the distance between the line and the plotted points. The scatter diagram and the visually-fitted cost line provide a valuable first approximation in the analysis of any cost suspected to be semivariable or curvilinear. The method is easy to use and to explain to others and provides a useful view of the overall cost behavior pattern. The visual-fit method also enables an experienced cost analyst to spot outliers in the data. The primary drawback of the visual-fit method is its lack of objectivity. Two cost analysts may draw two different visually-fitted cost lines.

6-16 The chief drawback of the high-low method of cost estimation is that it uses only two data points. The rest of the data are ignored by the method. An outlier can cause a significant problem when the high-low method is used if one of the two data points happens to be an outlier. In other words, if the high activity level happens to be associated with a cost that is not representative of the data, the resulting cost line may not be representative of the cost behavior pattern.

6-17 The term *least squares* in the least-squares regression method of cost estimation refers to the process of minimizing the sum of the squares of the vertical distances between the data and the regression line.

6-18 A least-squares regression line may be expressed in equation form as follows:

*Y = a + bX*

In this equation, *X* is referred to as the independent variable, since it is the variable upon which the estimate is based. *Y* is called the dependent variable, since its estimate depends on the independent variable. The intercept of the line on the vertical axis is denoted by *a*, and the slope of the line is denoted by *b*. Within the relevant range, *a* is interpreted as an estimate of the fixed-cost component, and *b* is interpreted as an estimate of the variable cost per unit of activity.

6-19 In simple regression there is a single independent variable. In multiple regression there are two or more independent variables.

6-20 Potential cost drivers in the cruise industry include the following: number of passengers, number of passenger miles traveled, number of port calls, cruise ship tonnage (i.e., ship size), and number of crew members, among others.

6-21 A particular least-squares regression line may be evaluated on the basis of economic plausibility or goodness of fit.

The cost analyst should always evaluate a regression line from the perspective of economic plausibility. Does the regression line make economic sense? Is it intuitively plausible? An experienced cost analyst should have a good feel for whether the regression line looks reasonable.

Statistical methods can also be used to determine how well a regression line fits the data upon which it is based. This method is referred to as assessing the goodness of fit of the regression. A commonly used measure of goodness of fit is the coefficient of determination, which is described in the appendix at the end of the chapter. The coefficient of determination is also denoted by *R2*.

# SOLUTIONS to ASSIGNED EXERCISES

## Exercise 6-22

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. |  | | | | | | | | | |
|  | |  |  | | Cost per Broadcast Hour | | | | | | |
|  | | Cost Item | | August | | | October | | | | |
|  | | Production crew: | |  | | | |  | | | |
|  | | $5,330/410 hr. | | $13.00 per hr. | | | |  | | | |
|  | | $8,840/680 hr. | |  | | | | $13.00 per hr. | | | |
|  | | Supervisory employees: | |  | | | |  | | | |
|  | | $6,000/410 hr. | | $14.63 per hr.\* | | | |  | | | |
|  | | $6,000/680 hr. | |  | | | | $ 8.82 per hr.\* | | | |
|  | |  | |  | | | |  | | | |
|  | | \*Rounded. | |  | | | |  | | | |
| 2. | | December cost predictions: | |  | | | |  | | | |
|  | |  | |  | | | |  | | | |
|  | | Production crew (440 × $13.00 per hr.) | | | | | | $5,720 | | | |
|  | | Supervisory employees | | | | | | 6,000 | | | |
| 3. | |  |  |  | | | |  | | | |
|  | | Cost Item | | | | Cost per Broadcast Hour in December | | | |
|  | | Production crew | | | | $13.00 per hr. | | |
|  | | Supervisory employees ($6,000/440 hr.) | | | | 13.64per hr.\* | | |
|  | | \*Rounded. | | | |  | | | |

## Exercise 6-25

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1. | Variable maintenance  cost per tour mile | | | | = | (18,750*r*-16,500*r*) / (30,000 miles – 12,000 miles) | |
|  |  | | | | = | .125*r* | |
|  | |  | | | | |  |
|  | | *r* denotes the *real*, Brazil’s national currency. | | | | |  |
|  | |  | | | | |  |
|  | | Total maintenance cost at 12,000 miles | | | | | 16,500*r* |
|  | | Variable maintenance cost at 12,000 miles (.125*r* × 12,000) | | | | | 1,500*r* |
|  | | Fixed maintenance cost per month | | | | | 15,000*r* |
|  | |  | | | | |  |
| 2. | | Cost formula: | | | | |  |
|  | |  | | | | | |
|  | | Total maintenance cost per month = 15,000*r* + .125*rX* , where *X* denotes tour miles traveled during the month. | | | | | |
|  | |  | | | | | |
| 3. | | Cost prediction at the 34,000-mile activity level: | | | | | |
|  | |  |  |  | | | |
|  | | Maintenance cost | = | 15,000*r* + (.125*r*)(34,000) | | | |
|  | |  | = | 19,250*r* | | | |

## Exercise 6-29

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. | Variable cost per pint of applesauce produced = | |  | |
|  |  |  | | |
|  | Total cost at 123,000 pints | $72,300 | | |
|  | Variable cost at 123,000 pints  (123,000 × $.10 per pint) | 12,300 | | |
|  | Fixed cost | $60,000 | | |
|  |  | | |
|  | Cost equation: | | |
|  |  | | |
|  | Total energy cost = $60,000 + $.10*X,* where *X* denotes pints of applesauce produced | | |
|  |  | | |
| 2. | Cost prediction when 78,000 pints of applesauce are produced | | |
|  |  | | |
|  | Energy cost = $60,000 + ($.10)(78,000) = $67,800 | | |

# SOLUTIONS to ASSIGNED PROBLEMS

## Problem 6-37

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. | Variable maintenance cost per hour of service | = |  | |
|  |  |  |  | |
|  |  | = | $8.00 | |
|  |  | | |  |
|  | Total maintenance cost at 310 hours of service | | | $2,990 |
|  | Variable maintenance cost at 310 hours of service (310 hr. × $8.00) | | | 2,480 |
|  | Fixed maintenance cost per month | | | $  510 |
|  |  | | |  |
|  | Cost formula: | | |  |
|  |  | | |  |
|  | Monthly maintenance cost = $510 + $8.00*X*, where *X* denotes hours of maintenance service. | | |  |
|  |  | | |  |
| 2. | The variable component of the maintenance cost is $8.00 per hour of service. | | |  |
|  |  | | |  |
| 3. | Cost prediction at 600 hours of activity: | | |  |
|  |  | | |  |
|  | Maintenance cost = $510 + ($8.00)(600) = $5,310 | | |  |

|  |  |  |
| --- | --- | --- |
| 4. | Variable cost per hour [from requirement (2)] | $8.00 |
|  | Fixed cost per hour at 610 hours of activity ($510/610) | $ .84\* |
|  | \*Rounded. |  |
|  | The fixed cost per hour is a misleading amount, because it will change as the number of hours changes. For example, at 500 hours of maintenance service, the fixed cost per hour is $1.02 ($510/500 hours). |  |