

Homework #1 Behavior of Costs

1. Define variable cost and fixed cost. Give an example of each.

Variable Cost: Having the cost per unit constant, the costs that varies in total being directly proportional to the change in activity of the cost driver.

Example: Price of groceries according to the availability/ seasons in a particular store.

Fixed Cost: Having the cost per unit increase or decrease, the costs remain constant with the change in activity of the cost driver.

Example: Rent/ Mortgage of a store per month, regardless of the sales or profit.

2. What is a cost driver? Give one example.

Cost Driver: It is an activity that triggers the cost of anything.

Example: Units of electricity consumption, results in the electricity bill. Consumed units of electricity is the cost driver here.

3. What is the relevant range? What role does the relevant-range concept play in explaining how costs behave?

Relevant Range: A specific activity level that is bounded by a minimum and maximum amount. The costs are defined as either fixed or variable as per the given relevant ranges.

- 4 Explain why unit costs must often be interpreted with caution.

Unit Cost: It is a ratio of total costs to the number of units.

It is often implemented with caution as the fixed cost in the total cost is constant at times, even when the number of units kept changing.

5 Fixed and variable costs.

A company manufactures two types of tires. Each tire requires a three-step process. The first step is mixing. The mixing department combines some of the necessary direct materials to create the material mix that will become part of the tire. The second step includes the forming of each tire where the materials are layered to form the tire. This is an entirely automated process. The final step is finishing, which is an entirely manual process. The finishing department includes curing and quality control.

Required:

Costs involved in the process are listed next. For each cost, indicate whether it is a variable or fixed cost.

Rubber	Variable
Reinforcement cables (this is part of the tire)	Variable
Other direct materials	Variable
Rent on factory building	Fixed
Fire Insurance on factory building	Fixed
Factory utilities	Variable/Fixed
Finishing department hourly laborers	Variable/Fixed
Mixing department manager (salary)	Fixed
Materials handlers	Variable/Fixed
Custodian in factory (hourly)	Fixed
Night guard in factory (hourly)	Fixed
Machinist (running the mixing machine)	Variable/Fixed
Machine maintenance personnel	Variable/Fixed
Maintenance supplies	Variable
Cleaning supplies	Variable/Fixed
Machinist (running the forming machine)	Variable/Fixed

6 Variable and Fixed Costs.

A company specializes in producing one specialty vehicle. It is called Surfer and is styled to easily fit multiple surfboards in its back area and top-mounted storage racks. The company has the following manufacturing costs:

Plant management costs, \$1,992,000 per year

Cost of leasing equipment, \$1,932,000 per year

Workers' wages, \$800 per Surfer vehicle produced

Direct materials costs: Steel, \$1,400 per Surfer; Tires, \$150 per tire, each Surfer takes 5 tires (one spare).

City license, which is charged monthly based on the number of tires used in production:

0–500 tires	\$ 40,040
501–1,000 tires	\$ 65,000
more than 1,000 tires	\$249,870

The company currently produces 170 vehicles per month.

Solution:

- What is the variable manufacturing cost per vehicle? What is the fixed manufacturing cost per month?**

Variable Manufacturing Cost per vehicle = $\$1,400 + \$150 + \$800 = \$2,950$ (per surfer)

170 vehicles require 850 tires.

Total Fixed Manufacturing Cost per month = $(\$1,992,000/12) + (\$1,932,000/12) + \$65,000 = \$392,000$

Fixed costs per month:

0 – 100 per month $\rightarrow (\$1,992,000/12) + (\$1,932,000/12) + \$40,040 = \$367,040$

101 – 200 per month $\rightarrow (\$1,992,000/12) + (\$1,932,000/12) + \$65,000 = \$392,000$

More than 200 per month $\rightarrow (\$1,992,000/12) + (\$1,932,000/12) + \$249,870 = \$576,870$

2. **Plot a graph for the variable manufacturing costs and a second for the fixed manufacturing costs per month. How does the concept of relevant range relate to your graphs? Explain.**

Note from Brian Lendecky – you don't literally have to plot a graph, just visually picture what the graph would look like before looking at the answer key.

The relevant range concept is relatable to both variable and fixed manufacturing costs per month.

The ranges per unit as shown in the previous question: 0 – 100 surfers per month, 101 – 200 surfers per month, and more than 200 surfers per month, shows that the total fixed manufacturing costs does not change when seen in total.

3. **What is the total manufacturing cost of each vehicle if 80 vehicles are produced each month? 205 vehicles? How do you explain the difference in the manufacturing cost per unit?**

Total Manufacturing Cost of each vehicle:

(1) If 80 vehicles are produced each month:

Tires produced	$= 80 \times 5 = 400$
Fixed cost per month	$= \$367,000$
Unit Fixed Cost per vehicle	$= \$367,000/80 = \$4,588$
Unit Variable Cost per vehicle	$= \$2,950$
Unit Total Cost per vehicle	$= \$4,588 + \$2,950 = \$7,538$

(2) If 205 vehicles are produced each month:

Tires produced	$= 205 \times 5 = 1025$
Fixed cost per month	$= \$576,870$
Unit Fixed Cost per vehicle	$= \$576,870/205 = \$2,814$
Unit Variable Cost per vehicle	$= \$2,950$
Unit Total Cost per vehicle	$= \$2,814 + \$2,950 = \$5,764$

The total cost per vehicle has decreased from \$7,538 to \$5,764, with increase in number of vehicles produced per each month from 80 to 205. The difference has occurred due to the fixed cost per month increment.

7 Variable costs, fixed costs, relevant range.

A company manufactures a product in a fully automated process. The machine that produces the

product was purchased recently and can make 5,000 per month. The machine costs \$6,500 and is depreciated using straight-line depreciation over 10 years assuming zero residual value. Rent for the factory space and warehouse and other fixed manufacturing overhead costs total \$1,200 per month.

The company currently makes and sells 3,900 units per month. The company buys just enough materials each month to make the units it needs to sell. Materials cost 40¢ per unit.

Next year the company expects demand to increase by 100%. At this volume of materials purchased, it will get a 10% discount on price. Rent and other fixed manufacturing overhead costs will remain the same.

Solution:

1. What is the company's current annual relevant range of output?

Number of units per month = 5000
Number of units per year = $5000 \times 12 = 60,000$

Annual Relevant Range – 0 to 60,000 units

2. What is company's current annual fixed manufacturing cost within the relevant range? What is the annual variable manufacturing cost?

Rent for factory space and warehouse and other fixed manufacturing overhead costs
= $1200\$ \times 12 = 14,400\$$
Depreciation over 10 years = 6500\$
Depreciation over a year = 650\$

Company's current Annual fixed Manufacturing cost = $14,400\$ + 650\$ = \$15,050$

Annual Variable Manufacturing cost = $\$0.40 \times 3,900 \times 12 = \$18,720$

3. What will the company's relevant range of output be next year? How, if at all, will total annual fixed and variable manufacturing costs change next year? Assume that if it needs to the company could buy an identical machine at the same cost as the one it already has.

It is given that, Next year the company expects demand to increase by 100%, Company would require a second machine to output 7,800 units per month.

If the second machine is bought,
Capacity -> increase from 5,000 units to 10,000 units
Annual relevant range -> increase from 60,000 units to 120,000 units

Identical second machine cost -> \$6500

Depreciation cost per year -> \$650

Annual Fixed Manufacturing cost for next year -> $14,400 + 650 + 650 = \$15,700$

Annual Variable Manufacturing cost for next year -> $\$0.36 \times 93,600 = \$33,696$

If capacity is not increased by the company, variable cost of \$0.40 per unit will be same.

Annual Variable Manufacturing cost -> $\$0.40 \times 5000 \times 12 = \$24,000$

Annual Fixed Manufacturing cost will be constant -> \$15,050.

8 Cost drivers and functions.

The representative cost drivers in the right column of this table are randomized so they do not match the list of functions in the left column.

Function	Representative Cost Driver
1. Accounts payable	A. Number of invoices sent
2. Recruiting	B. Number of purchase orders
3. Network Maintenance	C. Number of units manufactured
4. Production	D. Number of computers on the network
5. Purchasing	E. Number of employees hired
6. Warehousing	F. Number of bills received from vendors
7. Billing	G. Number of pallets moved

Required:

Match each function with its representative cost driver.

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|------------------------|---|
| 1. Accounts payable | - F. Number of bills received from vendors. |
| 2. Recruiting | - E. Number of employees hired. |
| 3. Network Maintenance | - D. Number of computers on the network. |
| 4. Production | - C. Number of units manufactured. |
| 5. Purchasing | - B. Number of purchase orders. |
| 6. Warehousing | - G. Number of pallets moved. |
| 7. Billing | - A. Number of invoices sent. |