Lectures Note

COST ACCOUNTING

Chapter 4: Cost Behavior and Cost Estimation

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Chapter IV
Cost Behavior and Cost Estimation

After studying this chapter, you should be able to:

1. ***Explain the characteristics and purpose of cost functions***
2. ***Identify the cost object and cost driver***
3. ***Explain the cost behavior***
4. ***Indicate how to estimate the cost***

This chapter will give you the specific explanation about cost concept and how to analysis and estimate

Managers must understand how costs behave to make strategic decisions and operating decisions. Knowledge of cost behavior is needed to answer these questions. This chapter will focus on how manager determine cost-behavior patterns – that is, how they understand how costs changes in activity levels, in the quantity of products produces, and so on.

General Issues in Estimating Cost Functions

A cost function is a mathematical description on how a cost changes in the level on activity relating to that cost. Examples of activities are preparing setups for production runs and operating machines. Cost functions can be plotted by measuring the level of an activity, such as a number of batches or number of machine hours used.

Managers often estimate cost functions based on two assumptions:

a. Variations in the level of a single activity (the cost driver) explain the variations in the related total costs.

b. Cost behavior is approximated by a linear cost function within the relevant range. Recall that a relevant range is the range of the activity in which there is a relationship between total cost and the level of activity.

Cost Estimation

Manager use **cost estimation** to measure relationship based on data from past costs and the related level of an activity. Managers are interested in estimating past cost-accurate **cost predictions**, or forecasts, about future costs.

Cost Estimation Methods

1. Industrial Engineering Method

The **industrial engineering method**, also called the **work-measurement method**, estimates cost functions by analyzing the relationship between inputs and outputs in physical term. This method is a very thorough and detailed way to estimate a cost function when there is a physical relationship between inputs and outputs, but it can very time-consuming.

Many organizations, such as Nokia, use it to estimate manufacturing costs but find it too costly or impractical for analyzing their entire cost structure. For example, physical relationships between inputs and outputs are difficult to specify for some individual cost items, such as R&D and advertising.

2. Scatter plot

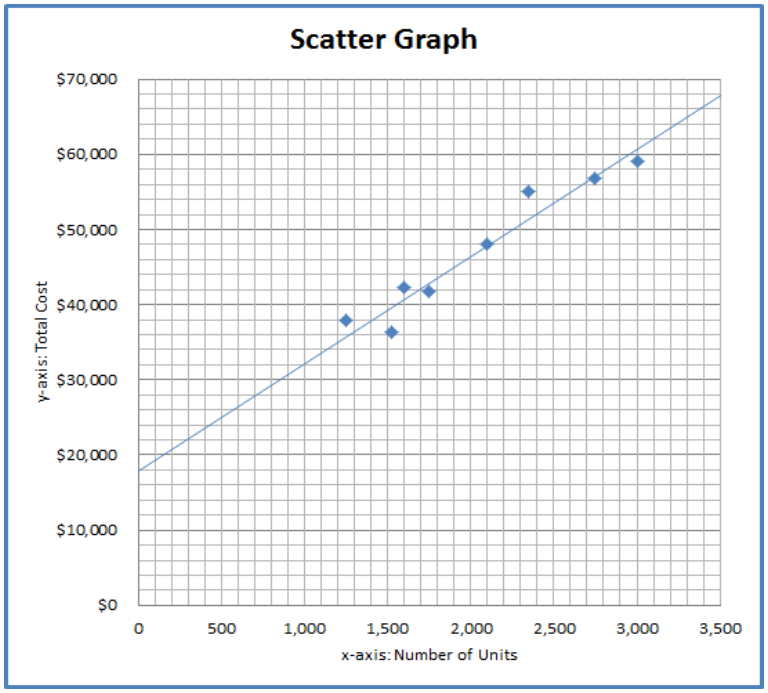

Exhibit 4-1: Example of Scatter plot

Scatter plot is a measurement of cost estimation using trend analysis of many plots used in a graph. The function of this method rarely used because of the nominal estimated is not specifically accurate.

3. Account Analysis Method

The **account analysis method** estimates coat functions by classifying various cost accounts as variable, fixed, or mixed with respect to the identified level of activity. This approach is widely used because it is reasonably accurate, cost-effective, and easy to use.

For example, during 12-week period, Elegant Co. ran the machine in the cell for a total of 862 machine hours and incurred total indirect manufacturing labor costs of $12,501. Using qualitative analysis, the manager and the cost analyst determine that indirect manufacturing labor costs are mixed cost.

As machine-hours vary, one component of the cost (such as supervision cost) is fixed, whereas another component (such as maintenance cost) is variable. The goal is to use account analysis to estimate a linear cost function for indirect manufacturing labor cost with number of machine hours as the cost driver.

The cost analyst uses experience and judgment to separate total indirect manufacturing labor cost ($12,501) into cost that are fixed ($2,157) and cost that are variable ($10,344) with respect of the number of cost driver (machine hours used). The linear cost equation;

$$y = a + bx$$

In this example is:

Indirect manufacturing labor cost = $2,157 + ($12 per machine hour x number of machine hours)

Variable cost per machine hours is $10,344 : 862 machine hours = $12 per machine hour. So, the indirect manufacturing cost per machine hour is $12,501 : 862 machine hours = $14.50 per machine hour.

4. Quantitative Analysis Method

Quantitative analysis uses a formal mathematical method to fit cost functions to past data observations.

Steps in estimating a cost function using quantitative analysis:

Step 1: Choose the dependent variable

Step 2: Identify the independent variable, or cost driver

Step 3: Collect data on dependent variable and the cost driver

Step 4: Plot the data

Step 5: Estimate the cost function

Step 6: Evaluate the cost driver of the estimates cost function

High-Low Point Method

The simplest form of quantitative analysis is the high-low method. It uses only the highest and lowest observed values of the cost driver within the relevant range and their respective costs. The cost function is estimated by using these two points to calculate the slope coefficient and the constant or intercept. We illustrate the high-low method using data below:

Week	*Cost Driver: Machine Hours*	*Indirect Manufacturing Labor Cost*
	(X)	(Y)
1	68	$1,190
2	88	1,211
3	62	1,004
4	72	917
5	60	770
6	96	1,456
7	78	1,180
8	46	710
9	82	1,316
10	94	1,032
11	68	752
12	48	963
Total	862	$12,501

	Cost driver: Machine-Hours (X)	Indirect Manufacturing Labor Costs (Y)
Highest observation cost driver (week 6)	96	$ 1, 456
Lowest observation cost driver (week 8)	46	710
Difference	50	$ 746

The slope coefficient, *b*, is calculated as:

$$\text{Slope coefficient} = \frac{\text{Difference s between costs associated with highest and lowest observations on the cost driver}}{\text{Different between highest and lowest observations of the cost driver}}$$

= $746 : 50 machine hours = $14.92 per machine-hour

Therefore, at the highest observation of the cost driver, the constant, *a*, is calculated as:

$$y = a + bx$$

$$a = y - bx$$

Constant = $1,456 – ($14.92 per machine-hour x 96 machine-hours) = $23.68

And the lowest observation of the cost driver,

Constant = $710 – ($14.92 per machine-hour x 46 machine-hours) = $23.68

Thus, the high-low estimate of the cost function is:

Y = a + bx

Y = $23.68 + (14.92 per machine-hour x number of machine-hours)

Regression Analysis Method

Regression analysis is a statistical method that measures the average amount of change in the dependent variable associated with a unit change in one or more independent variables. Simple regression analysis estimates the relationship between

the dependent variable and *one* independent variable. Multiple regression analysis estimates the relationship between the dependent variable and *two or more* independent variables.

Exercises

4-01 Kara Jones, manager of distribution at Angle Foods, has the following data about monthly distribution costs and the number of the package shipped each month during the past year. She wants to better analyze the cost and the cost driver relationship from data below.

Month	Distributon costs	Number of Package shipped
January	28,000	51,000
February	20,000	43,000
March	17,000	28,000
April	32,000	67,000
May	40,000	73,000
June	24,000	54,000
July	22,000	37,000
August	35,000	72,000
September	42,000	71,000
October	23,000	56,000
November	33,000	52,000
December	22,000	45,000
Total	338,000	649,000

If you want to solve this exercise, required:

a. Using the high low point method, estimates the linear relationship between fixed cost and variable cost

b. Give the examples of costs that would be included as *a* and *b*

c. If Angle Foods expects number of package shipped 660,000 in the coming year, what should its estimated operating budget for the distribution costs.

4-02 Reisen Travel offers helicopter service from suburban towns to JFK Intl Airport. Each of its 10 helicopters makes between 1,000 and 2,000 round-trips per year. The record indicate that a helicopter that has made 1,000 round-trips in the year incurs an average operating costs of $300 per round-trip, and one that has made 2,000 round-trips in the year incurs an average operating costs of $250 per round-trip.

a. Using the high low point method, estimates the linear relationship $y = a + bx$, where y is the total annual operating cost of helicopter and x is the number of round trips it makes to JFK during year.

b. Give the examples of costs that would be included as *a* and *b*
   If Reisen Travel expects number of round trips on average 1,200 round-trips in the coming year, what should its estimated operating budget for the distribution costs.

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