Cost Theory

Cost is best described as a sacrifice made in order to get something. In business, cost is usually a monetary valuation of all efforts, materials, resources, time and utilities consumed, risk incurred and opportunities forgone in production and delivery of goods and services.

Cost analysis refers to the study of behavior of cost in relation to one or more production criteria like size of output, scale of operation, prices of factors of production etc.

Various Cost Concepts

1. Accounting Vs Economic costs

To an accountant cost refers to the monetary expenses incurred by a firm in the course of producing a commodity. **Accounting cost** (money or explicit) is the total monetary expenses incurred by a firm in producing a commodity and this is what an entrepreneur takes into consideration in making payments for various items including factors of production (wages and salaries of labour), purchase of raw materials, expenditures on machine, including on capital goods, rents on buildings, interest on capital borrowed, expenditure on power, light, fuel, advertisement, etc. Money costs are known also as explicit costs that an accountant records in the firm's books of account. Explicit costs are the payments to outside suppliers of inputs.

To the economists, the cost of any good or service is the totality of all sacrifices made to bring the good or service into existence. Therefore, the "**economic cost**" (opportunity cost of production) is made up of both the explicit and the implicit cost. Implicit cost, are the imputed value of the entrepreneur's own resources and services. According to Salvatore, "implicit costs are the value of owned inputs used by the firm in its production process". These include the salary of the owner-manager who is content with having normal profits but does not receive any salary, the estimated rent of the building (if it belongs to the entrepreneur), etc.

2. Opportunity cost

This is the cost of the resources foregone, in order to get or obtain another. The opportunity cost of anything is the next best alternative that could be produced instead by the same factors or by an equivalent group of factors, costing the same amount of money. E.g. the real cost of labour is what it could get in some alternative employment. Opportunity cost includes both explicit and implicit cost.

3. Private Vs Social cost

Private costs are the costs incurred by a firm in producing a commodity or service. It includes both implicit and explicit cost. However, the production activities of a firm may lead to economic benefit or harm for others. For instance, production of commodities like steel, rubber and chemical pollute the environment which leads to **social costs**. The society suffers some inconveniences as a result of the production exercise embarked upon by the firm.

4. Direct Vs Indirect Costs

Direct costs are traceable to the production of a specific good or service. A direct cost can be traced to the cost object, which can be a service, product, or department.

Indirect costs may be necessary to production, but they are not traceable to the act of production. Indirect costs are those necessary to keep your business in operation. Indirect costs include administration, personnel and security costs.

Cost function

Cost function expresses a functional relationship between total cost and factors that determine it. Usually, the factors that determine total cost of production (C) of a firm are the output (Q), level of technology (T), the prices of factors (Pf), and the Capital (K). it can be represented as follows:

$$C = f(Q, T, P_f, K)$$

Short Run and Long Run Cost Functions

Economic theory distinguishes between short-run costs and long-run costs.

The short run is a period in the production process, which is too short for a firm to vary all its factors of production. Short-run costs are the cost over a period during which some factors of production (usually capital equipment, Technology, prices of factors and management) are fixed.

On the other hand, the long-run costs are costs over a period long enough to permit a change in all factors of production. The long-run costs are planning costs or ex ante costs, in that they present the optimal possibilities for expansion of the output and thus help the entrepreneurs to plan their future activities. In the long-run, there are no fixed factors of production and hence, no fixed costs. In the long-run, all factors are variable, all costs are also variable. Symbolically, we may write the long-run cost function as:

$$C = f(Q,T,P_f,K)$$

Where C is total cost, Q is output, T is technology, P_f is prices of factor inputs, and K is fixed factors of production.

and short-run cost function as:

$$C = f(Q)$$

Where C is total cost, Q is output, all other determinants are considered fixed so normally not shown.

Short Run Cost and its Types (With Diagram)

Conceptually, in the short run, the quantity of at least one input is fixed and the quantities of the other inputs can be varied. In the short-run period, factors, such as land and machinery, remain the same. On the other hand, factors, such as labor and capital, vary with time. In the short run, the expansion is done by hiring more labor and increasing capital. The existing size of the plant or building cannot be increased in case of the short run.

Following are the cost concepts that are taken into consideration in the short run:

1i. Total Fixed Costs (TFC):

Refer to the costs that remain fixed in the short period. These costs do not change with the change in the level of output. For example, rents, interest on loans and salaries. Fixed costs have implication even when the production of an organization is zero. These costs are also called supplementary costs, indirect costs, overhead costs, historical costs, and unavoidable costs.

TFC remains constant with respect to change in the level of output. Therefore, the slope of TFC curve is a horizontal straight line.

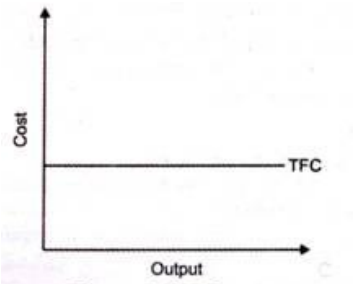


Figure-3: TFC Curve

As shown in above Figure, TFC curve is horizontal to x- axis. It can be seen that TFC remains the same at all the levels with respect to change in the level of output.

ii. Total Variable Costs (TVC):

Refer to costs that change with the change in the level of production. For example, costs incurred on purchasing raw material, hiring labor, and using electricity. If the output is zero, then the variable cost is also zero.

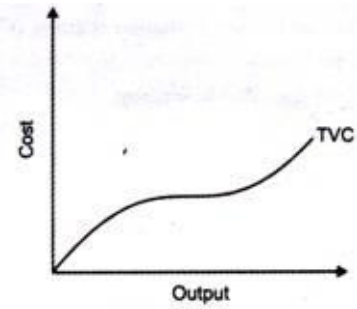


Figure-4: TVC Curve

In the above Figure, it can be seen that TVC curve changes with the change in the level of output.

iii. Total Cost (TC):

Total cost is the sum of Total Fixed Cost and Total Variable Cost. It can be calculated as follows:

Total Cost = TFC + TVC

TC also changes with the changes in the level of output as there is a change in TVC. The following Figure shows the total cost curve derived from sum of TVC and TFC:

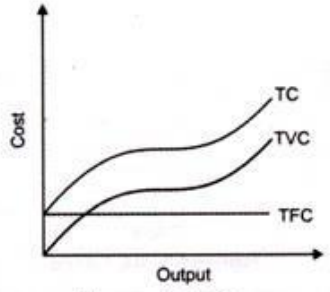


Figure-5: TC Curve

It should be noted that both TVC and TC increase initially at decreasing rate and then they increase at increasing rate Here, decreasing rate implies that the rate at which cost increases with respect to output is less, whereas increasing rate implies the rate at which cost increases with respect to output is more.

iv. Average Fixed Costs (AFC):

Refers to the per unit fixed costs of production. In other words, AFC implies fixed cost of production divided by the quantity of output produced. It is calculated as:

AFC = TFC/Output

TFC is constant as production increases, thus AFC falls.

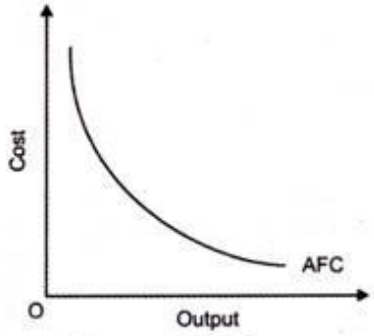


Figure-6: AFC Curve

AFC curve is shown as a declining curve, which never touches the horizontal axis. This is because fixed cost can never be zero. The curve is also called rectangular hyperbola, which represents that total fixed costs remain same at all the levels.

v. Average Variable Costs (AVC):

AVC refers to the per unit variable cost of production. It implies organization's variable costs divided by the quantity of output produced. It is calculated as:

AVC = TVC/Output

Initially, AVC decreases as output increases. After a certain point of time, AVC increases with respect to increase in output. Thus, it is a U- shaped curve, as shown in following Figure:

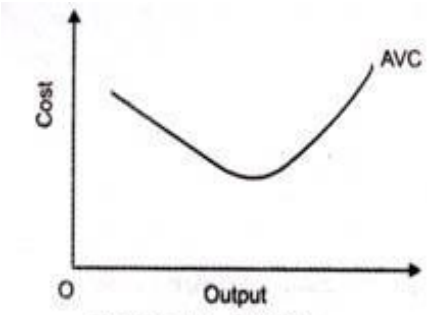


Figure -7: AVC Curve

vi. Average Cost (AC):

Average Cost refers to the total costs of production per unit of output. AC is calculated as:

AC = TC/ Output

AC is also equal to the sum total of AFC and AVC. i.e. AC=AFC+AVC

AC curve is also U-shaped curve as average cost initially decreases when output increases and then increases when output increases. The following figure shows the AC curve drawn by adding AFC and AVC:

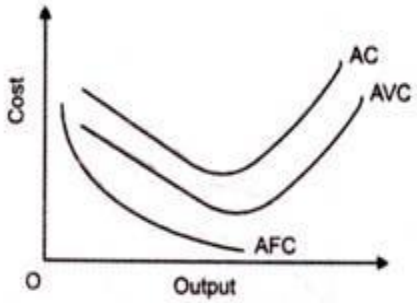


Figure -8: AC Curve

vii. Marginal Cost:

Marginal Cost refers to the addition to the total cost for producing an additional unit of the product. Marginal cost is calculated as**:**

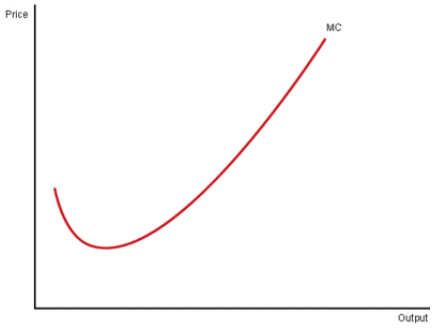
$MC = TC_n = TC_{n-1}$

n= Number of units produced

It is also calculated as:

$MC = \Delta TC/\Delta Output$

MC curve is also a U-shaped curve as marginal cost initially decreases as output increases and afterwards, rises as output increases. This is because TC increases at decreasing rate and then increases at increasing rate. The following figure shows the MC curve**:**



All the short run cost curves are shown in a single graph as follows:

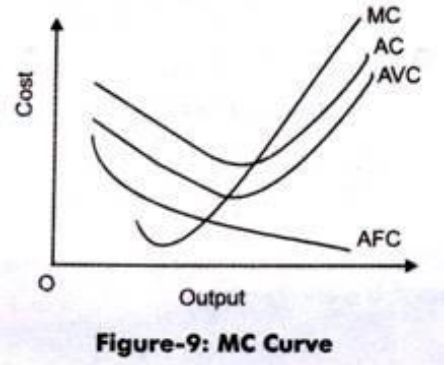


Figure-9: MC Curve

Let us learn the aforementioned cost concepts numerically with the help of following Table:

Table-1: Calculation of Short-run Costs

Units of Output	TFC =30	TVC	TC= TFC + TVC	AFC= TFC/Output	AVC= TVC/Output	AC= AFC+ AVC	MC
0	30	0	30	-	-	-	-
1	30	10	40	30	10	40	10
2	30	18	48	15	9	24	8
3	30	24	54	10	8	18	6
4	30	32	62	7.5	8	15.5	8
5	30	50	80	6	10	16	18
6	30	72	102	5	12	17	22

Economies and Diseconomies of Scale

Economies of scale refer to the cost savings made possible as plant size increases. A firm is said to achieve economies of scale if its long-run average costs decline as it increases the size of its plant. On the other hand, diseconomies of scale refer to the higher unit costs the firm incurs as a result of setting up a larger plant. Examining the U-shape of the LAC, this shape reflects the law of returns to scale. According to the law, the unit costs of production decreases as plant size increases, due to the economies of scale which the larger plant sizes make possible. The traditional theory of firm assumes that economies of scale exist only up to a certain size of plant, which is known as the optimal plant size because with this plant size all possible economies of scale are fully exploited. If the plant increases further than this optimal size there are diseconomies of scale, arising from managerial inefficiencies.

Internal and External Economies of Scale

Economies of scale can be internal or external. Internal economies are those cost savings that accrue directly to the firm by increasing its output level (or its plant size). Four main types of internal economies are often discussed:

a.) Technical economies:

In the mass-producing industries, there is intensive use of machinery giving rise to technical economies because overhead costs are spread over a larger output. Furthermore, a large firm is able to support its own research and development programme. Since the production process is highly fragmentized, it is easy to invent and introduce cost-reducing machines and equipments to perform simple production tasks.

b.) Managerial economies:

Cost-savings advantages are derived from specialization of labour. In a large firm, specialists are employed, each concentrating on a relatively small fraction of the total work according to their skills and abilities. Each worker becomes more proficient at his or her job thus increasing productivity and lowering unit cost of production.

c.) Financial economies:

Large firms can easily obtain loans at lower rates of interest than small firms because they can provide collateral security. Hence, they are considered less risky customers than small firms. The

rate of interest charged by banks to those firms regarded as best credit risks is called prime lending rate.

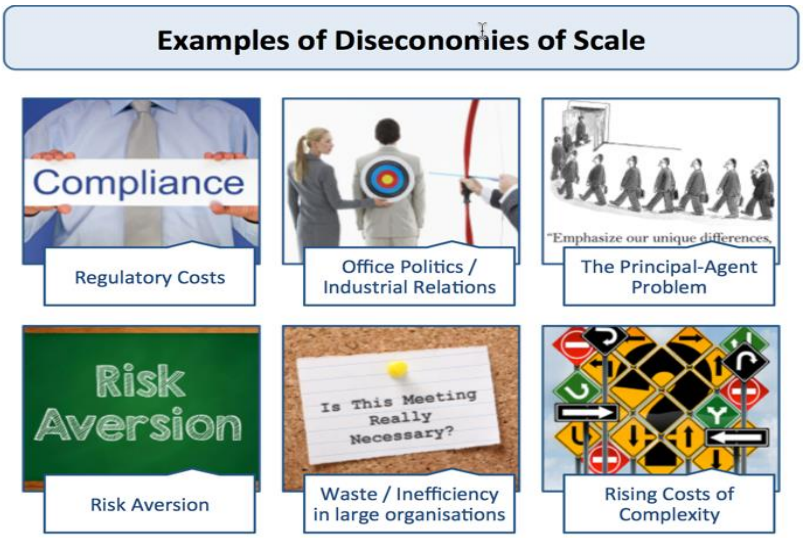
d.) Marketing economies:

A large firm buys its raw materials in bulk and obtain discount. Eventually, the large firm pays lower prices than the small firms. A large firm can also promote its sales through advertising thereby spreading the selling costs over a large output, i.e. the larger the output, the smaller the advertising cost per unit of output.

On the other hand, **external economies of scale** are cost savings benefits derived when firms in the same or similar industry are concentrated in a particular area. Such costs benefits are called "economies due to localization of industries".

Diseconomies of Scale

Diseconomies of scale are the cost disadvantages that economic actors accrue due to an increase in organizational size or on output, resulting in production of goods and services at increased per-unit costs. The concept of diseconomies of scale is the opposite of economies of scale. In business, diseconomies of scale are the features that lead to an increase in average costs as a business grows beyond a certain size. The examples of diseconomies of scale may be Insurance cost, Cost of safety measures, Issues in management of huge labor etc. The following figure also points out some disadvantages of production on large scale

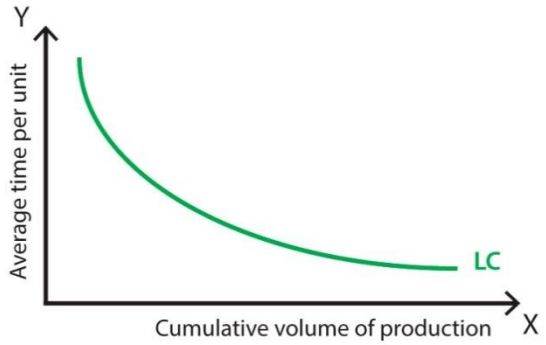


Economies of Scope:

Economies of scope describe situations in which the long-run average and marginal cost of a company, organization, or **economy** decreases, due to the production of some complementary goods and services. An **economy of scope** means that the production of one good reduces the cost of producing another related good. In simple words the benefits in terms of cost saving and increased profits that a firm earn by increasing its scope i.e. increasing variety of products being produced by it. Like Nestle produces many products. For example, a gas station that sells gasoline can sell soda, milk, baked goods, etc. through their customer service representatives and thus gasoline companies achieve economies of scope.

Planning/Learning Curve:

A long run average cost curve is known as a planning curve. This is because a firm plans to produce an output in the long run by choosing a plant on the long run average cost curve corresponding to the output. It helps the firm decide the size of the plant for producing the desired output at the least possible cost.



The following are the reasons for downward shape of LAC

1. Production Costs Vs Managerial Costs
2. Technical Progress
3. Learning