Module 2

Production and Cost

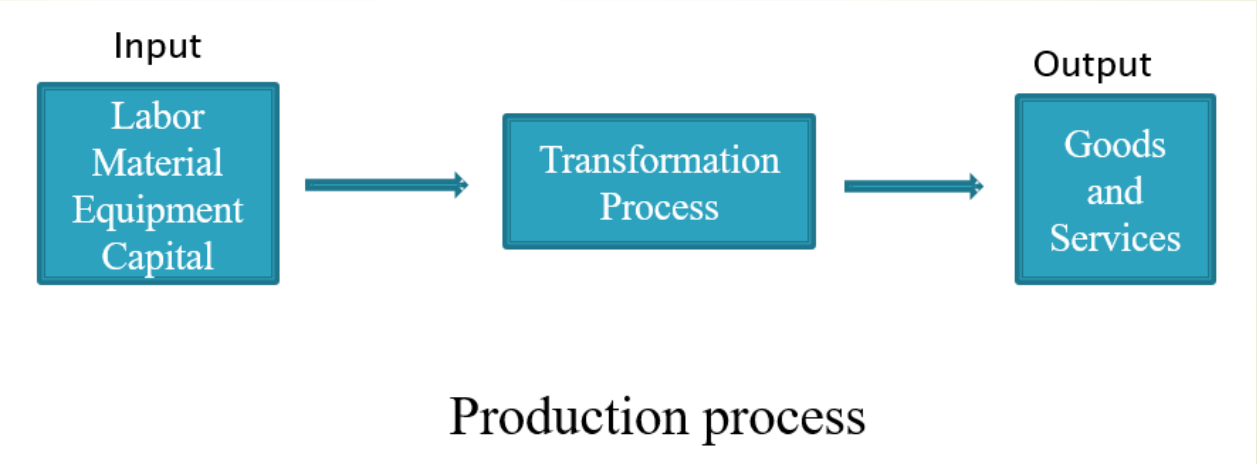
Module

Production function – law of variable proportion – economies of scale – internal and external economies – Isoquants, iso-cost line and producer's equilibrium – Expansion path – Technical progress and its implications – Cobb-Douglas production function - Cost concepts – Social cost: private cost and external cost – Explicit and implicit cost – sunk cost – Short-run cost curves - long run cost curves – Revenue (concepts) – Shutdown point – Break-even point.

Production

- Production is a process of converting an input into a more valuable output.
- **It is the process of transforming a set of inputs such as labour , raw material , capital , energy into finished products and services in proper quality and quantity.**

Theory of Production



Production process

Factors of Production

- **The resources which are used for the production are called the factors of production or the agents of production.**
- The factors of production and all other things which the producer buys to carry out production are called input.
- The final goods and services produced are knowns as output.

The factors of production have been traditionally classifies as :

- Land
- Labour
- Capital
- Entrepreneurship/Organisation

Land:

It represents all the gifts of nature., including soil ,hidden resources, mountains forests, air, rain, light etc. Therefore, land represents everything which is not made by man. It provides platform for human action.

Labour:

In economics , the term labour includes the work done by human beings in the economy. It is often defined as the physical or mental effort exerted by human beings in the production process.

Capital:

Capital is the produced means of production. Capital stands for assets available for use in the production of further assets. Capital is wealth in the form of money or property owned by a person or business and human resources of economic value.

Entrepreneurship/Organisation

An enterprise is composed of individuals and physical assets with a common goal of generating profits. An organized is one who plans, organizes and manages business enterprise and bears the risk involved in it.

Total Product , Average Product and Marginal Product

Total Product (TP) / Total Physical Product (TPP)

- It refers to the total amount of a commodity produced during given period of time with each set of inputs. It is also known as Total Returns.

Average Product (AP)

- It is the output produced using per unit of the variable factor input.

AP = TP / X

(X is the variable factor used)

Marginal Product (MP)

- It is the change in total product from the use of an additional unit of variable factor input
- **MP= (TPx) – (TPx-1)**

Total Product , Average Product and Marginal Product

Labour	TP	AP (TP/x)	MP
0	0	-	-
1	15	15/1=15	15-0=15
2	35	35/2=17.5	35-15=20
3	50	50/3=16.6	50-35=15
4	48	48/4=12	48-50=-2
5	38	38/5=7.6	38-48=-10
6	26	26/6=4.3	26-38=-12

Production Function

- The functional relationship between input and output is known as production function.
- It states the maximum quantity of output which can be produced from any selected combinations of inputs.
- The production function can be expressed in form of an equation in which Inputs are the independent variable and outputs is the dependent variable

The equation is expressed as follows

- **Qx= f (L,K,N,T)**

Where Qx = Output

L = Labour

K = Capital

N = Natural resources including Land

T = level of technology

Short run and Long run Production Function

Short run production function

It is an arrangement in which only one input is varied keeping all other inputs fixed. Therefore the proportion between inputs changes. So it is known as variable proportion production function.

Long run Production Function

It is an arrangement in which all inputs are variable keeping the proportion between inputs fixed. Since the proportion between inputs are fixed, it is also known as fixed proportion production function.

The law of variable proportions

- It is also known as ***Law of Diminishing Returns, Returns to Factor, Short run Production Function***. The law examines the short run relationship between one variable input and output produced, while keeping all other factor inputs constant.

Statement of Law

"The law of variable proportion states that as more and more units of a variable factor are applied to a given quantity of a fixed factor, the total product increase at an increasing rate initially, then increase at a diminishing rate and eventually it will decline.

The Marginal product of the variable factor will increase initially, then it decreases and finally it becomes negative."

The law of variable proportions has three stages.

- Increasing returns to a factor
- Diminishing returns to a factor
- Negative returns to a factor

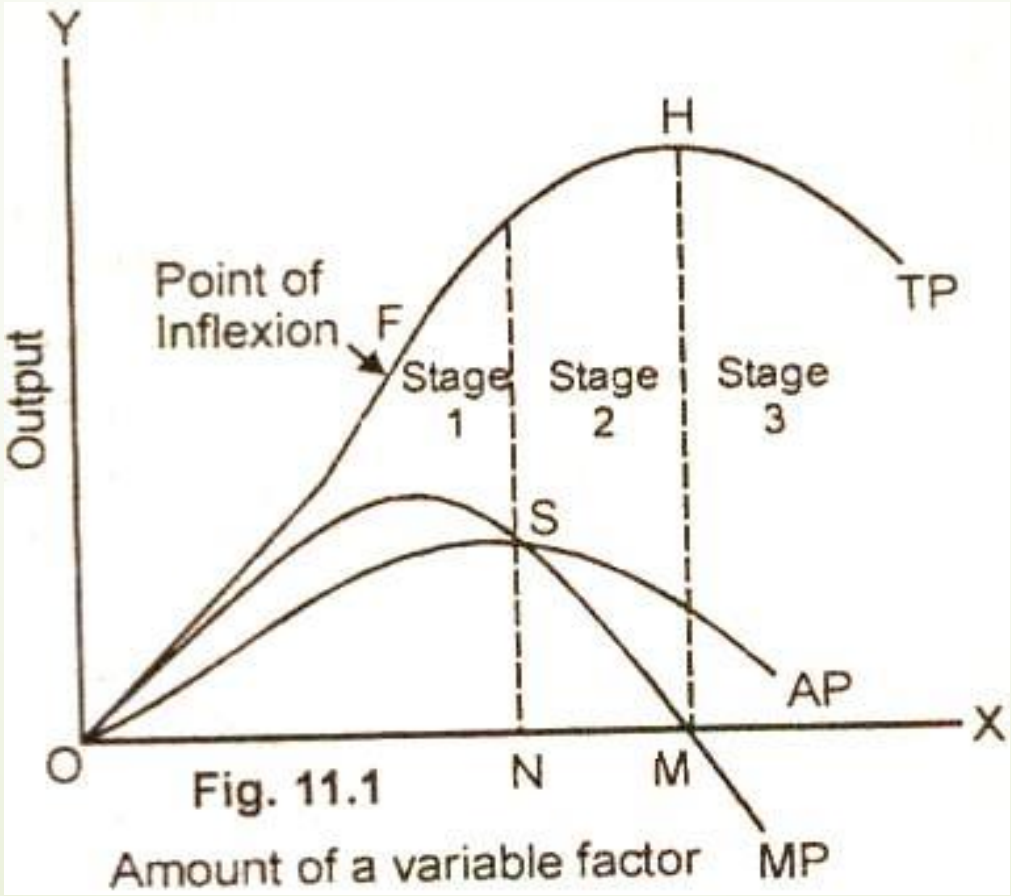


Fig. 11.1

STAGE 1 : Increasing Returns to Factor (IRF)

- TP, AP, MP increases at an increasing rate in the initial stage of production.

STAGE 2: Diminishing Returns to Factor (DRF)

- Most relevant stage in production
- MP falls and TP increases at a diminishing rate
- At the end of second stage, TP reaches max and MP reaches zero ,AP also falls

STAGE 3: Negative Returns to Factor (NRF)

- MP becomes negative, TP and AP falls

No . of workers	Total Product	Average Product	Marginal Product	Stages
1	10	10	10	Stage 1- IRF
2	30	15	20	Stage 1- IRF
3	55	18.33	25	Stage 1- IRF
4	65	16.25	10	Stage 2- DRF
5	70	14	5	Stage 2- DRF
6	70	11.66	0	Stage 3- DRF
7	67	9.57	-3	Stage 3- NRF

Long run production function/Fixed proportion/Returns to Scale

- In the long run all the factors are variable. Therefore, output can be increased by increasing the quantities of all the factors in the same proportion.
- Law of returns to scale is a long run concept . A return to scale refers to change in output when all inputs are variable and proportion between inputs remain constant.

There are three cases to return to scale.

- 1. **Increasing returns to scale:**

When inputs are increased in a given proportion and output increases in a greater proportion, the returns to scale are said to be increasing.

E.g if inputs are increased by 40% and output increased by 50%.

- 2. **Constant return to scale:**

When inputs are increased in a given proportion and output increases in the same proportion, the returns to scale is said to constant.

E.g if inputs are increased by 40% and output also increase by 40 %.

- 3. **Decreasing returns to scale:**

If a proportionate increase in all inputs results in less than proportionate increase in output, the return to scale is said to be decreasing.

E.g if inputs ae increased by 40% but output increases by only 30%.

The following numerical illustration explain the concept of Return to Scale.

Units of capital	Units of Labour	Total Output	% change in input	% change in Output	Returns to Scale
20	150	3000	-	-	-
40	300	7500	100	150	increasing
60	450	12000	50	60	Increasing
80	600	16000	33	33	Constant
100	750	18000	25	13	Decreasing

Cobb Douglas Production Function

- Cobb-Douglas production function is widely used to represent the technological relationship between the amounts of two inputs, particularly capital and labour, and the amount of output that can be produced by those inputs. It was proposed by Knut Wicksell and tested empirically by Charles Cobb and Paul Douglas in the year 1928.
- In its most standard form for production of a single good with two factors, the function is written as

$$Q = AL^{\alpha} K^{\beta}$$

where: Q = Total output,

L = Labour

K = Capital

A = Total factor productivity

α = Output elasticity of labour

β = Output elasticity of capital

- The value of ‘ A’ depends on technology. Higher the value of ‘A’ higher would be the level of output Q.
- ‘ α' , ‘β’ are the Output elasticities which measures the degree of responsiveness of output to a change in quantities of either labour or capital used in production.
- ***‘ α' is the output elasticity of labour*** which measures the percentage change in Q for a 1% change in L, while keeping ‘K’ constant.
- ***‘β’ is the output elasticity of capital*** which measures the percentage change in Q for a 1% change in ‘K’ , while keeping L constant.
- **Cobb-Douglas production function is a homogeneous production function of degree $\alpha + \beta$.**
- ***If a+ß= 1 it is the case of constant returns to scale***. Here production function becomes linearly homogeneous. That is, if the inputs are increased by 10 times, output will also increase by 10 times.
- ***If a+ß>1 it is the case of increasing returns to scale***. In this case output increases at a greater proportion than the increase in inputs.
- ***If a+ß<1 it is the case of decreasing returns to scale***. Here output increases at a lesser proportion than the increase in inputs.

Numerical Examples –Cobb Douglas production function

Q) In a production function,

$$Q = 2L^{1/2} K^{1/2}$$

If $L = 36$,

how many units of capital are needed to produce 60 units of output?

Ans)

$$Q = 2L^{1/2} K^{1/2}$$

$$60 = 2 \times 36^{1/2} K^{1/2}$$

$$60 = 2 \times \sqrt{36} K^{1/2}$$

$$60 = 2 \times 6 K^{1/2}$$

$$60 = 12 \sqrt{K}$$

$$\sqrt{K} = \frac{60}{12}$$

$$\sqrt{K} = 5$$

$$K = 5^2$$

$$K = 25$$

Q) Let the production function,

$$Q = 5L^{1/2} K^{1/2}$$

find the maximum possible output that a firm can produce with 100 units of L and 100 units of K.

Ans). $Q = 5L^{1/2} K^{1/2}$

$Q = 5(100)^{1/2} (100)^{1/2}$

$= 5 \times \sqrt{100} \times \sqrt{100}$

$5 \times 10 \times 10$

$= \underline{\underline{500}}$

The maximum output a firm can produce with 100 units of L & 100 units of K.

Date: / /

Q) If the production function of a firm is $Q = 10L^{1/2}K^{1/2}$. Find the maximum output that can be produced, if 144 unit of labour ~~and~~ is combined with 169 unit of capital. Also calculate the average and marginal product of labour from the function.

Ans). $Q = 10L^{1/2}K^{1/2}$

$= 10 \times (144)^{1/2} (169)^{1/2}$

$= 10 \times \sqrt{144} \times \sqrt{169}$

$= 10 \times 12 \times 13$

$= \underline{1560}$

AP of labour $= \frac{Q}{L} = \frac{1560}{144} = \underline{10.83}$

MP of labour $= \frac{\partial Q}{\partial L}$

$= 10 \cdot K^{1/2} \frac{1}{2} L^{-1/2}$

$= 10 \times (169)^{1/2} \cdot \frac{1}{2} (144)^{-1/2}$

$= 10 \times \sqrt{169} \cdot \frac{1}{2} \cdot \frac{1}{\sqrt{144}}$

$= \frac{5}{10} \times 13 \cdot \frac{1}{2} \cdot \frac{1}{12}$

$= \frac{65}{12} = \underline{5.41}$

Economies of scale

- Economies mean advantages. Scale refers to the size of unit. **Economies of scale refer to the advantages due to the larger size of production.** As the volume of production increases, the overhead costs will come down.

There are two types of economies of scale

- **a. Internal Economies of Scale**
- **b. External Economies of Scale**

Internal economies of scale are the advantages enjoyed within the production unit. These economies are enjoyed by a single firm independently of the action of the other firms. There are different types of internal economies. They are:

1. Technical Economies: As the size of the firm is large, more capital is available and the firm can introduce up to date technologies. It is also possible to conduct research and development which will help to increase the quality of the product.

2. Labour Economies: Large Scale production paves the way for division of labour and specialisation. This will increase the quality and ability of the labour. The productivity of the firm increases.

3. Managerial Economies: Firms might be able to lower costs by improving the management structure within the firm. The firm might hire better skilled or more efficient managers.

4. Purchase Economies: A firm ordering bulk purchases get raw materials at the lowest possible cost.

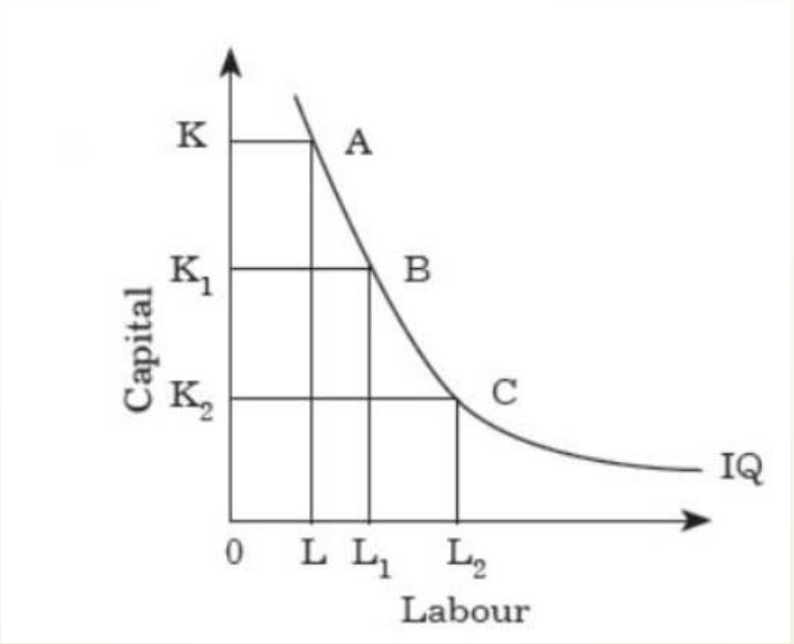
External economies of scale : When many firms expand in a particular area, the industry grows and all of them enjoy a number of advantages which are known as external economies of scale. This is not the advantage enjoyed by a single firm but by all the firms in the industry due to structural growth. They are:

- a) Increased transport facilities.
- b) Banking facilities.
- c) Development of townships.
- d) Information and communication development.

All these facilities are available to all firms in an industrial region and result in all round development which finally benefits each one of the firms.

Iso-quants

- The word isoquant is derived from its Greek base where ‘Iso’ means same and ‘quant’ means quantity.
- The **isoquant curve represents different combinations of two inputs that give the same level of output.** Isoquants are also called Iso-product or equal product curves.



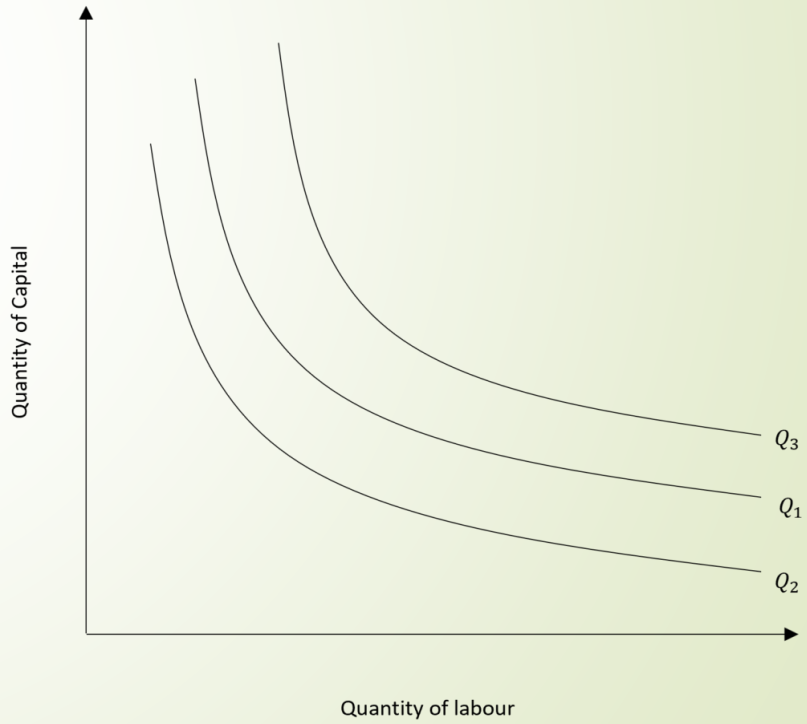
- Considering two factors of production, labour and capital, the following table shows various combinations of capital and labour that help a firm to produce 2000 units of a product.

Combination	Labour	Capital	Output
A	12	1	2000
B	8	2	2000
C	5	3	2000
D	3	4	2000
E	2	5	2000

- The above table shows that all combinations with different quantities of labour and capital result in the same level of output of 2000 units.

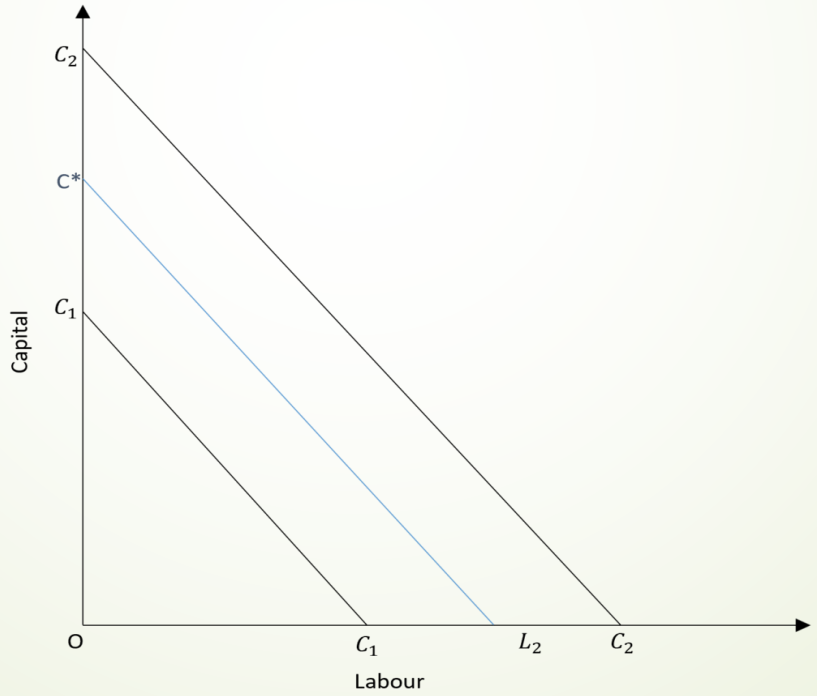
Properties of Isoquants

- Isoquants have a negative slope
- A higher isoquant represents a higher output
- Isoquants do not intersect
- Isoquants are convex to the origin
- Isoquants never touch the axes



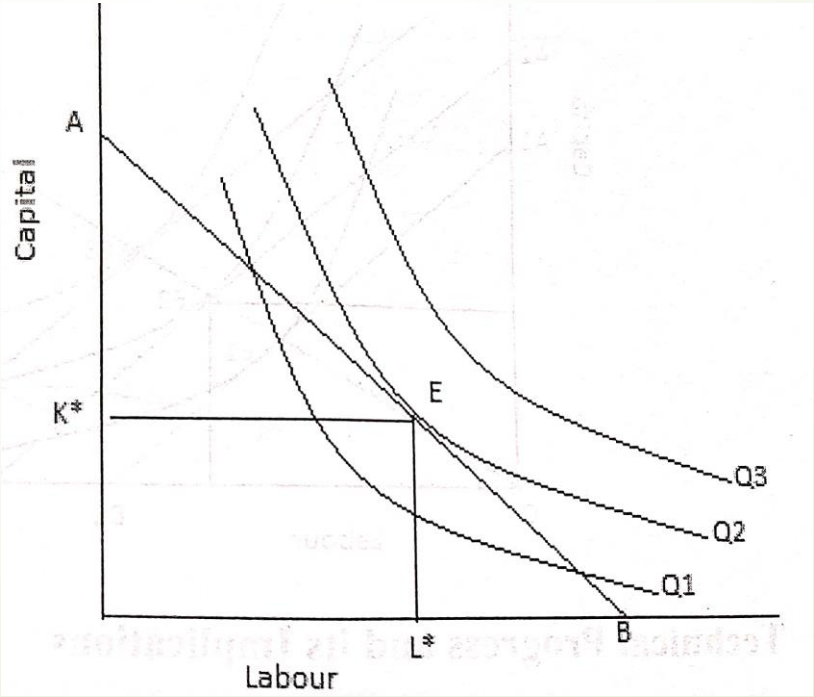
Iso-cost line

- An Iso-cost line is a line that represents various combinations of two inputs which the firm can buy for the same amount of money. A higher Iso-cost line represents higher cost.



Producer’s equilibrium-Least cost combination

- A producer will be in equilibrium when he is able to produce a given quantity of output with least cost or when he produces maximum output with a given amount of inputs . In other words, ***least cost combination of inputs is that combination which cost least to the firm in producing a certain quantity of output. It is attained at that point where the isoquant is tangent to Iso-cost line.*** This is shown in the diagram.



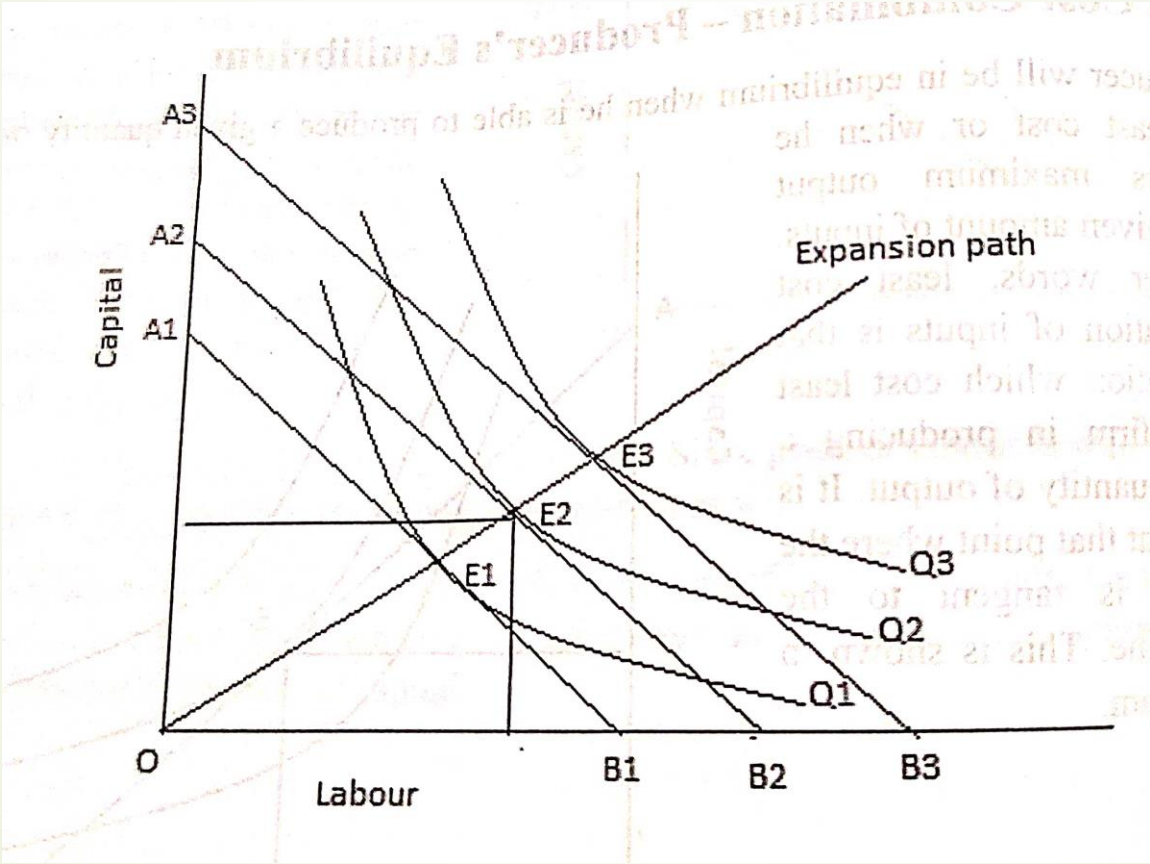
- In the diagram, producer is in equilibrium at point ‘E’ where the highest possible isoquant is tangent to the Iso-cost line .He is able to produce maximum output with the available resources . In other words, output Q2 is produces with the least cost.

Expansion Path

Expansion path is a line connecting optimal input combinations as the scale of production expands . In other words, it gives the least input combinations at every level of output. It is a long run concept .**We can obtain the expansion path by joining the point of tangency between isoquants and Iso-cost lines of a firm.**

An expansion path is shown in the diagram.

- In this diagram, expansion path is obtained by the least cost combination points E1,E2 and E3



Technical progress and its implications

Technological progress refers to the discovery of new and improved methods of producing goods allowing more output to be produced from the same quantities of factor inputs, capital (K) and labour (L).

Three types of technological progress.

- Neutral technical progress
- Labour augmenting technical progress
- Capital augmenting technical progress

Neutral technical progress

It means change in marginal product of labour and capital are same due to technical progress

Labour augmenting technical progress

It means the marginal product of labour increases faster than the marginal product of capital due to technical progress.

Capital augmenting technical progress

It means the marginal product of capital increases faster than the marginal product of labour due to technical progress.

Cost

- Cost denotes the amount of money that a company spends on the creation or production of goods or services.
- The cost function of a firm shows a relationship between output produced and the associated cost of producing it. Hence costs are nothing but input prices.

Different Types of Cost

Money Cost

Money cost is the total monetary expenses incurred by a firm in producing a commodity. Examples includes cost of raw materials, salaries, expenditure on machinery, interest, advertisement, insurance premium, taxes etc.

Real Cost

Real cost expresses the pains and sacrifices involved in producing a commodity.

Opportunity Cost

The opportunity cost of any good is value of the next best alternative forgone.

Explicit cost

These are directly paid out for by the producer e.g. salaries, prices for the raw materials, rent, interest, taxes etc.

Implicit cost

Implicit costs are costs of self-owned and self-employed resources such as salary of the entrepreneur. These costs are sometimes ignored in calculating the expenses of production.

Social cost

The social cost is the sum of private cost and external cost. Due to the existence of external cost, the cost to society of producing a product is larger than the cost to the firm. The cost of producing oil includes the private cost of the firm plus the cost to society adversely affected by pollution.

Private cost

Private cost is the cost that the firm pays in order to produce a product. It includes both implicit costs and explicit costs.

External Cost

External cost or externalities arises when a business influences the well-being of an external person who neither pays nor receives any compensation for that effect. The exhaust gases released into the environment from an automobile is an example.

Sunk Costs

Sunk cost, a cost that has already been incurred and that cannot be recovered.

Cost Output Relationship

To produce goods and services, a firm needs inputs . When a firm purchases inputs the firm incurs cost. A particular level of output can be produced with different combination of inputs . From all these combination of inputs the firm will choose the combination which costs least . This cost output relationship is known as cost function.

The cost output relationship can be analyzed in two ways.

- Cost output relationship in short run
- Cost output relationship in long run

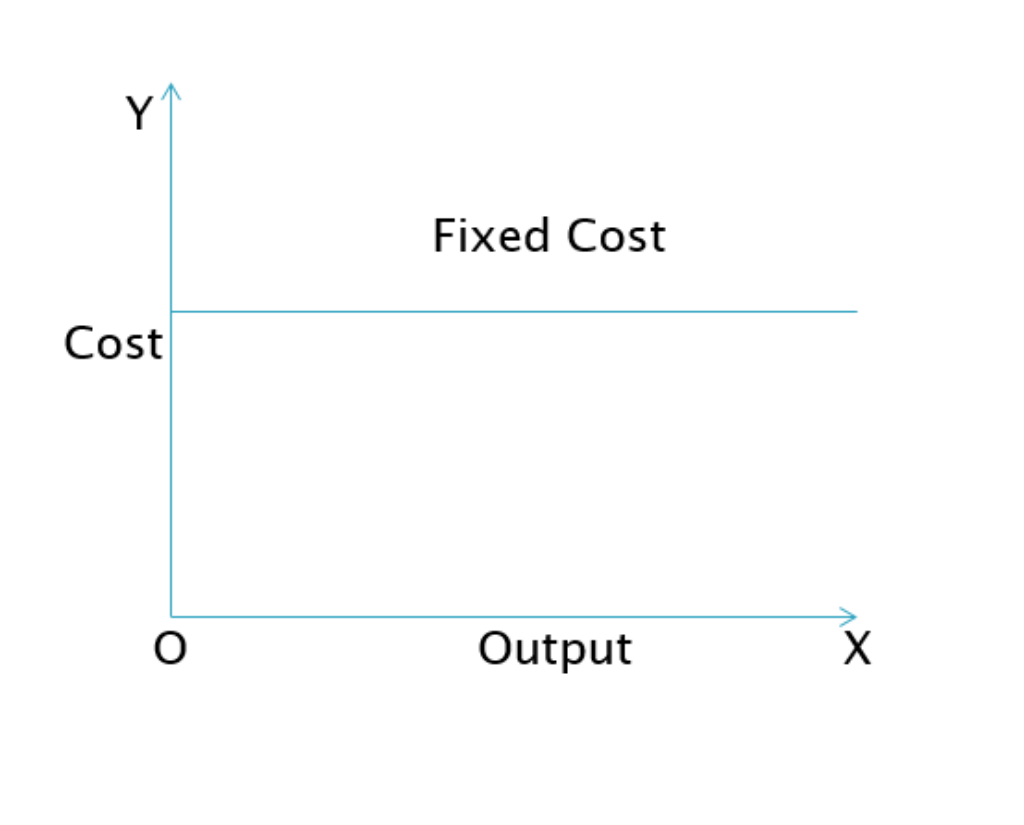
Short run costs

- In the short run production function, some inputs are fixed and some are variable. Therefore, in the short run costs are of two types.They are:
- **Total Fixed cost and**
- **Total Variable cost**

Total Fixed cost (TFC)

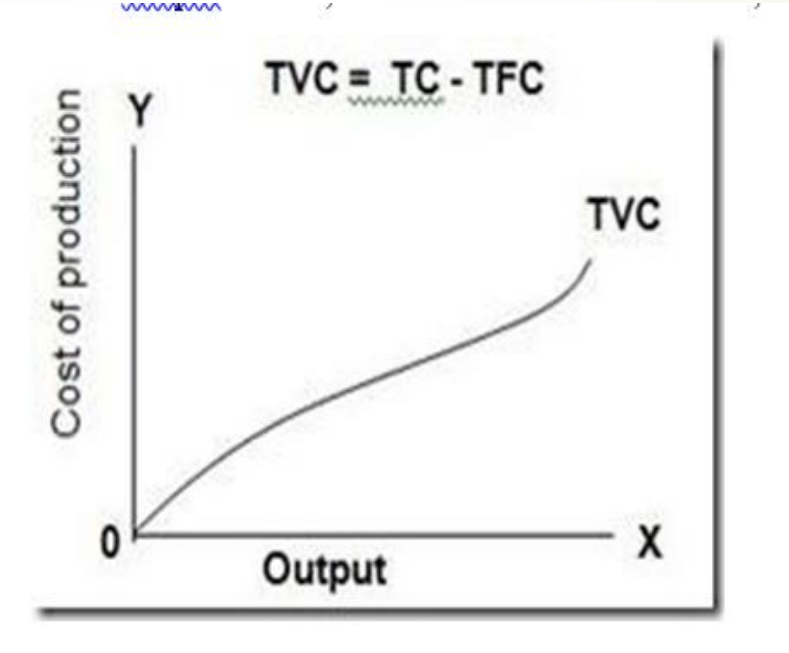
- Fixed costs are sometimes called as overhead costs or overhead.
- The fixed cost must be paid even if the firm does not produce the output. They will not change if the output changes. Therefore, the fixed costs are the fixed amount of cost that should be paid irrespective of the level of output.
- Rents of the building, office
- Salaries of permanent employees.

- TFC (Total Fixed Cost) Curve



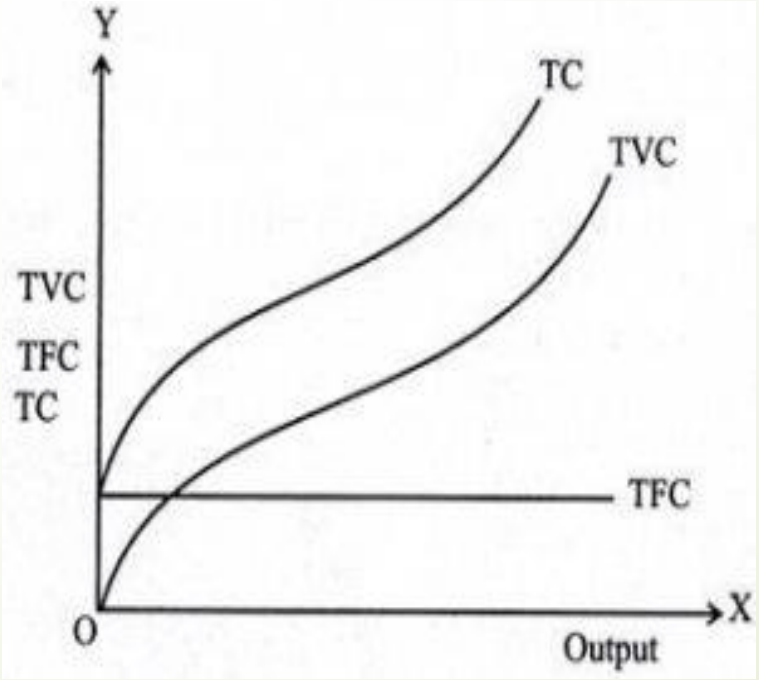
Total Variable cost (TVC)

- Variable costs are the costs that vary with the level of output. Variable costs vary in direct proportion to the volume of production.
- Therefore, if the output increases, then the variable cost increases. If the output decreases, then the variable cost decreases.
- For e.g. electricity charges, transportation charges and salespeople are paid a commission only if they sell products or services, so this is clearly a variable cost.



Total cost (TC)

- The total cost refers to the aggregate money expenditure incurred by a firm to produce a given quantity of output. The total cost is measured in relation to the production function by multiplying the factor prices with their quantities. TC = f (Q) which means that the TC varies with the output.
- TC= TFC+TVC



Average Fixed Cost (AFC)

- It is the fixed cost per unit of output.
- It is calculated by $AFC = \frac{TFC}{Q}$

Average Variable Cost (AVC)

- It is the variable cost per unit of output.
- It is calculated by $AVC = \frac{TVC}{Q}$

Average Cost (AC)

- It is the total cost per unit of output.
- Average cost is total cost divided by the number of units produced.

$$\textbf{Average cost} = \frac{\textbf{Total cost}}{\textbf{Output}} = \frac{\textbf{TC}}{\textbf{Q}}$$

It can also be calculated by AFC+AVC=AC

Marginal cost

- Marginal cost refers to the change in total cost due to a change in output
- **It is calculated by MC = $\frac{\text{Change in total cost}}{\text{Change in output}}$**

OR

- **MC= (TCq) - (TCq-1)**
- **Where TCq is the Total cost when output is q unit**
- **And TCq-1 is the total cost when output is q-1 unit**

TFC,TVC,TC,AFC,AVC,AC,MC Table

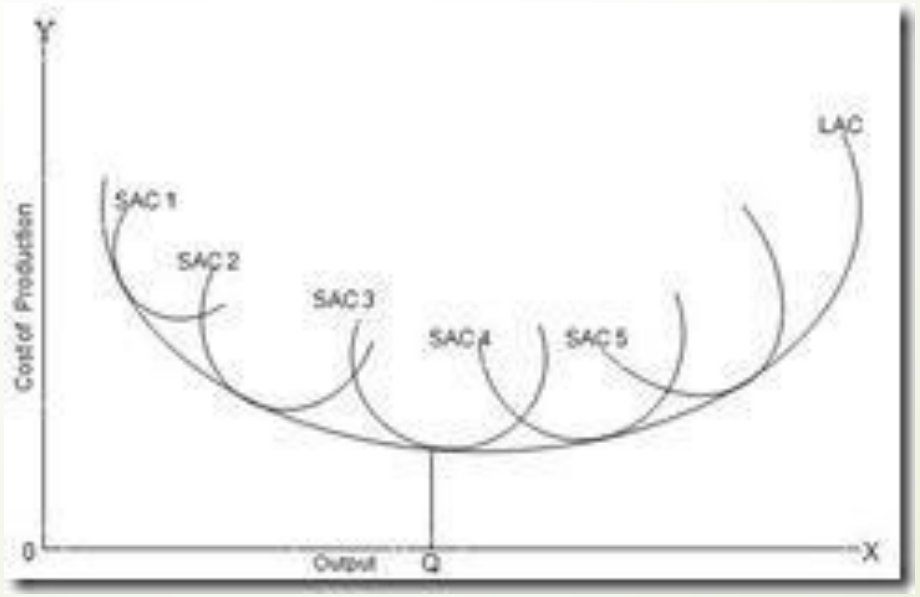
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Qty Q	**Fixed Cost (FC)**	**Variable Cost (VC)**	**Total Cost TC= FC+VC**	**Marginal Cost (MC)**	**Average Cost AC= TC / Q**	**Average Fixed Cost AFC= FC / Q**	**Average Variable Cost AVC= VC / Q**
0	55	0	55	-	-	-	-
1	55	30	85	30-0=30	85/1 = 85	55/1 = 55	30/1 = 30
2	55	55	110	55-30=25	110/2 = 55	55/2 = 27.5	55/2 = 27.5
3	55	75	130	75-55=20	130/3 = 43.3	55/3 = 18.3	75/3 = 25
4	55	105	160	105-75=30	160/4 = 40	55/4 = 13.7	105/4 = 26.2

The cost output relationship in Longrun
Long Run Costs

- Long run is defined as a period of time where adjustments to changed conditions are complete. It is actually a period during which the quantities of all factors, variable as well as fixed factors can be adjusted. Hence, there are no fixed costs in the long run.
- If demand for the product increases, it can expand output by enlarging its plant capacity.
- It can construct new buildings or hire them, install new machines, employ administrative and other permanent staff.
- As all costs are variable in the long run, the total of these costs is total cost of production.

Long run Average Cost (LAC) curve

- The long run cost – output relationship is explained by drawing a long run cost curve through short – run curves as the long period is made up of many short – periods as the day is made up of 24 hours and a week is made out of 7 days. This curve explains how costs will change when the scale of production is varied.



Revenue Concepts

- **Total Revenue (TR)**

It is the total amount obtained by a firm from the sale of output

$$TR = p \times q$$

Where ‘p’ is the price and ‘q’ is the quantity

- **Average Revenue (AR)**

It is the per unit revenue from the sale of the output

$$AR = TR \div q$$

- **Marginal Revenue**

It is the addition to the total revenue when a firm sells one more unit of the output

Shutdown Point

- Economic losses motivate organizations to shut down.
- The **shutdown point** is the level of operations at which a company can no longer cover its **variable costs**, leading to the decision to halt production or business activity temporarily or permanently. At this point, the company is better off stopping operations rather than continuing to produce at a loss.

Key Concepts Related to Shutdown Point:

- **Fixed Costs (FC)**: Costs that remain constant, regardless of the level of output (e.g., rent, salaries).
- **Variable Costs (VC)**: Costs that vary with the level of output (e.g., raw materials,)
- **Total Costs (TC)**: The sum of fixed and variable costs.
- **Revenue (R)**: The income generated from selling goods or services.

Conditions for the Shutdown Point

- The shutdown point occurs when the following condition is met:

Revenue<Variable Costs

- The shutdown point can also be expressed in terms of **price (P)** and **average variable cost (AVC)**. The firm should shut down if:

P<AVC

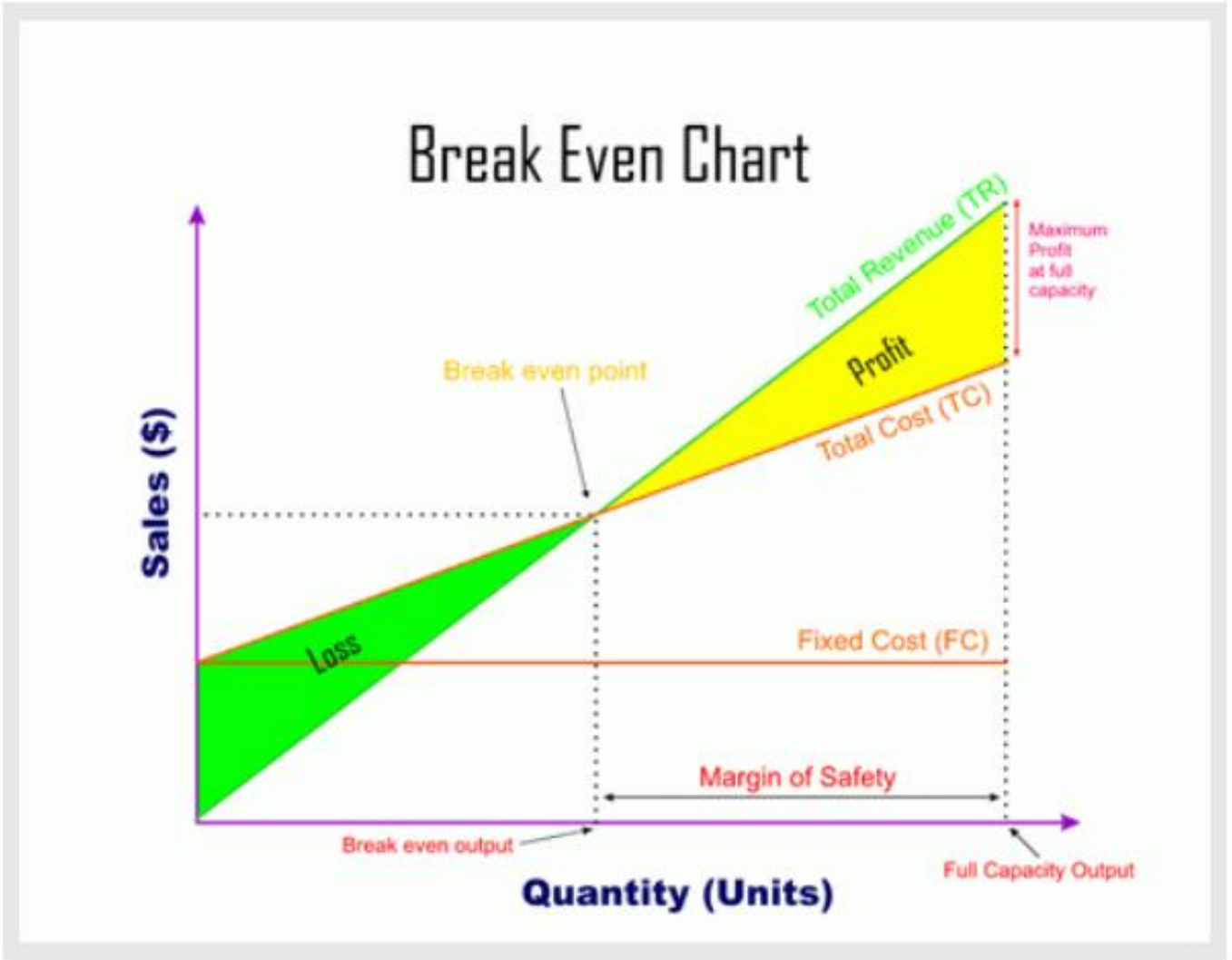
This means that if the price a firm receives for its product is less than the average variable cost, the firm is better off stopping production in the short run.

Break Even Analysis

- The break-even analysis is used to analyze the relationship between cost, revenues and sales of a firm.
- Break even analysis used to find out the level of output and sales volume at which firm's costs and revenues are equal.
- The break-even point is most important in break even analysis.

Break Even Point

- Break even point is that point of sales volume where total revenues and total expenses are equal.
- **It is a point of zero profit i.e stage of no profit and no loss.**
- Production level below the break-even point will result into loss while production above break-even point will result in profits.


Break Even Chart
Total Revenue (TR)
Maximum Profit at full capacity
Profit
Break even point
Total Cost (TC)
Sales ($)
Loss
Fixed Cost (FC)
Margin of Safety
Break even output
Full Capacity Output
Quantity (Units)

Components Involved in BEP Analysis

- **Fixed Costs (FC)**: Costs that remain constant regardless of the level of production or sales (e.g., rent, salaries).
- **Variable Costs (VC)**: Costs that change in direct proportion to production or sales (e.g., raw materials, direct labor).
- **Sales Revenue (SR)**: The total revenue generated from selling products.
- **Contribution** : The difference between sales revenue and variable costs. It contributes to covering fixed costs and profit.
- **P/V Ratio (Profit volume Ratio):** Explains the relationship between company’s profit and sales volume.
- **Margin of safety:** It is the sales beyond break even point.

Equation for Break even Point

- The **Break-Even Point in units** can be calculated using the formula:

break even point in units ; $$Q = \frac{F}{S - V}$$

Where,

F = Fixed Cost per unit

V = variable Cost per unit

S = Selling Price per unit

Q = Quantity(Volume of output)

- The **Break-Even Point in sales** can be calculated using the formula

$$\textbf{BEP (in sales)} = \frac{\textbf{F}}{\textbf{P/V ratio}}$$

- $\textbf{P/V ratio} = \frac{S-V}{S}$
- **Contribution** = S-V

Where, S= sales and V = Variable cost

Note:

Total sales revenue = No of units sold * Selling price per unit.

Break-even (in Units)	Break-even (in Sales)
BEP in Units $Q = \frac{F}{S - V}$ F= Fixed Cost S= Selling price per unit V= Variable Cost	**BEP (in sales)** = $\frac{F}{P/V \text{ ratio}}$ **P/V ratio** $= \frac{S - V}{S}$ S= Sales , V = Variable cost
Profit/Loss = S x Q - (F+V x Q) Where S= selling price per unit Q= Quantity F= Fixed Cost V= Variable Cost	**Profit/Loss =** Total sales revenue – (Fixed cost + variable cost)
Margin of safety in units = Actual Sales Units−Break-even sales units	**Contribution = S – V** S= sales V= Variable cost
	Margin of safety = Actual sales – Break even sales.

P/V Ratio (Profit volume Ratio)

- Explains the relationship between company's profit and sales volume.
- It is calculated by,
- **P/V Ratio**= $\frac{\text{Contribution}}{\text{Sales}} = \frac{\text{S-V}}{\text{S}}$
- **Contribution = Sales- Variable cost**
- The **contribution** per unit measures the profitability for each item sold, **representing how much each unit contributes to covering fixed costs and then to profit.** It is calculated by subtracting the variable cost per unit from the selling price per unit. The "Selling Price Per Unit" is how much the product is sold for.
- **Contribution per unit can be computed by = Selling price per unit – Variable cost per unit**

Margin of safety

- **Margin of safety is the sales beyond break even point.**
- In other words, all sales revenue above the break-even point represents the margin of safety.
- For example, if actual sales of the company for the month of December 2015 are Rs.2,50,000/- and the break-even sales are Rs.1,50,000/- the difference of Rs.1,00,000/- is margin of safety. It can expressed as below:
- **Margin of safety = Actual sales – Break even sales.**

BREAK-EVEN POINT -NUMERICAL EXAMPLES

1) Consider the following data of a company for the year 2022.
Sales = 80000/-
Fixed Cost = 15000/-
Variable cost = 35000/-

Estimate: (a) Margin of Safety, (b) Contribution, (c) Break-Even Sales, (d) Profit.

Answer:

Break-Even Sales = $\frac{F}{P/_V}$, $\frac{p}{v} = \frac{s-v}{s} = \frac{80000-35000}{80000} = \underline{0.5625}$

F= 80000
p/v ratio = 0.5625
Break- even sales = $\frac{15000}{0.5625} = \underline{26,666.}$

(a) Margin of safety = Actual Sales- Break even sales
= 80000- 26666 = 53334.
(b) Contribution = S- V
= 80000- 35000= 45000.
(c) BES= 26666
(d) Profit = S- (F+V)
= 80000-(15000+35000)
= 30000

(2) Suppose a firm pays Rs: 10000/- as Monthly rent and Rs: 10000/- as Interest payment. Its Monthly expenditure on raw materials is Rs: 40000/- and it get monthly sales revenue of Rs: 80000/-. The price of one unit of output is Rs: 40/-.

Estimate the following:

a) p/v Ratio, b) Break-even sales, c) Break-even output, d) Profit earned, e) Margin of safety.

Answer:

(a) P/V ratio = $\frac{S-V}{S} = \frac{80000-40000}{80000} = \underline{0.5}$
(b) BES = $\frac{F}{P/_V} = \frac{20000}{0.5} = \underline{40000}$
(c) Break-Even output = $\frac{BES}{Price\ per\ unit} = \frac{40000}{40} = \underline{1000}$
(d) Profit = Sales – (F+V)
= 80000- (20000+40000)
= 80000- 60000
= 20000
(e) MOS = Actual – BES
= 80000-40000
= 40000

(3) Suppose the Monthly Fixed cost of a firm is Rs: 20000/- and its Monthly total variable cost is Rs: 30000/- Find Break Even sales and Contribution if the monthly sales is Rs: 60000/-

Answer:

Contribution = S- V

= 60000- 30000

= 30000

BES= $\frac{F}{P/V}$ $\frac{P}{V} = \frac{S-V}{S} = \frac{60000-30000}{60000} = 0.5$

= $\frac{20000}{0.5} = 40000$

(4) The Financial details of a company are as given below:

Variable cost per unit Rs: 30/-

Selling price per unit is Rs: 40/-

Fixed expenses are: 100000/-

Calculate, (a) The break-even Unit, (b) Margin of safety considering actual sales as 1500 units

(c) The selling price per unit if BEP is brought down to 8000 units.

Answer:

(a) Break- Even Point (BEP) = $\frac{F}{S-V} = \frac{100000}{40-30} = 10000$

(b) Margin of Safety = Actual Sales – Break- Even Sales

= 15000- 10000

= 5000

(c) Selling price per unit =

BEP = $\frac{F}{S-V}$

$8000 = \frac{10000}{S-30}$

S= 42.5

(5) Suppose a firm's fixed cost is Rs: 50000/- and they sell their product at a price of Rs: 100/- per unit. If the average variable cost per unit of output is Rs:50/-, Estimate Break-even output. If they sell 1500 units, what will be the profit and margin of safety.

Answer:

F= 50000 S= 100 V= 50

BEP = $\frac{F}{S-V} = \frac{50000}{100-50} = 1000$

Profit = $S \times Q - (F + V \times Q)$

$= 100 \times 1500 - (50000 + 50 \times 1500)$

= 25000

Margin of Safety = 1500- 1000= 500