ACC406: Cost Behaviour

TEXTBOOK: MOWEN, M. M., HANSEN, D. R., MCCONOMY, D. J., HEITGER, D. L., PITTMAN, J. A., & WITT, B. D. (2018). *CORNERSTONES OF MANAGERIAL ACCOUNTING*. TORONTO: NELSON.

Chapter 3: Cost Behaviour

Cost behavior describes how a cost changes when level of activity changes. Costs can be broken down into variable, fixed or mixed costs.

Fixed Cost

- A **fixed cost** is one that does not change as activity changes for example, rent. You will pay the same amount in rent regardless if you produce 10,000 units or 1 unit.
- **A discretionary fixed cost** can be changed or avoided at the discretion of the manager. For example, advertising which a manager can choose to reduce.

Variable Cost

- A **variable cost** increases in total with an increase in activity and decreases in total with a decrease in activity levels.
- For example, as more snowboards are produced, the total cost of gear needed to make the snowboards increases in proportion to the number produced.

$$Total\ variable\ costs = \ variable\ rate\ per\ unit * units\ of\ output$$

Mixed Costs

- These costs have both a fixed and variable component. An example is paying a sales employee who receives a salary wage in addition to commissions on sales. The commissions are variable depending on levels of sales (activity driver) but the salary paid remains the same (fixed)

$$Total\ cost = total\ fixed\ cost + total\ variable\ cost$$

Separating Mixed Costs into Fixed and Variable Components Methods

1) High-low Method**
2) Method of Least Squares
3) Scatter Graph Method

All three of these methods involve expressing cost as equation:

$$Total\ cost = \ fixed\ cost + (variable\ rate * output)$$

Let us break down the formula:
Dependent variable: the variable in which its value depends on the value of another, in this case this is total cost, the total cost of an activity depends on the fixed and variable cost
Independent variable: variable that measures output and used to explain changes in the cost of another variable, an example is the cost driver, so drawing on a previous example, the number of snowboards produced is an activity driver which is also an independent variable
Intercept: This is the fixed cost, this is also where cost line intercepts the vertical axis
Slope: represents the variable cost per unit of output (variable rate)

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High Low Method

The high-low method separates mixed cost into fixed and variable by using the high and low data points. Here are the four steps:

1) Find the high point and low point for the data set. The high point is based on the highest activity level NOT the cost! The low point based on the lowest activity level. The highest activity level may not have the highest cost, so it is important to select the points based on the activity level not cost. Make a note of these points for example write down: August high point: 500 hours and the cost is 7200. January low point: 100 hours and cost is 2100. Writing it down will make it easier for when you need to input it into the formula
2) Using these high and low points, calculate the variable rate (variable cost per unit). The variable rate is calculated using this formula:

$$Variable\ rate = \frac{high\ point\ cost - low\ point\ cost}{high\ point\ output - low\ point\ output}$$

Based on the sample high and low points previously provided, the formula would look like this:

$$Variable\ rate = \frac{7200-2100}{500-100} = \$12.75\ per\ hour$$

3) Calculate the fixed cost using the variable rate from step 2 using EITHER the high or low point using this formula:

$$Fixed\ cost = total\ cost\ at\ high\ point - (variable\ rate * output\ at\ high\ point)$$

$$OR$$

$$Fixed\ cost = total\ cost\ at\ low\ point - (variable\ rate * output\ at\ low\ point)$$

Let us use the high point from the previous example to calculate the fixed cost using the previously calculated variable rate of $12.75 from step 2 and the high point of 7200 total cost and hours of 500:

$$Fixed\ cost = 7200 - (\$12.75 * 500) = 825$$

4) Now create a cost formula. We have all the components of a cost formula, the variable rate and fixed cost so, the cost formula is: $Total\ cost = fixed\ cost + (variable\ rate * output)$

$$Total\ cost = 825 + (12.75 * output)$$

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Example of High-Low Method

Bobby's Burgers create specialty burgers. The company wants to calculate the fixed and variable costs associated with labour used in their restaurant. Data for the past 6 months were collected:

Month	Labour Cost ($)	Employee Hours
January	6000	360
February	5110	210
March	9010	710
April	6783	540
May	7540	550
June	4580	615

Using the high-low method, calculate the fixed cost of labour, calculate the variable rate per employee hour and construct the cost formula for total labour cost. Then find the cost for 800 hours using the cost formula

Solution:

Let's use the steps outlined above:

1) Find the high point and low point for the data set. The high point is based on hours: March is the highest point with total cost of 9010 and hours of 710. Lowest point is February with 5110 cost and 210 hours.
2) Using these high and low points, calculate the variable rate (variable cost per unit). The variable rate is calculated using this formula:

$$Variable\ rate = \frac{9010 - 5110}{710 - 210} = 7.80\ per\ hour$$

3) Calculate the fixed cost using the variable rate from step 2 using EITHER the high or low point using this formula:

$$Fixed\ cost = total\ cost\ at\ high\ point - (variable\ rate * output\ at\ high\ point)$$

Let us use the high point which is March, which is 9010 total cost and 710 hours. We have a variable rate from the previous question which is 7.80 per hour:

$$Fixed\ cost = 9010 - (\$7.80 * 710) = 3472$$

4) Now create a cost formula. We have all the components of a cost formula, the variable rate and fixed cost so, the cost formula is: $Total\ cost = fixed\ cost + (variable\ rate * output)$

$$Total\ cost = 3472 + (7.80 * hours)$$

To calculate the total cost for 800 hours. Use the cost formula created in the previous step and input 800. So:

$$Total\ cost = 3472 + (7.80 * 800) = 9712$$

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Least Squares Method

- This is a statistical way to find the best-fitting line through a set of data points.
- Calculating this by hand is a complicated and lengthy process and this is calculated using spreadsheet programs such as Excel. As this cannot be done during an in-person exam, the intercepts and variables are given.

Example of Least Squares

Refer to the company information from the High-Low Question we previously did. Coefficients shown by a regression program for this data are:

Intercept 2,100

X Variable 9.2

Use the results of regression to do the following:

1. Calculate the fixed cost of labour and the variable rate per employee hour. 2. Construct the cost formula for total labour cost. 3. Calculate the budgeted cost for next month, assuming that 800 employee hours are budgeted.

Solution

1. The fixed cost of labour is the y intercept so $2100 and the variable rate is $9.20 per hour (both given through regression data)
2. The cost formula is: $Total\ cost = \ fixed\ cost + (variable\ rate * output)$ so $total\ cost = 2100 + (9.20 * hours)$
3. Use the previous formula in question 2 and input 800 hours: so $total\ cost = 2100 + (9.20 * 800) = 9460$

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Scatter graph Method

- This method involves seeing the cost relationship by plotting the points on a graph. The cost goes on the x (vertical) axis and the output is plotted on the y axis.
- The purpose of a scatter graph is to see whether a straight line adequately describes the relationship; a straight line means that the relationship between cost and output is correlational.

Steps for separating costs with a scatter graph

1) Use the scatter graph to plot a line of best fit, making sure that the line crosses through the first point (this will create an intercept which is the fixed cost)
2) Then calculate the variable rate (slope) by using the fixed cost point and the first point that the line of best fit crossed through: $Variable\ rate = \frac{high\ point\ cost - low\ point\ cost}{high\ point\ output - low\ point\ output}$

** high point cost is the first point crossed through, and the low point cost and output corresponds to the intercept so it will be fixed cost as the low point cost and 0 as the low point output

3) Now create a cost formula using the variable rate and fixed cost previously calculated:

$$Total\ cost = fixed\ cost + (variable\ rate * output)$$

*The scatter graph method suffers from the lack objective criteria for creating a line of best fit

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