

## FYBCOM SEM 1 (NEP 2020)

### Chapter 4- Cost and Revenue analysis

**Syllabus- Concept of Costs, Historical Cost Replacement Cost, Accounting Cost and Economic cost, Direct and Indirect Cost (Only Definition) Total cost, Average Cost in Marginal Cost (Simple Numerical Calculation Based on Cost), Behavior of Cost Curves in Short run and Long Run. Total Revenue (TR), Average Revenue (AR), Marginal Revenue (MR)**

#### ❖ COST ANALYSIS

Profit is the ultimate aim of any business and the long-run prosperity of a firm depends upon its ability to earn sustained profits. Profits are the difference between selling price and cost of production. In general the selling price is not within the control of a firm but many costs are under its control. The firm should therefore aim at controlling and minimizing cost. Since every business decision involves cost consideration, it is necessary to understand the meaning of various concepts for clear business thinking and application of the right kind of costs.

#### ❖ COST CONCEPTS:

A managerial economist must have a clear understanding of the different cost concepts for clear business thinking and proper application. The several alternative bases of classifying cost and the relevance of each for different kinds of problems are to be studied. The various relevant concepts of cost are:

- 1. Historical costs and Replacement costs-** Historical cost or original costs of an asset refers to the original price paid by the management to purchase it in the past. whereas Replacement costs refers to the cost that a firm incurs to replace or acquire the same asset now. The distinction between the Historical cost and the replacement cost results from the changes of prices over time. In conventional financial accounts, the value of an asset is shown at their Historical cost but in decision making the firm needs to adjust them to reflect price level changes.
  - Example- If a firm acquires a machine for ₹ 20,000 in the year 2010 and the same machine costs ₹ 40,000 now. The amount ₹ 20,000 is the historical cost and the amount ₹ 40,000 is the Replacement cost.
- 2. Accounting and Economic costs:** Accounting costs are the actual or outlay costs that points out the amount of expenditure that has already been incurred on a particular process or on production as such accounting costs facilitates for managing the taxation need and profitability of the firm.
  - Examples- All sunk costs are Accounting costs.  
In other words, Accounting costs are the costs recorded for the purpose of preparing the balance sheet and profit and loss statements to meet the legal, financial and tax purpose

of the company. The accounting concept is an historical concept and records what has happened in the past.

- Economic costs are related to the future. They play a vital role in business decisions as the costs considered in decision making are usually future costs. They have a nature similar to that of incremental cost, imputed explicit and opportunity costs.  
In short, Economic cost concept considers future costs and future revenues, which help future planning, and choice, while the accounting cost describes what has happened, the economic cost aims at predicting what will happen.

**3. Direct Cost Variable Cost / Prime Cost-** Direct costs are those which have a direct relationship with a unit of operation like manufacturing a product, organizing a process or an activity etc. In other words, direct costs are those which are directly and definitely identifiable. The nature of the direct costs are related with a particular product/process, they vary with variations in them. Therefore all direct costs are variable in nature. It is also called as "Traceable Costs"

- Examples: In operating railway services, the costs of wagons, coaches and engines are direct costs.

**Indirect Costs / Fixed Cost-** Indirect costs are those which cannot be easily and definitely identifiable in relation to a plant, a product, a process or a department. Like the direct costs indirect costs, do not vary i.e., they may or may not be variable in nature. However, the nature of indirect costs depend upon the costing under consideration. Indirect costs are both the fixed and the variable type as they may or may not vary as a result of the proposed changes in the production process etc. Indirect costs are also called Non-traceable costs. Example: The cost of factory building, the track of a railway system etc., are fixed indirect costs and the costs of machinery, labour etc.

**4. Explicit and implicit costs:** Explicit costs are those expenses that involve cash payments. These are the actual or business costs that appear in the books of accounts. These costs include payment of wages and salaries, payment for raw-materials, interest on borrowed capital funds, rent on hired land, Taxes paid etc.

- Implicit costs are the costs of the factor units that are owned by the employer himself. These costs are not actually incurred but would have been incurred in the absence of employment of self – owned factors. The two normal implicit costs are depreciation, interest on capital etc. A decision maker must consider implicit costs too to find out appropriate profitability of alternatives.

**5. Short – run and long – run costs:** Short-run is a period during which the physical capacity of the firm remains fixed. Any increase in output during this period is possible only by using the existing physical capacity more extensively. So short run cost is that which varies with output when the plant and capital equipment is constant.

- **Long run costs:** Are those, which vary with output when all inputs are variable including plant and capital equipment. Long-run cost analysis helps to make investment decisions.

**6. Fixed and variable costs:** Fixed cost is that cost which remains constant for a certain level to output. It is not affected by the changes in the volume of production. But fixed cost

per unit decreases, when the production is increased. Fixed cost includes salaries, Rent, Administrative expense, depreciation etc.

- **Variable cost:** Is that which varies directly with the variation in output. An increase in total output results in an increase in total variable costs and decrease in total output results in a proportionate decline in the total variables costs. The variable cost per unit will be constant. Ex: Raw materials, labour, direct expenses, etc.
- 7. **Total, average and marginal costs:** Total cost is the total cash payment made for the input needed for production. It may be explicit or implicit. It is the sum total of the fixed and variable costs. Average cost is the cost per unit of output. It is obtained by dividing the total cost (TC) by the total quantity produced.

$$\text{Average cost} = \text{TC}/\text{Q}$$

- **Marginal cost:** Is the additional cost incurred to produce an additional unit of output or it is the cost of the marginal unit produced.

#### ❖ *COST-OUTPUT RELATIONSHIP*

A proper understanding of the nature and behavior of costs is a must for regulation and control of cost of production. The cost of production depends on money forces and an understanding of the functional relationship of cost to various forces will help us to make various decisions. Output is an important factor, which influences the cost.

The cost-output relationship plays an important role in determining the optimum level of production. Knowledge of the cost-output relation helps the manager in cost control, profit prediction, pricing, promotion etc. The relation between cost and its determinants is technically described as the cost function.

$$C = f(S, O, P, T \dots)$$

Where;

C= Cost (Unit or total cost)

S= Size of plant/scale of production

O= Output level

P= Prices of inputs

T= Technology

Considering the period the cost function can be classified as (a) short-run cost function and (b) long-run cost function. In economics theory, the short-run is defined as that period during which the physical capacity of the firm is fixed and the output can be increased only by using the existing capacity to bring changes in output by physical capacity of the firm.

#### **(A) Cost-Output Relation in the short-run:**

The cost concepts made use of in understanding the cost behavior are total cost, Average cost, and marginal cost.

1. Total cost is the actual money spent to produce a particular quantity of output. Total cost is the summation of fixed and variable costs.

$$TC = TFC + TVC$$

Up to a certain level of production total fixed cost i.e., the cost of plant, building, equipment etc, remains fixed. But the total variable cost i.e., the cost of labour, raw materials etc., Vary with the variation in output.

2. Average cost is the total cost per unit. It can be found out as follows.

$$AC = TC/Q$$

The total of average fixed cost (TFC/Q) keeps coming down as the production is increased and average variable cost (TVC/Q) will remain constant at any level of output.

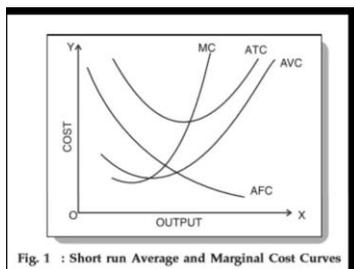
3. Marginal cost is the addition to the total cost due to the production of an additional unit of product. It can be arrived at by dividing the change in total cost by the change in total output.
- In the short-run there will not be any change in total fixed cost. Hence change in total cost implies change in total variable cost only.

Cost – output relations

Units of Output Q	Total fixed cost TFC	Total variable cost TVC	Total cost (TFC + TVC) TC	Average variable cost (TVC / Q) AVC	Average fixed cost (TFC / Q) AFC	Average cost (TC/Q) AC	Marginal cost MC
0	-	-	60	-	-	-	-
1	60	20	80	20	60	80	20
2	60	36	96	18	30	48	16
3	60	48	108	16	20	36	12
4	60	64	124	16	15	31	16
5	60	90	150	18	12	30	26
6	60	132	192	22	10	32	42

- The above table represents the cost-output rerection.
  1. The table is prepared on the basis of the law of diminishing marginal returns.
  2. The fixed cost Rs. 60 may include rent of factory building, interest on capital, salaries of permanently employed staff, insurance etc.
  3. The table shows that fixed cost is the same at all levels of output.
  4. The average fixed cost, i.e., the fixed cost per unit, falls continuously as the output increases.
  5. The expenditure on the variable factors (TVC) is at a different rate. If more and more units are produced with a given physical capacity the AVC will **fall** initially, as per the table declining up to 3rd unit, and being **constant** up to 4th unit and then **rising**. It implies that variable factors produce more efficiently near a firm's optimum capacity than at any other levels of output. And later rises. But the rise in AC is felt only after it (AVC) starts rising.

6. In the table 'AVC' starts rising from the 5th unit onwards whereas the 'AC' starts rising from the 6th unit only so long as 'AVC' declines and 'AC' also declines. 'AFC' continues to fall with an increase in Output.
7. When the rise in 'AVC' is more than the decline in 'AFC', the total cost again begins to rise.
8. Thus there will be a stage where the 'AVC' may have started rising, yet the 'AC' is still declining because the rise in 'AVC' is less than the drop in 'AFC'.
9. Thus the table shows an increasing returns or diminishing cost in the first stage and diminishing returns or diminishing cost in the second stage and followed by diminishing returns or increasing cost in the third stage.
  - The **short-run** cost-output relationship can be shown graphically as follows:



In the above given diagram, it is clear that,

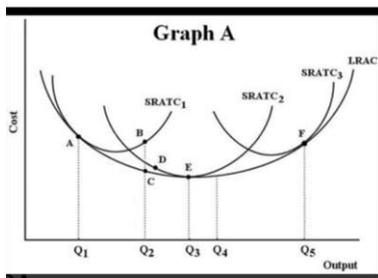
- The "AFC" curve continues to fall as output rises on account of its spread over more and more units of Output.
- But the AVC curve (i.e. variable cost per unit) first falls and then rises due to the **operation of the law of variable proportions**.
- The behavior of the "ATC" curve depends upon the behavior of the 'AVC' curve and 'AFC' curve.
- In the initial stage of production both 'AVC' and 'AFC' decline and hence 'ATC' also decline.
- But after a certain point 'AVC' starts rising.
- If the rise in average variable cost is less than the decline in average fixed cost, ATC will still continue to decline otherwise AC begins to rise.
- Thus the lower end of the 'ATC' curve thus turns up and gives it a U-shape. That is why 'ATC' curves are U-shaped.
- The **lowest point in the 'ATC' curve indicates the least-cost combination of inputs**. Where the total average cost is the minimum and where the "MC" curve intersects the 'AC' curve, It is not the maximum output level rather it is the point where per unit cost of production will be at its lowest.
- **The relationship between 'AVC', 'AFC' and 'ATC' can be summarized up as follows:**
  1. If both AFC and 'AVC' fall, 'ATC' will also fall.
  2. When 'AFC' falls and 'AVC' rises:
    - a. 'ATC' will fall where the drop in 'AFC' is more than the rise in 'AVC'.
    - b. 'ATC' remains constant where the drop in 'AFC' = rise in 'AVC'
    - c. 'ATC' will rise where the drop in 'AFC' is less than the rise in 'AVC'.

### (B) Cost-output Relationship in the long-run:

Long run is a period, during which all inputs are variable including the one, which are fixed in the short-run. In the long run a firm can change its output according to its demand. Over a long period, the size of the plant can be changed, unwanted buildings can be sold, staff can be increased or reduced. The long run enables the firms to expand and scale their operation by bringing or purchasing larger quantities of all the inputs. Thus in the long run all factors become variable.

The long-run cost-output relations therefore imply the relationship between the total cost and the total output. In the long-run cost-output relationship is influenced by the law of returns to scale.

In the long run a firm has a number of alternatives in regards to the scale of operations. For each scale of production or plant size, the firm has an appropriate short-run average cost curves. The short-run average cost (SAC) curve applies to only one plant whereas the long-run average cost (LAC) curve takes into consideration many plants. The long-run cost-output relationship is shown graphically with the help of "LCA" curve.



- In the above figure,
  1. It is assumed that technologically there are only three sizes of plants – small, medium and large, 'SAC' for the small size, 'SAC2' for the medium size plant and 'SAC3' for the large size plant.
  2. If the firm wants to produce 'OP' units of output, it will choose the smallest plant.
  3. For an output beyond 'OQ' the firm will be optimum for medium size plants. It does not mean that the OQ production is not possible with small plants. Rather it implies that the cost of production will be more with a small plant compared to the medium plant.
  4. For an output 'OR' the firm will choose the largest plant as the cost of production will be more with a medium plant. Thus the firm has a series of 'SAC' curves.
  5. The 'LAC' curve drawn will be tangential to the entire family of 'SAC' curves i.e. the 'LAC' curve touches each 'SAC' curve at one point, and thus it is known as envelope curve. It is also known as the planning curve as it serves as a guide to the entrepreneur in his planning to expand the production in future.
  6. With the help of 'LAC' the firm determines the size of plant which yields the lowest average cost of producing a given volume of output it anticipates.

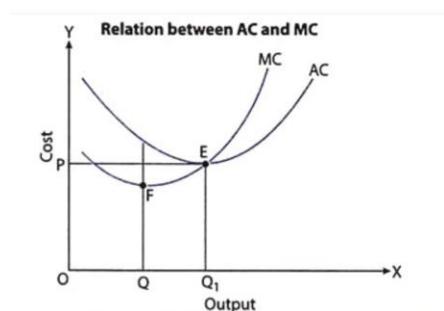
❖ Relation between Average Cost and Marginal Cost:

Relation between average cost and marginal cost is explained through the below given table and figure.

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**TABLE 6. Relation between Average Cost and Marginal Cost**

Output (Units)	Total Cost (₹)	Average Cost $AC = \frac{TC}{Q}$ (₹)	Marginal Cost $MC = TC_n - TC_{n-1}$ (₹)
0	10	∞	—
1	20	20	10
2	28	14	8
3	34	11.3	6
4	38	9.5	4
5	42	8.4	4
6	48	8	6
7	56	8	8
8	72	9	16



The above shown Table and Figure offer the following observations with regard to the relation between average cost and marginal cost:

1. When AC Falls, MC is Lower than AC:

When average cost falls, marginal cost is less than AC. In the given Table, AC is falling till it becomes Rs.8, and MC remains less than Rs.8. In the above given Fig. AC is falling till point E, and MC continues to be lower than AC. In this case, marginal cost falls more rapidly than the average cost. That is why, when the marginal cost (MC) curve is falling, it is below the average cost (AC) curve. It is shown in the given Fig.

2. When AC Rises, MC is Greater than AC:

When average cost starts rising, marginal cost is greater than average cost. In Table, when AC rises from Rs.8 to Rs.9, MC rises from Rs.8 to Rs.16. In Fig., AC starts rising from point E. And, beyond E, MC is higher than AC.

3. When AC does not Change, MC is Equal to AC:

When average cost does not change, then  $MC = AC$ . It happens when falling AC reaches its lowest point. In Table, at the 7th unit, average cost does not change. It sticks to its minimum level of Rs.8. Here, marginal cost is also Rs.8.

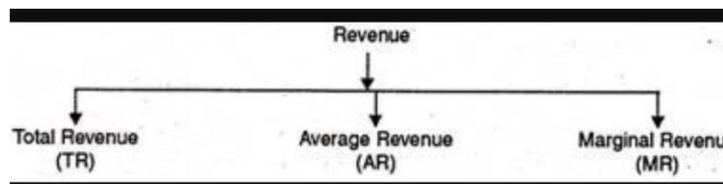
4. Thus, the given Fig. shows that the MC curve is intersecting the AC curve at its minimum point E.

❖ Revenue analysis

● Meaning of Revenue-

The term revenue refers to the income obtained by a firm through the sale of goods at different prices. In the words of Dooley, 'the revenue of a firm is its sales, receipts or income'.

The revenue concepts are concerned with Total Revenue, Average Revenue and Marginal Revenue.



● Concepts of revenue

- Total Revenue
- Average Revenue
- Marginal Revenue

1. Total Revenue: The income earned by a seller or producer after selling the output is called the total revenue. In fact, total revenue is the multiple of price and output. The behavior of total revenue depends on the market where the firm produces or sells.

“Total revenue is the sum of all sales, receipts or income of a firm.” Dooley

Total revenue may be defined as the “product of planned sales (output) and expected selling price.” Clower and Due

“Total revenue at any output is equal to price per unit multiplied by quantity sold.” Stonier and Hague

Thus,

$TR = AR \times Q$

where

TR = Total Revenue

AR = Average Revenue or Price per Unit

Q = Output

For example if the price of a commodity is Rs. 100 and total units sold are 20 in that case total revenue will be

$TR = 100 \times 20 = 2000$

TR = 2000

2. Average Revenue:

Average revenue refers to the revenue obtained by the seller by selling the per unit commodity. It is obtained by dividing the total revenue by total output.

“The average revenue curve shows that the price of the firm’s product is the same at each level of output.” Stonier and Hague

Thus :  $AR = \frac{TR}{Q}$   
 where AR = Average Revenue  
 TR = Total Revenue  
 Q = Output

According to McDonnell, "Average Revenue is the per unit revenue received from the sale of one unit of a commodity."  
 $TR = \text{Price} \times \text{Output}$   
 $TR = Pq$   
 $AR = \frac{Pq}{q} = P$

and  $P = f(Q)$  is an average curve which shows that price is a function of quantity demanded. It is also a demand curve.

### 3. Marginal Revenue:

Marginal revenue is the net revenue obtained by selling an additional unit of the commodity.

"Marginal revenue is the change in total revenue which results from the sale of one more or one less unit of output." Ferguson. Thus, marginal revenue is the addition made to the total revenue by selling one more unit of the good. In algebraic terms, marginal revenue is the net addition to the total revenue by selling  $n$  units of a commodity instead of  $n - 1$ .

Therefore,

$$MR = \frac{\Delta TR}{\Delta Q}$$

$$MR_n = TR_n - TR_{n-1}$$

Whereas

$TR_n$  = Total Revenue of ' $n$ ' units  
 $TR_{n-1}$  = Total Revenue from  $(n - 1)$  units  
 $MR_{(nth)}$  = Marginal revenue from  $n$ th unit  
 $n$  = Any given number

A. Koutsoyiannis, "The marginal revenue is the change in total revenue resulting from selling an additional unit of the commodity."

If total revenue from  $(n)$  units is 110 and from  $(n - 1)$  units is 100.  
 in that case

$$MR_{nth} = TR_n - TR_{n-1} = 110 - 100$$

$$MR_{nth} = 10$$

MR in mathematical terms is the ratio of change in total revenue to change in output

$$MR = \Delta TR / \Delta q$$

- Relationship between Total Revenue, Average Revenue and Marginal Revenue:

The relation of total revenue, average revenue and marginal revenue can be explained with the help of table and figure.

Table Representation:

The relationship between TR, AR and MR can be expressed with the help of table 1.

Unit (q)	TR/q AR or Price	(Pq) TR	(TR <sub>n</sub> - TR <sub>n-1</sub> ) MR
1	10	10	10
2	9	18	8
3	8	24	6
4	7	28	4
5	6	30	2
6	5	30	0
7	4	28	-2
8	3	24	-4
9	2	18	-6
10	1	10	-8

From table 1 we can draw the idea that as the price falls from Rs. 10 to Re. 1, the output sold increases from 1 to 10. Total revenue increases from 10 to 30, at 5 units. However, at 6th unit it becomes constant and ultimately starts falling at the next unit i.e. 7th. In the same way, when AR falls, MR falls more and becomes zero at 6th unit and then negative. Therefore, it is clear that when AR falls, MR also falls more than that of AR: TR increases initially at a diminishing rate, it reaches maximum and then starts falling.

The formula to calculate TR, AR and MR is as under:

$$TR = P \times q$$

$$AR = TR/q$$

$$MR = TR_n - TR_{n-1}$$

In fig. 1 three concepts of revenue have been explained. The units of output have been shown on horizontal axis while revenue on vertical axis. Here TR, AR, MR are total revenue, average revenue and marginal revenue curves respectively.

In figure 1 (A), a total revenue curve is sloping upward from the origin to point K. From point K to K' total revenue is constant. But at point K' total revenue is maximum and begins to fall. It means even by selling more units total revenue is falling. In such a situation, marginal revenue becomes negative.

Similarly, in figure 1 (B) average revenue curves are sloping downward. It means average revenue falls as more and more units are sold.

In fig. 1 (B) MR is the marginal revenue curve which slopes downward. It signifies the fact that MR with the sale of every additional unit tends to diminish. Moreover, it is also clear from the fig. that when both AR and MR are falling, MR is less than AR. MR can be zero, positive or negative but AR is always positive.

