Chapter 2 – Part III

Estimating Cost Behavior

Cost estimation

Cost estimation is process of ***developing*** and ***estimating*** a well-defined cost ***function*** that explains how the total amount spent on a cost ***object*** react to the changes in its ***cost driver(s***).

The objectives of cost estimation are to:

(1) ***identify*** the key cost drivers for each cost object to help managers control costs
(2) ***measure*** the variable and/or fixed components of the cost item so as to help managers make correct decisions, and
(3) ***predict*** the expected future amount of the cost object so as to help managers correctly plan for the future budget.

- There are several methods for cost estimation. The most common ones are "High-Low" method and Regression Analysis. In this chapter, we cover only the High-Low (H-L) method.

Basic assumptions

(1) Changes in total costs can be explained by changes in the level of a single cost driver.
(2) Cost behavior can adequately be approximated by a linear function of the activity level within the relevant range

Basic Linear Function:

Based on the above two assumptions, we can express the relationship between a particular cost item and its cost driver in a mathematical form using the straight line equation as follows:

$$y = a + b(x)$$

where:

y =	Total costs
a =	fixed cost component
b =	slope coefficient (variable cost rate)
x =	the volume (quantity) of the cost driver

Note that:

1. If the estimated value of $a = 0$ and $b > 0$ then we conclude that the cost behavior is **Variable.**
2. If the estimated value of $b = 0$ and $a > 0$ then we conclude that the cost behavior is **Fixed**.
3. If the estimated values of both a & $b > 0$ then we conclude that the cost behavior is **Mixed**.

High-Low (HL) Method

The high-low method uses the highest and lowest activity levels of a data set to estimate the portion of a mixed cost that is variable and the portion that is fixed.

The high-low method provides reasonable estimates when the costs incurred at the high and low levels of activity are representation of the majority of the other data points. However, this method may be misleading if the activity levels are not representative of the normal activity.

The following steps will guide you through the high-low method:
Step 1: Find the lowest and highest activity points in the data as follows:

- Identify the highest value of volume (X) and ***its associated*** value of cost (Y)
- Identify the Lowest value of volume (X) and ***its associated*** value of cost (Y)

Step 2: Determine **variable costs per** unit by using the mathematical slope formula:

$$b = \frac{\text{Change in (y)} \quad (H_y - L_y)}{\text{Change in (x)} \quad (H_x - L_x)}$$

Where:

H_x is the highest activity level

L_x is the lowest activity level

H_y is the total cost at the highest activity level

L_y is the total cost at the lowest activity level

Step 3: Plug your answer to step 2 and the amounts of "y" and "x" from *either* the high or the low data point into the cost formula. Then solve for **total fixed** costs (***a***).

Step 4: Plug your answers to steps 2 and 3 into the cost formula by replacing the slope (***b***) with variable cost per unit and the y-intercept (***a***) with total fixed costs in the following format:

$$y = a + b(x)$$

Step 5: Use the estimated equation to predict future costs.
Note that the estimated cost function is valid to predict future costs only within the relevant range (i.e., between the highest and lowest points of activity).

Major Weakness of High-Low Method:

1. H-L method uses only two data points and ignores the rest of the data.
2. H-L method could provide biased estimates if the two data points are outliers.
3. H-L method does not provide information to evaluate how good the estimated function in representing the cost behavior or how accurate it is in predicting future costs.
4. It allows only one independent variable to explain the behavior of cost.

Example:
Information concerning units sold and total delivery costs for ABC, Inc. for five months of 2017 appears below:

Month	Units	Costs
January	1,200	$70,150
February	1,150	71,000
March	1,190	72,400
April	1,300	80,600
May	1,310	79,000

Required:

1. Use the high-low method to estimate the cost function for shipping costs.

2. ABC Inc. expects to sell 1,300 units of product in June. Use the estimated equation to predict the estimated shipping cost for June.

Practice Questions

1. Nellibell's Café bakes croissants that are sold to local restaurants and grocery stores in the Columbia, South Carolina area. When 600 croissants are baked, the average cost is $0.70. When 720 croissants are baked, the average cost is $0.65. What is the total cost when 670 croissants are baked?

a. $568
b. $588
c. $448
d. $532
e. $500

Use the following information to answer the next two questions:

Felinas Inc. produces floor mats for cars and trucks. The owner, Kenneth Felinas, asked you to assist him in estimating his maintenance costs. Together, Mr. Felinas and you determined that the single best cost driver for maintenance costs was machine hours. Below are data from the previous fiscal year for maintenance expense and machine hours:

Month	Maintenance Expense	Machine Hours
1	$3,120	2,200
2	3,310	2,300
3	3,490	2,400
4	3,620	2,430
5	3,620	2,280
6	3,680	2,440
7	3,610	2,420
8	3,420	2,390
9	3,140	2,210
10	2,880	2,080
11	2,780	1,690
12	2,940	2,070

2. Using the high-low method, unit variable cost is calculated to be:

a. $1.31
b. $1.59
c. $1.36
d. $1.14
e. $1.20

3. Using the high-low method, total monthly fixed cost is calculated to be:

a. $484
b. $364
c. $752
d. $259
e. $89

Answers: 1) C 2) E 3) C