## UNIT – IV COST & REVENUE

A producer requires various factors of production or inputs for producing a commodity. He pays them in the form of money. e.g. rent to the landlord, wages to the labour, interest to the capital and spends on other inputs like raw materials, power, fuel, transportation, communication, insurance charges, etc, ordinarily, such money expenses incurred by a firm in the production of a commodity are called the cost of production. However, in economics, money expenses along do not constitute cost of production of a commodity. The term cost is used in much broader sense. For example, if a producer were not to engage in the production of a commodity, he would have been paid some salary. Since the producer forgoes this salary, this should form part of the cost of production. Similarly, an entrepreneur running his business in his own flat could have rented the same and would have got some rent. He foregoes this rent. This rent should form a part of his cost of production. Likewise, the money invested by the entrepreneur in his business could have earned interest, if it had rent out to others. By keeping this money this money for his own use business, he loses this reward also. Thus, it is clear that money expenses constitute only a part of the cost. The real nature of cost can be understood by studying various concepts related to the cost of production.

### DIRECT COST AND INDIRECT COST

(Cost Classification on the basis of Traceability)

Distinction between direct and indirect costs is of significance in a multiproduct firm in setting economic prices for different products. Whether a specific cost is direct or indirect depends on the costing unit under consideration. In actual practice, firms allocate common costs among various departments, processes or products on the basis of their approximate uses in various activities, which is, in turn, judged by their relative turnovers. Traceability of costs becomes important, when multiple products with common costs differ considerably in production or marketing processes.

### Direct Cost

Direct or separable or prime or traceable cost is one which can be easily and directly identified or attributed to a particular product, operation or plant. For example, the use of

raw material, labour and machine in the production. Likewise, the salary of a divisional manager, when division is a costing unit, is a direct cost.

**Indirect Cost**

Common or joint or indirect cost is that cost, which is not accurately traceable to any plant, department or operation or any individual final product. Electric power for operating machines stationary and other office expenses, depreciation on building are some examples of such non-traceable cost. Reception staff, decoration, cost of escalators, parking facilities, etc. are some other examples. Likewise, the monthly salary of the general manager, when one of the divisions is a costing unit, is an indirect cost.

**MONEY COST AND REAL COST**

The classification of cost into money and real cost has been given by Marshall.

**Money Cost**

When production cost is expressed in terms of monetary units, it is called money cost. It means the aggregate money expenditure incurred by a producer on the purchase of inputs. Money cost is widely used in the theory of production. While the production function considers technical relationship between physical inputs and output, the cost analysis basically deals with the monetary aspect of these relationships. This cost includes not only sacrificed alternative, but also monetary payments. It is the sum of explicit and implicit cost.

**Real Cost**

Alfred Marshall calls real cost of production as a social cost Real cost refers to the payments made to the factors of production to compensate for disutility's of rendering their services. It is computed in terms of the toil, trouble, pain and discomfort involved for labour, when it is engaged in production. Similarly, the abstinence, pain and sacrifice involved in saving and capital accumulation is the real cost of capital. In the words of Marshall, the exertions of all the different kinds of labour that are directly or indirectly involved in making it together with abstinence or rather the waiting required, for saving the capital used in making it, all these sacrifices together will be called the real cost of production of a commodity." All works do not involve same level of real cost. Some works are more unpleasant, irksome and painstaking and therefore, involve more real sacrifice. Similarly, a work in which the health of the workers is adversely affected involves more real cost.

The concept of real cost, though important from social point of view. It lacks precision due to subjectivity involved. It cannot be subjected to accurate monetary measurement. In reality, real costs seldom equal money expenses of production.

## EXPLICIT COST AND IMPLICIT COST

Economic costs that a firm incurs in the production of a good include payments for all the resources employed by it in the production of those goods. Economist takes into account both of these costs. Therefore, economic cost is the sum of explicit cost (cost in hired inputs) and implicit cost (cost of hiring inputs). A firm gets economic profits, if its revenue exceeds the sum of explicit and implicit cost. While the former involves sacrifice on money expenditure on inputs, the latter involves the sacrifice of alternatives that have been foregone in the production of a commodity. Every item of input used must be included in costs, whether paid for in cash or not.

The concept of economic cost is very important and more often employed than any other concept of cost. This concept is also used to analyse the equilibrium of a firm under different market forms.

### Explicit Cost

Explicit cost is the monetary payment made by the entrepreneur for purchasing or hiring the services of various productive factors, which do not belong to him. This cost is in the nature of contractual payment and includes rent for land, wages to the labour, interest on capital, payment for the raw materials, fuel, power, light insurance premium, transportation, advertisement, taxes, etc. Leftwich defines explicit cost as “those outlays made by a firm that we usually think of as its expenses. They consist of resources bought or hired by the firm “. This cost is called out of pocket cost and is recorded in firm’s account book. As accountant takes into account his cost, it is also called accounting cost.

### Implicit Cost

Implicit cost arises in the case of those factors, which are possessed and supplied by the entrepreneur himself. There is no contractual obligation for payment to anyone else in order to obtain these factor units. But, the factor units are responsible for costs, since they could be supplied to other producers for contractual sum, if they were not used in this business. Further, if the same factors were to be hired or purchased by a firm instead of being arranged from its own sources, then, it would certainly have to make payment explicitly to the suppliers of these services. The monetary payment involved would be

equal to the amount of money; the firm is deprived of, when it avails the services of its own factors of production.

Leftwich defines implicit cost of production as *"cost of self-owned, self employed resources that are frequently overlooked in computing the expenses of a firm. "* It is the amount that could be earned in the best alternative use of the entrepreneur's money and time. It includes (i) the wage or salary that the entrepreneur could have earned, if he sold his services to others, (ii) money rewards for other factors owned by the entrepreneur himself and employed by him in his business, and (iii) the normal return on capital invested by him in his own business. Implicit cost is also known as imputed cost, as it is not possible to assign exact money value to it. It is worked out or imputed on the basis of potential earnings, which the factors of production owned by the firm could get in the next best alternative use.

## PRIVATE COST AND SOCIAL COST

### Private Cost

Private cost refers to the cost of production incurred and provided for by an individual firm engaged in the production of a commodity. It is found out to get private profits. This cost has nothing to do with the society. It includes both explicit as well as implicit cost. A firm is interested in minimizing private cost.

### Social Cost

Social cost refers to the cost of producing a commodity to the society as a whole. It takes into consideration all those costs, which are borne by the society directly or indirectly. Social cost is not borne by the firm. It is rather passed on to persons not involved in the activity in the direct way.

Social cost is a much broader concept. In is found out to get social profits rather than private profits. The production of a commodity by a firm generates advantages (benefits) as well as disadvantages (cost) to other members of society, called external benefits and external costs respectively. These benefits are available free of cost. For instance, to facilitate easier movement of raw materials and finished products, a producer constructs a road, linking it with a highway. This road may be used by others, who will not pay for the benefits derived. On the similar lines, no producer compensates other for the costs

incurred to them as a result of his production. Water pollution caused by the disposal of wastes into a river (or sea) or air pollution and consequent health hazards by the smoke generation by factories or buses plying in big cities are some other examples.

Social cost is the sum of private cost and external cost. Alternatively, external cost is the difference between social cost and private cost, which may by positive or negative. If social cost is more than private cost, there is an external cost (or negative externality) on the other hand, if social cost is less than private cost, there is an external benefit (or positive externality).

Social cost is an important concept. Knowledge of social cost and social benefit is extremely important in the efficient utilization of limited resources.

## ACTUAL COST AND OPPORTUNITY COST

(**Cost classification on Basis of Economic Concept or Computation**)

### Actual Cost

Actual or historical cost refers to the actual expenditure incurred for acquiring or producing a good or service. Such cost is popularly known as absolute cost or outlay cost. Actual wages, rent or interest paid are some examples of absolute cost. The assets are usually shown in the conventional financial accounts at their historical costs. However, during phases of rising price levels, historical cost fails to provide correct basis for projecting future cost. Thus, historical cost should be adjusted to reflect current or future price levels, i.e. the price that would have to be paid for acquiring the asset (replacement cost). For very old plant and machine, exact replacement cost may not be known as they may no longer be available in the market. During inflationary conditions, replacement cost exceeds the historical cost. The opposite holds true during deflationary situations. This type of cost is generally recorded in the books of accounts. It may be different from opportunity cost, as explained below.

### Opportunity Cost

Opportunity cost is the cost which is not actually incurred, but would have been incurred in the absence of employment of self-owned factors. As expenditure is not currently incurred, this cost is often ignored and not recorded in the books of accounts. However, management should never ignore it while taking business decision. In the words of Joel Dean, “In business problems, the massage of opportunity costs is that it is dangerous to confine cost

knowledge to what the firm is doing. What the firm is not doing is frequently the critical cost consideration, which it is perilous but easy to ignore."

The concept of opportunity cost was popularized by the American writers. It occupies a very important place in modern economic analysis. Opportunity cost of any input is the next best alternative use that is sacrificed by its present use. It is measured by the value of factors of production used in producing a good, when put to the next best alternative use. In other words, it indicates what a factor could earn in the next best use. Opportunity cost reflects the benefits we give up to select the most preferred choice. For example, Meetu sacrifices lunch and takes his friend Charu to the cinema. In this case, the opportunity cost of the cinema is the lunch he did not have. Similarly, if a farmer decides to grow wheat instead of rice, the opportunity cost of the wheat would be the rice, which he might have grown rather. Thus, opportunity cost is the cost of foregone alternative. If we produce more of one thing, resources have to be withdrawn from other uses, as these are scarce. In the words of Lipsey. "The opportunity cost of using any factor is what is currently foregone by using it. " Opportunity cost is also the opportunity lost or sacrificed. To quote Watson, "Cost of anything is the value of the alternative or the opportunity that is sacrificed."

Implicit cost incurred by a firm is actually the opportunity cost of the factor owned by him. By employing this factor in the firm, the producer loses the opportunity of earning the factor income, had it been employed elsewhere. Thus, the opportunity cost of a factor input is nothing but a potential return from the next best alternative use of that factor.

Opportunity cost is also the minimum price necessary to retain a factor in the current employment. Joan Robinson calls it transfer earning. Since a firm has to pay to owners of factors what they can secure in alternative employment, opportunity cost is also known as alternative cost.

Opportunity cost of a good is not simply any other alternative good that could be produced with the same factors. It is only the most valuable (or next best alternative) good, which the same factors or nearly the same value of factors could produce. To quote Benhan "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".

The concept of opportunity cost is highly useful to each and every economic unit. Each cost concept can be expressed in terms of opportunity cost. Every action that we take involves an opportunity cost, as cost of getting something involves losing something else. For a student, the cost of seeing a movie may be the book, whose purchase is foregone. For the consumer, the opportunity cost of buying a commodity is the price; he pays for it in monetary

terms. For the government, the cost of building a college may be the hospital sacrificed. For the society, the cost of setting up arm factory may be the bread and butter sacrificed. It can be shown on the production possibility curve. Opportunity concept has wide economic implications. It is important in the context of factors of production. As supply of the factors is limited, a factor can be utilized in one use (or at present) by sacrificing its use for other purpose (in future). It helps us to know, how limited resource get allocated in different branches of production. Further, it can be used to determine factor price. The concept is especially relevant for an industry which must pay wages which are at least equal to what are being paid in other industries. Otherwise, labour will shift to another industry. Thus, the opportunity cost concept is useful in short term decision term decisions like sales strategy, inventory management, hiring and firing of labour, etc. It is also applicable in investment planning to make a choice of best alternative after evaluating all available le alternatives carefully. A profit oriented firm must consider opportunity cost besides explicit cost in order to use all the resources most economically.

**The concept of opportunity cost has some limitations**. It is only applicable to those factors which have alternate uses. Thus, if no sacrifice is involved, then the opportunity cost is zero, even though the actual cost or the acquisition cost or the historical cost (the cost at which the factor was originally acquired or purchased) was substantial. Further, foregone alternatives are often not clearly ascertainable due to imperfect knowledge of factor owners and imperfections in the market.

**SHORT RUN & LONG RUN COST CURVES:**

(Cost classification based on time dimension)

**SHORT RUN COST CURVES: on the basis of total**

**TOTAL (COST) CURVE**

**(Cost Classification on Basis of Variability)**

Short run cost varies with output, when unlike long-run costs all the factors are not variable. This cost becomes relevant, when a firm has to decide whether or not to produce more in their immediate future. This cost can be divided into two components of fixed cost and variable cost on the basis of variability of factors of production the distinction between fixed and variable cost is not a water tight one. What is fixed at one level of

output may be come variable at another level of output. Actually most of the costs are semi variable, which fall between these two extremes. They are neither perfectly variable nor absolutely fixed in relation to change in volume. For example, telephone bills include both fixed charge and variable charges based on consumption. Similarly, development officers of insurance companies and sales man business firms get commission o volume of these business apart from the monthly salary. Thus, though, semi-variable costs vary in the same direction as sales volume, but not in direction proportion thereto.

The distinction between fixed and variable costs is explained below, which is useful to managers for forecasting. The effect of short-run changes in sales volume on costs as well as profit and hence for understanding break even analysis. The distinction between fixed cost and variable cost is similar to that between sunk cost and incremental cost. Like sunk cost, fixed cost is irrelevant for decision making, but in the short-run only. As there is no fixed cost in the long- run, fixed cost is suck cost in the short-run.

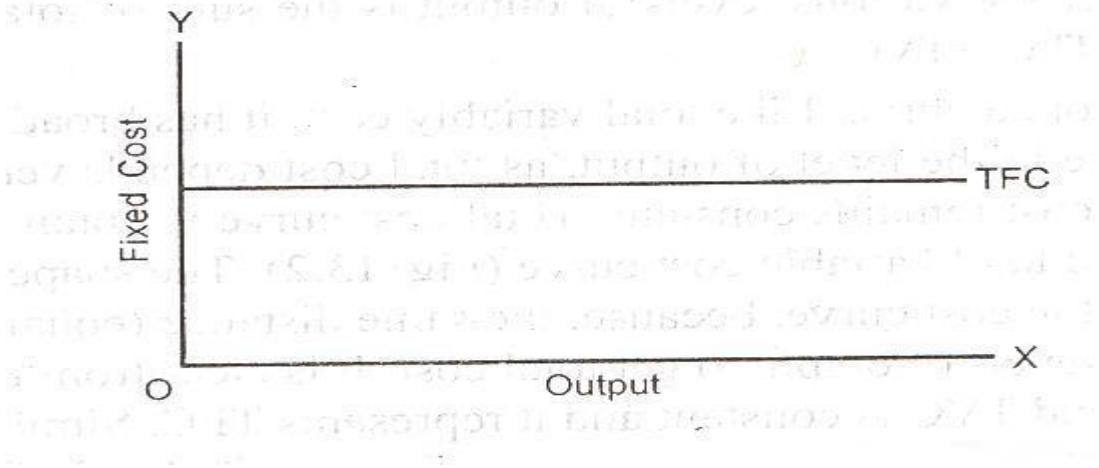
It is important to note that fixed and variable costs are not exactly synonymous to direct and indirect cost as explained earlier. The criterion used by the economists to divide cost into fixed and variable is whether or not the cost varies with the level of output .On the other hand the accountant divides the cost on the basis of whether or not the cost is reparable with respect to the production of individual output units, the accountants often, divide overhead, expenses in to 'variable overhead' and 'fixed overhead'. When the variable overhead expenses per unit are added to the direct cost per unit, we set what economist call as average variable cost.

**Total Fixed Cost (TFC)**

In short period, some factors are fixed, while others are variable. Cost incurred on the fixed factors like machinery, building, etc. is called fixed cost. In other words, fixed cost is the cost of employing fixed factors in the short period. Fixed cost is a 'fixed' amount, which must be incurred by a firm, whether the output is large, small or even zero. Thus, fixed cost is not related to the level of output. Even when the firm closes down for some time, but, rains in business, this cost has to be borne by it. Salaries of managerial and administrative staff, rent, insurance charges, property taxes, interest on capital and maintenance cost, depreciation cost due to technical obsolescence are some examples of fixed cost, which do not change with the change in output. It is also called as sunk cost, since, the expenditure has to be incurred irrespective of the level of production.

Fixed cost known as indirect cost or overhead cost or supplementary cost. Fixed cost curve is a horizontal straight line parallel to X-axis (Fig.13.1.). The curve shows that the total fixed cost remains same at different levels of output, even if the output is zero.

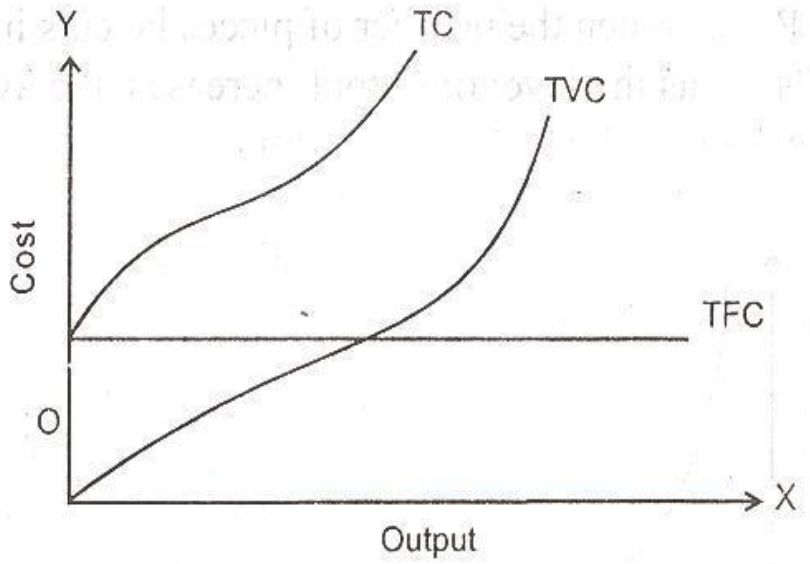
Fig.13.1




**Total Variable Cost (TVC)**

Variable cost is incurred on the employment of variable factors like raw material, direct labour, power, fuel, transportation, sales commission, depreciation charges associated with wear and tear of assets, etc. It varies directly with output. Cost of a factor is obtained by the product of number of physical units of the factor and its price. The variable cost is incurred only, when some amount of output is produced and it rises with the increase in the level of production and vice- versa. In other words, variable cost also ceases. I f a firm shuts down its business for some time; it has not to incur any expenditure on variable cost. However, the maximum quantity of output that can be purchased depends upon the quantity of the fixed factors of production. Marshall calls the variable cost as prime cost. It is also called direct cost, since; it varies directly with the change in the level of output. Total variable cost is graphically shown in Fig.13.2

Fig.13.2




**Total Cost (TC)**

Total cost to a producer for the various levels of output is the sum of total fixed cost and total variable cost i.e., TC= TFC+TVC.

Total cost is positively sloped curve. Like total variably cost, it has broadly an inverse 'S' shape. It increases with an increase in the level of output, as total cost depends very much on total variable cost, whereas total fixed cost remains constant. Total cost curve is obtained by adding up vertically total fixed cost curve and total variable cost curve (fig.13.2). The shape of the total cost curve is same as that of total variable cost curve, because, the same distance (equal to fixed cost) is added to variable cost as different levels of output to get total cost. It is clear from the Fig.13.2 that the vertical distance between TC and TVC is constant and it represents TFC. Similarly, the vertical distance between TC and TFC is TVC, which increases with increase in the level of output.

In case variable cost varies at constant returns, when output is expanded, variable cost as well as total cost curves would be upward sloping linear curves (with constant slope)

**SHORT RUN COST CURVES: AVERAGE (COST) CURVES (based on per unit)**

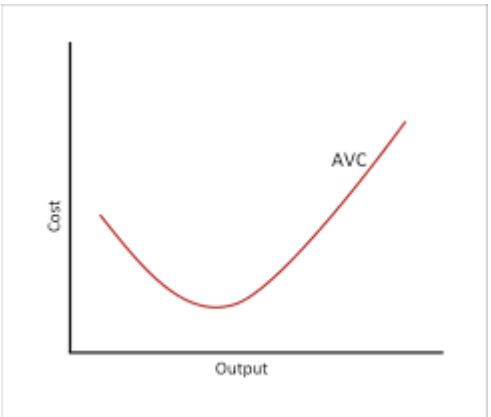
**Average Fixed Cost (AFC)**

Per unit fixed cost of producing a commodity is called the average fixed cost. It is calculated by dividing the total fixed cost by the number of units of commodity produced. Therefore,

Where Q is the total output.

Suppose, Kapil Khurana incurs an expenditure of Rs. 20,000/0 on installing a stone cutter machine. If he cuts 10,000 pieces of stones during the first month of installation, the average fixed cost will be Rs. 20,000/10,000 = Rs. 2. When the number of pieces he cuts increases to 20,000, the average fixed cost falls to Rs.1. Thus, as the level of output increases, the average fixed cost falls. It is clear from the Fig. 13.3 given below.

Fig. 13.3




Total fixed cost is a constant quantity. As the output increases, the total fixed cost spreads out over more and more units and therefore average fixed cost becomes less and less. When output becomes very large, average fixed cost approaches zero. Business Executives refer to it as spreading the overheads.

It will be seen that average fixed cost (AFC) falls continuously, as more units are being produced at the same fixed expenses. AFC corresponding to any point on the TFC curve is equal to the slope of the ray from origin to that point, i.e. perpendicular ( total fixed cost) divided by base ( total output) or tangent of the angle made by the ray with the X-axis. Graphically, the average fixed cost curve is a downward sloping curve, since the slope of the ray from origin to any point on TFC curve decreases, as one moves to the right. It will fall steeply in the beginning and will tend to touch X-axis, but will never become zero. Similarly, AFC curve can never touch Y-axis. It is so, because, TFC is a

positive value at zero output and any positive value divided by zero will provide infinite value. Thus, AFC curve approaches both the axes asymptotically. Further, the nature of AFC curve is rectangular hyperbola indicating that every rectangle (TFC= AFCx Q) will be equal to every other rectangle in area. When the output increases by a certain percentage, the average fixed cost decreases by the same percentage such that their product representing total fixed cost remains constant throughout.

**Average Variable Cost (AVC)**

Per unit variable cost of producing a commodity is called the average variable cost. It is computed by dividing total variable cost by the number of units produced.

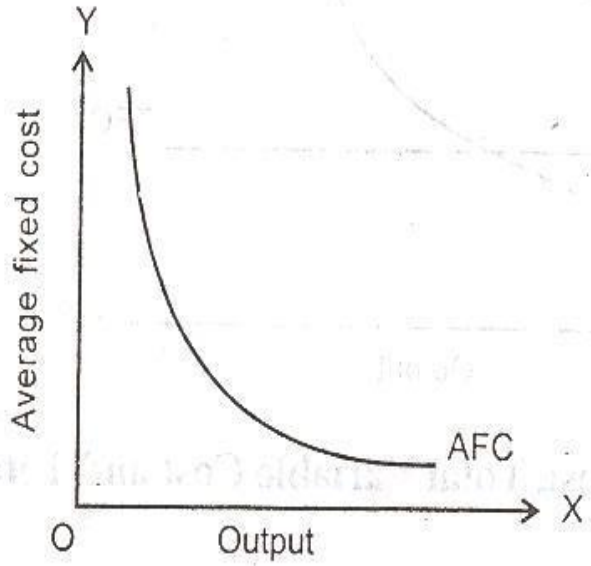
Therefore,

$$AVC = TVC/Q$$

Where, Q is the total output.

As output rises, average variable cost falls initially due to the occurrence of increasing returns (when total variable cost rises less then proportionately to output) It is minimum at the optimum capacity output. At this level of output, all the factors used by the firm are being employed as efficiently as possible. Beyond the optimum capacity, the average variable cost will rise steeply because of the operation of diminishing returns (when total variable cost rises more than proportionately to output). This is illustrated in Fig. 13.4 Graphically, the average variable cost curve is U shaped due to the operation of the law of returns. This curve is drawn by considering the average variable cost (AVC) at each level of output derived from the slope of a ray drawn from the origin to the point on the total variable cost (TVC) corresponding to the particular level of output3. The slope of the ray through the origin declines continuously until the ray becomes tangent to the total variable cost. To the right of this point, the slopes of rays through origin start increasing.

Fig. 13.4




Thus, the AVC falls initially as the productivity of the variable factor (s) increases, reaches a minimum, when the plant is operated (with the optimal combination of fixed and variable factors) and rises beyond that point.

If the total variable cost curve is a linear curve, the average variable cost will be constant and is equal to marginal cost (derivative of total cost with respect to output or change in total cost divided by change in output).

**Average Total Cost (ATC)**

Average total cost is the sum of the average fixed cost and average variable cost. Alternatively ATC is computed by dividing total cost by the number of units of output.

Therefore,

ATC or AC = AFC + AVC

Average cost is also known as *unit cost*, as it is cost per unit of output produced. It is graphically shown in Fig. 13.5 it is derived from total cost curve in the same way as the average variable cost curve is derived from total variable cost curve. If the total cost curve is linear, the average total cost curve continues to decline, as output increases.

The behaviour of the average total cost depends upon the behaviour of the average fixed cost and average variable cost. Initially, average total cost is high, as both the

average fixed cost and average variable cost are high at low levels of output. As the level of output increases in the initial stages, ATC falls sharply, as both AFC and AVC curves fall. When AVC curve begins to rise, AFC curve still continues to fall. The ATC curve continues to fall, because, the fall in AFC curve outweighs the rise in AVC curve. Therefore, the minimum point of AFC becomes equal to rise in AVC; ATC reaches its minimum point, which is the optimum point of output. If output increases further, rise AVC more than offsets the fall in AFC. ATC rises after that point as a result. Thus, ATC curve like the AVC curve first falls reaches its minimum value and then rises. That is why; it is U- shaped curve, similar to that of AVC.

At each level of output, AC curve lies above AVC curve at a distance equal to the corresponding height of curve AFC. As the output increases, both AVC and ATC tend to come closer and closer, as the gap between them (given by AFC) becomes smaller and smaller. When AFC curve approaches X-axis, the AVC curve approaches the ATC curve.

**MARGINAL COST CURVE**

It is worth noting that marginal cost is independent of the fixed cost, as fixed cost does not change with output ( in the short period) Marginal cost is affected only by the variable cost, over which the firm has the most direct control. Marginal cost can be saved by reducing total output. The firm has most direct control over marginal cost. A firm's decision as to what output level to produce is largely influenced by this cost. Marginal cost can be obtained by comparing either the change in total cost or the change in total variable cost, when output is increased by one unit. This point can be explained with the help of simple algebra as follows

$MCn = TCn - TCn\text{-}1$

$TC = TFC + TVC$

$MCn = TVCn - TVCn\text{-}1$

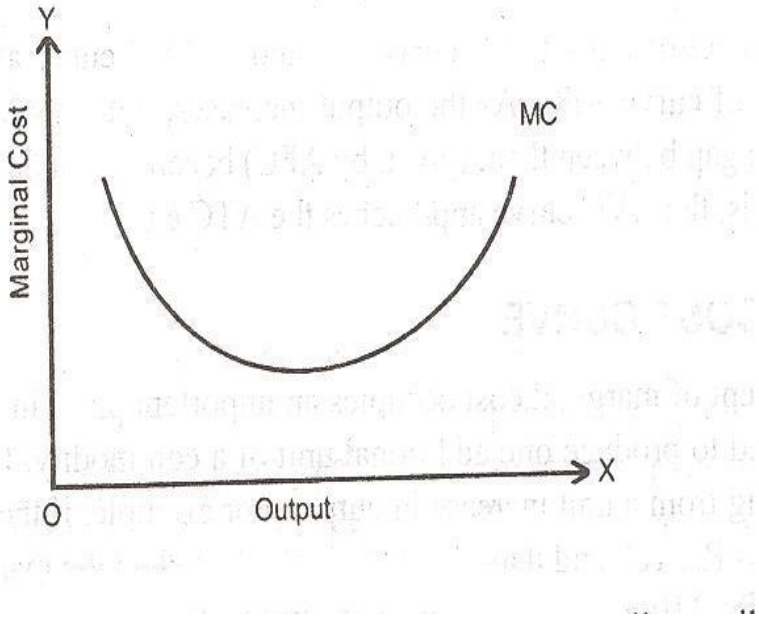
Therefore, marginal cost reflects only the change in total variable cost. The summation of marginal costs of different sellers gives the supply of a commodity, which together with demand influence price and hence production decision.

The behaviour of marginal cost is also influenced by the law of returns, Initially, marginal cost falls (when total or variable cost rises slowly), then it remains constant and finally it rises (when total or variable cost rise fast). Thus, MC curve is U-shaped. MC curve is graphically illustrated in Fig. 13.6 MC at each level of output is derived from the

slope of the TC or TVC curve. The slope of a curve at any point is the slope of the tangent at that point. With an inverse-s Shape of the TC or TVC curve, the MC curve will be U-shaped.

The slope of the tangent to the total cost curve declines gradually, unit it becomes minimum at point, then starts rising. This explains the shape of MC curve.

Fig. 13.6




**RELATIONSHIP BETWEEN AVERAGE COST AND MARGINAL COST**

Both marginal cost (MC) and average cost (AC) are derived from the total cost. They bear unique relationship. The relationship between MC and AC can be stated as under:

(a) When AC falls with increase in output, MC is lower than AC, i.e. MC curve lies below the AC curve. However, it is not necessary that MC should fall throughout this stage. Actually MC rises earlier than AC.

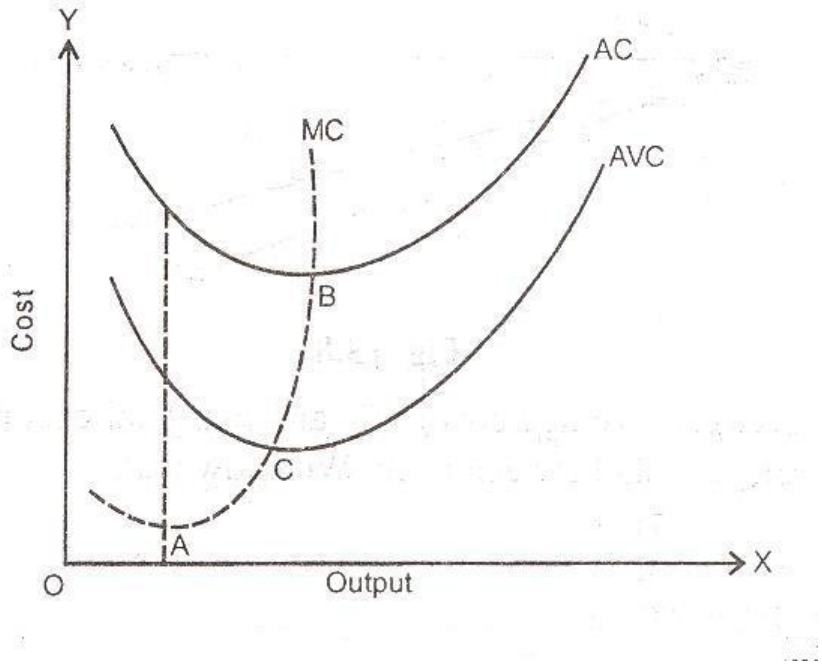
(ii) When AC rises with increase in output, MC is higher than AC, i.e. MC curve lies above the AC curve.

(iii)At the level of optimum output, average cost is minimum and constant. Here, MC stands equal to AC, i.e. MC pulls AC horizontally.

(iv) At zero level of output, AC is zero, but MC is indeterminate.

If brief, it can be said that MC intersects AC at its minimum point. Both are U-shaped curves on account of the operation of the law of variable proportions. The above relationship between MC and AC can be illustrated with the help of a diagram (see Fig. 13.7).

Fig. 13.7




In fig. 13.7, as long as AC curve is falling, MC is less than AC, i.e. MC pulls AC downwards. However, MC falls more rapidly and reaches its minimum point A earlier than AC reaches its own minimum point 'B' Therefore, MC starts rising from point 'A' to point 'B' AC is still falling upto point 'B' further, beyond point ' B' both MC and AC rise , but , the former rises more sharply. When MC rises above AC, it pulls the latter upwards. Similar relationship holds between MC and AVC too. MC intersects both AVC and AC (from below) at their respective minimum points in that order. The relationship between AC and MC can also be shown with the help of a simple diagram (Fig. 13.8) It shows that so long as the marginal cost curve lies below the average cost curve, the average cost falls (pulled downwards by the marginal cost) On the other hand, when marginal cost lies above the average cost curve, the average cost rises (pulled upwards by the marginal cost). When marginal cost is equal to average cost, it is the minimum point of the latter.

Fig . 13.8

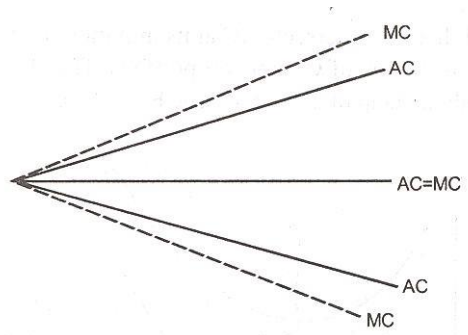



Fig. 13.8

It is important to note that as long as the marginal cost is less than average cost, each additional unit of output will add less to total cost in comparison to the average ( per unit) cost incurred on the previous units. This lowers the overall average cost of production. Hence, the average cost will continue to decline as long as the marginal cost is less-than the average cost (whether the marginal cost is itself rising or falling). Further, when the marginal cost exceeds the average cost, each extra unit of output produced adds more to the total cost than the average cost incurred on the previous units, resulting in rise in the overall average cost of production. This leads to a rise in the average cost curve, when the marginal cost is more than the average cost. Finally, if the additional unit of output produced costs same as the average cost incurred on the previous units, the overall average cost does not change and attains its minimum value. Thus, when the average cost reaches its minimum level, it is equal to the marginal cost.

**LONG RUN COST CURVE:**

**LONG RUN AVERAGE COST CURVE**

In the short run, there is only one short run average cost (SAC) curve corresponding to one (fixed) plant, However, in the long run, a firm has a number of alternatives with regard to the sale of production. For each scale of production, the firm has an appropriate short run average cost curve. The long run average cost (LAC) curve can be derived from a number of short run average cost curves, corresponding to different plant sizes.

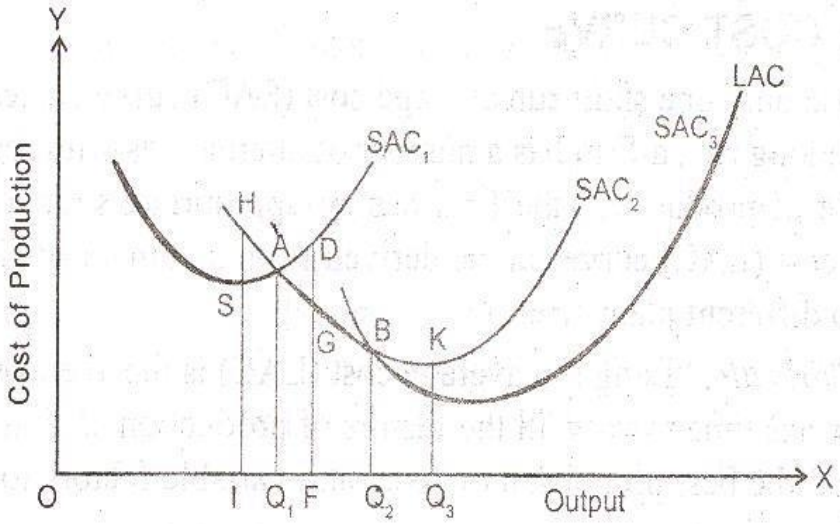
In the words of G. L. Thirkettle, "Long run average cost (LAC) is the average cost per unit of output when the entrepreneur has time to vary all the factors of production so that

he has the most profitable size of the plant and the best proportion of fixed and variable factors for any given output."

In order to derive the LAC curve, consider three units of production, each with different plant size – a small plant, a medium plant and a large plant, at a given state of technology at a particular point of time. The three plants operate with short run average costs denoted by SAC1, SAC2 and SAC3 respectively 9 (Fig.13.11). Each plant is suitable for a particular range of output. Within this range, output can be varied by varying the quantity of variable inputs. If the firm starts production with small plant (represented by SAC1) can operate this plant with the least possible cost for various levels of output upto OQ1. For producing an output level beyond OQ1, (possible on account of rise in demand), average cost in small plant is higher (DF>GF in Fig. 13.11). Thus, in the long run, the firm sets up a medium plant (bigger sized plant) represented by SAC2. The average cost for this plant is lower than small plant. However, this plant was not suitable for output lower than OQ1, since average cost with this plant is at higher level of HI than average cost with small plant i.e. JI, however, if the firm anticipates a rise in demand beyond OQ2, the medium plant entails higher average cost than the long plant, while large plant is too large for output level below OQ2.

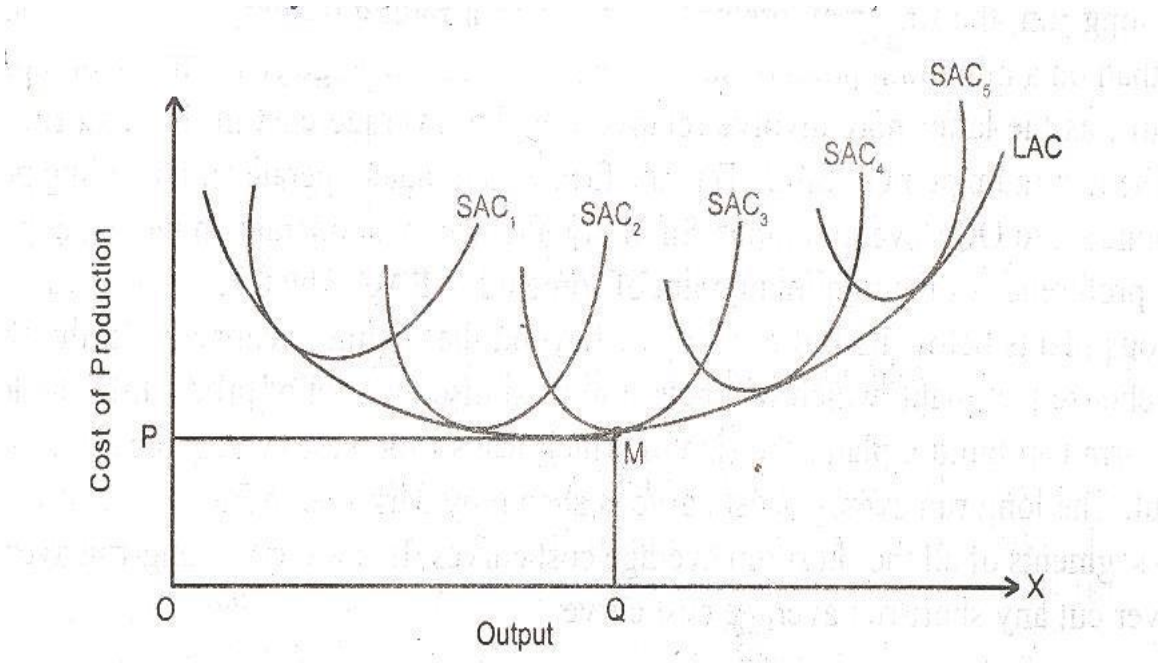
In the long run, the firm may prefer to operate on a falling (rising) portion of a short run average cost than on a minimum point of some other short run average cost curve (for a particular level of output) , as the latter may involve relatively higher average cost in the long run. In Fig. 13.11 K is the minimum point of SAC2. But the firm would rather operate on the falling portion of SAC3 corresponding to OQ3 level of output. Similarly, the firm may operate on the rising portion of some SAC in preference of the minimum point of some other SAC. Thus, in the long run, the firm may use various plants below its full capacity or beyond the optimum capacity. In the short run, the firm will choose that plant, the size of which leads to lowest average cost for any given level of output. The long run average cost curve is shown by dark line in Fig. 13.11. It consists of some (lower) segments of all the short run average cost curves.

Fig.13.11




Till now we have taken the three plant case. It can be extended to a multiple plant case, each plant being used to produce only that output, which can be produced most efficiently. Suppose, if the size of the plant is varied by infinitely small amount, such that there are infinite number of plants. Corresponding to these plants, there will be numerous short run average cost curves resulting in smooth continuous curve without any scallop. Fig. 13.11 illustrates such a smooth long run average cost (LAC) curve. Each point on this curve shows the minimum cost of producing the corresponding level of output. No portion of it ever lies above any portion of the producing different outputs with optimum plant size, it shows lower frontier of all short –run cost curves. If the firm plans to produce a particular level of output in the long run, it will choose a point on the LAC curve corresponding to that level of output and will then plan to build a relevant plant and operate on the corresponding short run average cost curve. LAC curve is sometimes called the planning curve of a firms at it helps the firm to decide what plant to set up in order to produce any level of output at the minimum cost in the long run. It is a guide to the entrepreneur in his decision to plan the future and output decisions upon the cost schedule with the existing plant.

Fig. 13.12




Since LAC envelopes (or supports) the SAC curves, it is also known as envelope curve. It is clear from the Fig. 13.12 that LAC curve is tangent to the whole set of SAC curves relevant for different plant sizes. However, LAC curve is not tangent to the minimum points of all the short run average cost curves. The point of tangency occurs to the falling portion of the SAC curves for points lying to the left of the minimum point M of the LAC. The point of tangency for output larger than OQ occurs to the rising part of the SAC curves. Thus, at the falling part of the LAC, the plants are not worked to full capacity and to the rising part of the LAC, the plants are overworked. Only at the minimum point M the plant is optimally used. In case of constant return to scale, however, the LAC curve touches the minimum point of all SAC curves, in which case the LAC curve will be a horizontal straight line. Under constant returns, every plant is equally efficient, since the lowest point of the average cost curve is the same for all these plants. According to Robinson, Stigler, Kaldor and others, this happens only, when all the factors of production are perfectly divisible. Thus, a horizontal LAC curve is only theoretically possible. Even according to George Stigler constant returns is not a necessary characteristic of the production function.

**Optimum Size of Plant**

It is important to note that in a smooth continuous LAC curve, no plant (except for an output level of OQ in Fig. 13.12) is operated at its minimum point of average cost. It is the plant (represented by SAC3) for which the minimum point of SAC curve coincides with the minimum point of the LAC curve at point M. The plant represented by SAC3 is optimum size of the plant, since its minimum cost of productions is the least of the minimum costs of all other plants. In other words, this plant is more efficient as compared to other plant sizes. In the words of Eckert and Leftwich, "The optimum size of plant is the one generating the short-run average cost curve that forms the minimum point of the long-run average cost curve. It can also be thought of as that size of plant with a short run average cost curve tangent to the long-run average cost curve at the minimum points of both".

The optimum plant represented by SAC can be used at is full capacity by producing its optimum output OQ at the minimum cost of MQ. The firm producing optimum with the optimum plant is called as optimum firm. The optimum firm can also be defined as one which produces at the minimum point of the firm. In agriculture and extractive industries it is relatively small, i.e., the minimum point of the LAC curve is reached at a comparatively smaller output. On the other hand, the optimum size of the firm in steel industry, automobile industry, other heavy industries and public utilities is relatively very large. In such industries, generally there are few large firms and the minimum point of the LAC curve is reached at a relatively larger output.

When the size of the plant is increased beyond the optimum size, it results in higher average cost. Likewise, if the size of the plant is smaller than that of optimum size, average cost of production is higher (Fig.13.12). Often, firms are not in a position to operate at the optimum level on the account of various factors:

(i) Firms, sometimes, want to hoard the stock and to create artificial scarcity so as to get higher price in the future. Such a situation arises, when there is a lack of competition in the market for the commodity.

(ii) Firms in drive for industrial empire often produce beyond full capacity in order to keep the potential entrants out of the market. This strategy is known as market dominance strategy.

(iii) Sometimes, the government's regulation stipulates the level of output and the firms are forced to operate below optimum output. This is especially true of firms governed by the Monopolies and Restrictive Trade Practices (MRTP) Act.

(iv) Sometimes, the firms keep on trying to move towards the optimal scale, but are unable to reach optimal level. This happens, when by the time, the firms make adjustments to the changes in market conditions, technology and the price of factor inputs, other changes take place in the mean time failing them to reach at the optimal levels of output.

(v) Optimal scale is only lowest cost scale of enterprise. It is not necessary the most profitable scale. The market may not be big enough to permit the firm to operate at optimal scale.

**Explanation of U-Shape of LAC Curve**

In this section, we shall explain the U-shape of the LAC curve through the law of returns to scale. With increase in the scale of operation, the LAC curve initially slopes downward due to the economies of scale (which explain increasing returns to scale). In this situation, the proportionate rise in long –run cost is less than proportionate rise in the scale of operation. However, when diseconomies set in, the LAC curves turns upwards which explain diminishing returns to scale reflecting the increase in the long-run average cost of production.

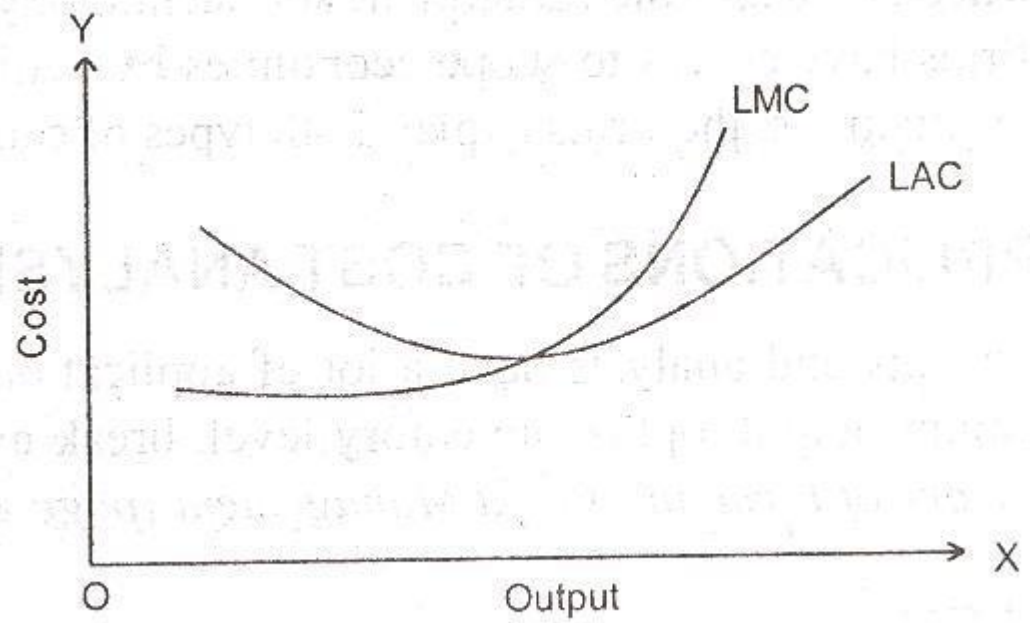
When a firm expands in the long run, it tends to reap the benefits of economies of large scale production (internal economies of scale). On account of these advantages, the firm's long-run total cost increase slowly with output. As a result, long-run average cost declines.

Once the economies of scale have been exploited and the LAC curve has reached its minimum point, further expansion in output leads to diseconomies of scale .The diseconomies of scale are the disadvantages, which accrue to the firm on account of over expansion of the scale of operation beyond its optimal size .These diseconomies may be technical, managerial or of other types. If building a larger sized plant raises the long-run average cost, the rational firm should not go for it. Rather, it should keep replicating the plant, which has produced the minimum long-run average cost.

**RELATIONSHIP BETWEEN LAC AND LMC**

The relationship between LAC and LMC (long run) is same as the one between AC and MC (short run).LMC curve cuts LAC curve at its minimum point (Fig.13.15).In other words , when LAC is falling LMC<LAC; when LAC is rising LMC>LAC and when LAC is minimum , LMC=LAC.

Fig.13.15




**REVENUE**

Revenue refers to the payments received by an entrepreneur from the sale of the goods produced. If a producer can sell during a week 200 pens at the price of Rs.5 each his total revenue during the week equals Rs. 5 × 200 = Rs. 1, 000.

**Total Revenue**

Total Revenue refers to the total amount of money that a firm receives from the sale of its products.

By selling 20 apples at the rate of Rs. 2 each, the total revenue he gets is 20 × 5 = Rs. 100. Thus,

$TR = Q \times P$,

where Q is total quantity sold and P stands for price per unit.

**Average Revenue**

Average revenue is obtained by dividing total revenue earned by the total number of units sold by a producer. Average revenue curve of a firm is same thing as the demand curve of the consumer. Thus, it means price of the product. Symbolically,

$AR = TR/TQ$

**Marginal Revenue**

Marginal revenue is the change in total revenue resulting from a unit (one unit) change in the output sold. In other words, it is the revenue, which would be earned by a producer by selling an additional unit of his product.

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

Where, TRn is the current or selected value of total revenue and TRn-1 is the previous value of total revenue. For example, TR of selling first unit of a product is Rs. 12 and TR of selling one more unit is Rs. 20, then TRn and TRn-1 are 20 and 12 respectively. Thus, MR = 20 – 12 = 8. It means, by selling one more unit the seller gets additional revenue of Rs. 8.