

# → ECONOMICS AND FINANCIAL FOR ENGINEERS

15/9/23

## → Basic fundamentals:

→ The basic roots of economics are given by Chanakya (Kautilya) in his book of 'Artha Shastra'. In his book he has given a clear concepts regarding political administration, Kingdom rules, how to use the various resources for the social well being.

→ Society needs so many products and services in a daily routine for social well being.

→ In the society an engineer is expected to innovate, design and create new products, and it is the manufacturer who brings the product into the real-time existence with the help of design whereas it is the end user (customer or consumer), to judge whether the product is acceptable or not. Hence \*(an engineer create, manufacturer produce and end user to justify a particular product or a service.)\*

→ When once a manufacturer is satisfied with the design he will take the decision to produce and supply into the market. During this process if <sup>is</sup> required to analyse three based economic problems

i) what to produce (Producer's goods vs Consumer's goods)

→ Producer's goods are the goods which are used for production of something else.

Ex: Grinding machine

→ Consumer's goods are the goods which are for direct consumption by the consumer.

ii) How to produce

a) Labour intensified production system (use more amount of labor force)

b) Capital intensified production system (used more amount of capital in the form

3) How much to produce (Quantity of output to be manufactured).

→ After taking a decision various resources are to be called up.  
Resources are 2 types:

1) Limited resource

⇒ A resource is said to be limited when  $s < d$  (Supply & demand)  
Ex: Money, time etc.

2) Unlimited resource

⇒ A resource is said to be unlimited when there is no boundary on the availability ( $s > d$ )  
Ex: Air, Sunrays etc.

→ The four basic resources to produce are LLCO (Land Labour Capital organisation)

⇒ firm

⇒ It is a single business unit which pools up various resources for manufacturing a specific type of resource.

Ex: Bata, Samsung

⇒ Industry

⇒ Industry is group of firms which produce similar (or) same type of product.

Ex: Automobile Industry, TVS, Honda, Hyundai, etc.

→ Resource: It is one from which we can derive the profit 20/9/23

⇒ Benefit can be monitory or non-monitory.

⇒ Money                      interest                      Satisfaction

→ Scarcity: (im)

→ Scarcity means shortage that is availability is less than requirement

→ A resource is said to be scarce when availability (supply) is less than the requirement (demand).

→ Scarcity is the subject matter of economics.

→ Economics studies about only scarce resources (limited resources).

→ Scarcity definition of Economics:

→ According to Lionel Robbins, "Economics is a science which studies about human behaviour, as a relationship between, ENDS and Scarce MEANS, which have alternative users"

ENDS means wants (or) requirement.

MEANS means resources.

→ MICRO vs MACRO Economics:

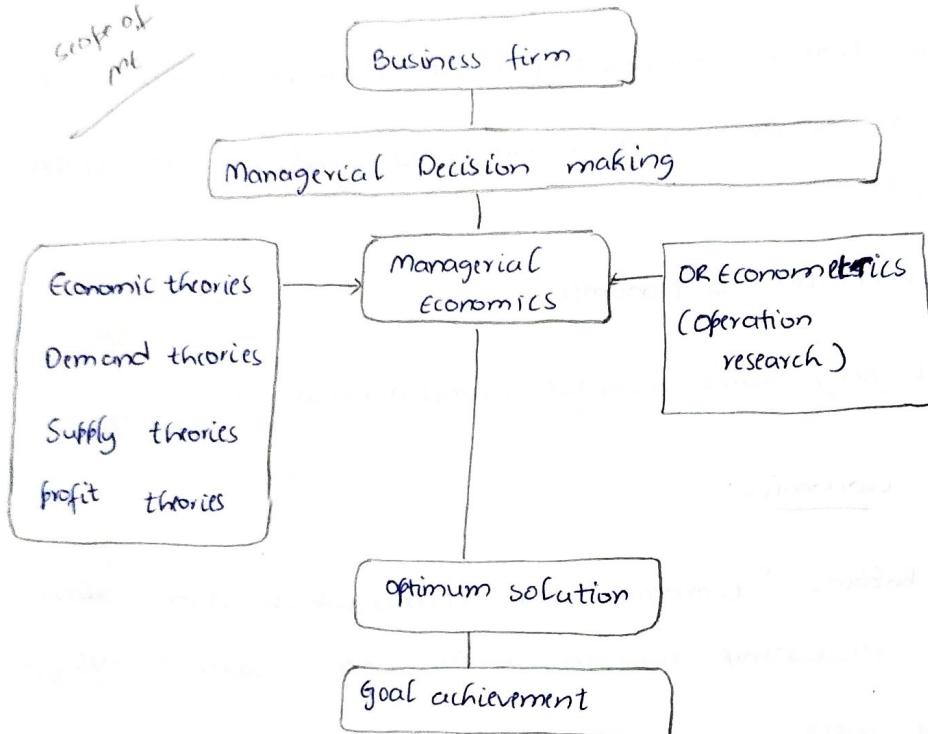
→ MICRO economics studies about a firm level whereas MACRO economics studies about economy of a country.

→ Product demand, supply, profit planning etc related to micro economics whereas inflation (raising of prices), poverty, unemployment etc relates to macro economics.

→ Scope

### ② Managerial economics :

→ According to Spencer and Siegelman managerial economics is the "Integration of economic theory with the business practise for the purpose of decision making and facilitating forward planning by the management."



→ Define managerial economics. Explain nature and scope of managerial economics.

→ Nature of managerial economics:

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- 1) close to micro economics
- 2) operates in the backdrop of macroeconomics etc
- 3) Normative statements: what should be business
- 4) prescriptive in actions
- 5) Applied in nature
- 6) offer scope to evaluate each alternative
- 7) Interdisciplinary
- 8) Assumptions & limitations

→ Scope of M&E:

- 1) Demand analysis Decision - Analyse & estimate the demand
- 2) Input output decision -
- 3) Price output decision
- 4) Profit related decision
- 5) Investment decision
- 6) Academic forecasting and forward planning

→ Law of demand:

Concept of demand

desire

→ A product is said to have a demand backed by - desire for the product, ability to pay, willingness to pay

→ when all these 3 conditions are satisfied it is said that there is a demand for that product, from the customer, at that moment of time. Hence demand is time specific and customer specific

→ Demand determinants the various factors that influence the demand (determines) of the demand) are as follows

- 1) Price 1
- 2) Quality
- 3) Availability
- 4) Technology 5
- 5) Price of Substitute Commodity 3
- 6) Income of Consumer 2
- 7) Taste & preferences of the consumer
- 8) Weather Conditions 4
- 9) Money in Circulation 6
- 10) Population 7

### Types of demands:

- 1) Price demand - The various quantities purchased by the customers at various prices is known as price demand.
- price demand represents the relationship between price and quantity demanded.
- 2) Income demand
- 3) Cross demand

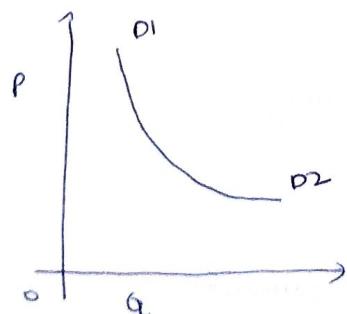
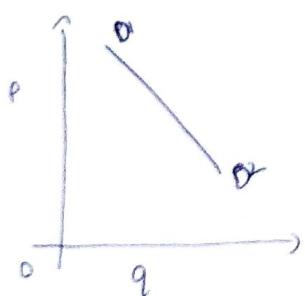
### Demand schedule:

→ It is a tabular form which represents various quantities demanded at various prices

P	Q.demand
10	100
15	75
25	40
50	10

### Demand curve:

→ The graphical representation of demand schedule is known as demand curve.



→ If any of these 3 conditions are not satisfied then it is not demand for that particular object.

### → Law of demand:

→ It is given by Alfred Marshall.

→ According to Alfred Marshall it states that "The greater the amount to be sold the smaller must be price, at which it is offered, in order to find that it may find a purchaser (or) in other words the amount demanded increases with a fall in the price and diminishes with a raise in a price, when all other things remain constant".

Q) State law of demand and explain (Statement, demand schedule, demand curve)

### → Assumptions of Law of demand:

→ It assumes that all other factors except the price is constant.

(i) Income is constant etc

### → Exceptions to Law of demand: (1M)

→ In certain cases law of demand does not occur.

### → Giffen's paradox

### → Depletion rules

### → Speculations

### → Illusion

### → Future expectations about the market price and supply

### → Supply of the product

→ Speculation means buying a product at a low price with an intention to sell at high price.

## Elasticity of demand:

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- Price elasticity ✓
- Income elasticity
- Cross elasticity
- Advertisement elasticity

→ Elasticity of demand represents a ratio between proportionate change in the quantity demanded to proportionate change in the determinant.

Say price, income etc

$$E_d = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in the determinant}}$$

$$E_p = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in the price}}$$

→ A company is at present able to sell 100 units at a price of 20Rs per unit. It is estimated that the quantity demanded will decrease to 70 units if the price of commodity increases to 30Rs. Therefore to calculate elasticity of demand in relation to price the following procedure is adopted

$$\begin{aligned} \text{Proportionate change in Q demanded} &= \frac{Q_2 - Q_1}{Q_1} \times 100 \\ &= \frac{70 - 100}{100} \times 100 \\ &= -30 \end{aligned}$$

$$\text{Proportionate change in price} = \frac{P_2 - P_1}{P_1} \times 100$$

$$= \frac{30 - 20}{20} \times 100$$

$$= 50\%$$

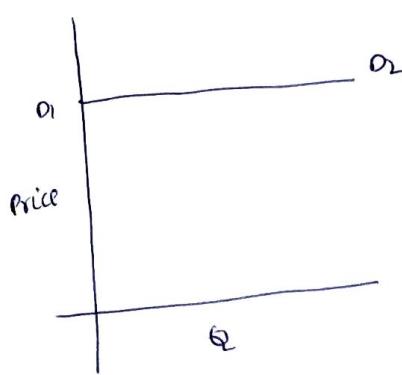
$$\epsilon_p = \frac{-30}{50} \\ = -0.60$$

→ Price elasticity of demand is always -ve because of inverse relation between price and quantity demanded.

$\epsilon_p = -0.60$  implies for every raise in a price by 1 rupee there will be a reduction in the quantity demanded by 0.60 units.

→ Types of price elasticity:

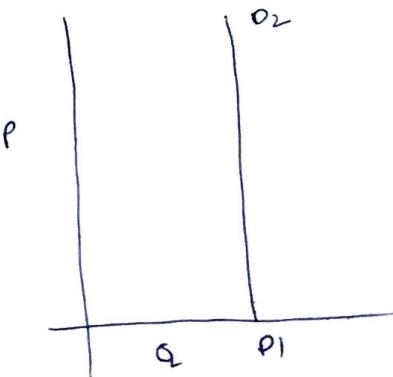
1) Perfectly elastic demand



$$\epsilon_p: \infty$$

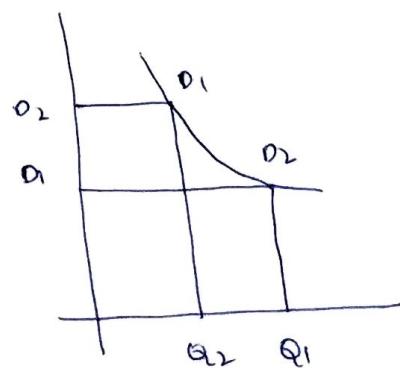
D<sub>1</sub>D<sub>2</sub> is || to x axis

2) Perfectly Inelastic Demand



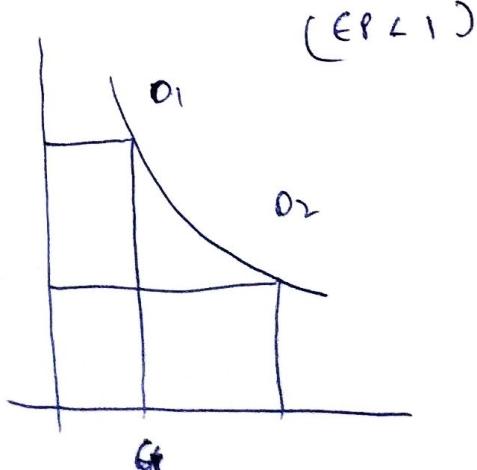
$$\epsilon_p = 0$$

3) Relatively elastic demand



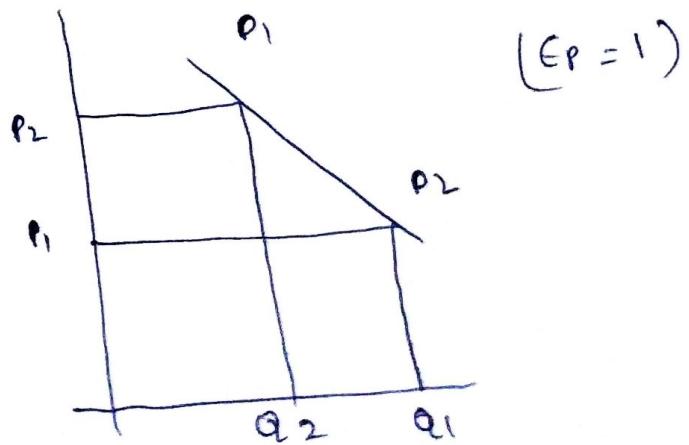
$$\epsilon_p > 1$$

4) Relatively Inelastic Demand



$$(\epsilon_p < 1)$$

5) Unit elasticity of demand



$$(\epsilon_p = 1)$$

1) Cost concept:

→ cost is the amount of expenditure incurred from the manufacturing of a product (or) for rendering a specific service. Cost is known to the manufacturer whereas price is known to the buyer.

→ At every stage of transfer of goods profit element is included to the cost, hence selling price is equal to cost plus profit.

2) Costing:

→ method of ascertaining the cost of a product or service is called costing.

→ Various methods of costing include

✓ Unit costing (Ascertainment of cost per unit) - Cost sheet is used

✗ Batch Costing (Cost per batch)

✗ Contract Costing

✗ Process Costing

(e.g.)  
 1 → duster    2 → chalkpiece box    3 → building roads    4 → Sugarcane → Sugar  
 (or)  
 biscuit packet

process

3) Classification of cost:

→ The cost is classified on varied bases:

1) Element wise classification

⇒ three elements are identified

a) material

b) Labour

c) Expenses

## 2) Direct Cost vs Indirect Cost

⇒ Direct cost is one which is identifiable with a product (or) the cost which is directly associated to a product.

⇒ Indirect material ⇒ which is attributable to a product.

→ Direct material + Direct Labour + Direct Expenses is together called prime cost

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Indirect material + Indirect Labour + Indirect Expenses is together called overhead.

→ Differentiate b/w direct cost and Indirect cost  
(cost def, cost direct, cost indirect, direct, Indirect, prime, overhead).

→ classification on the basis of variability:

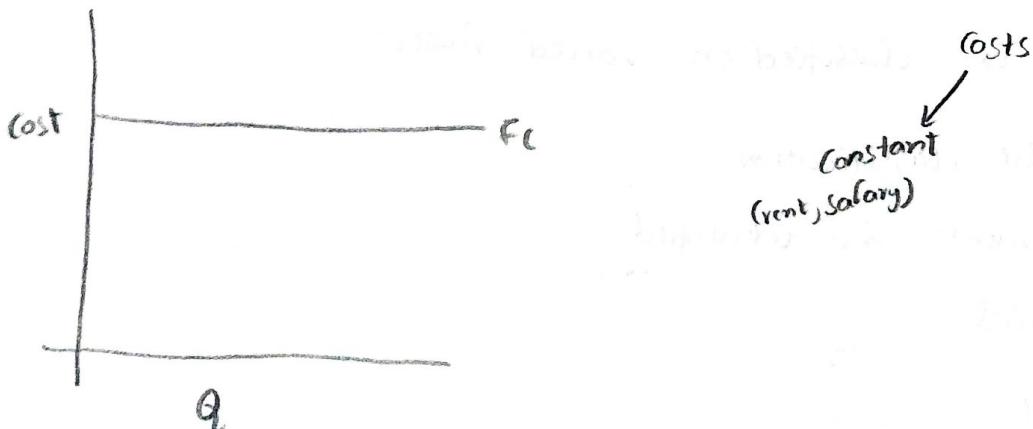
→ whether costs varies with the volume of output (or) not?

### 1) Fixed cost :

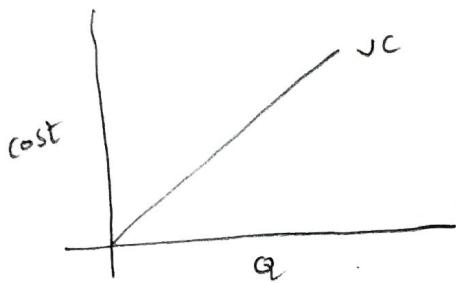
⇒ Fixed cost is one which doesn't vary in the volume of output that means whether the output (Quantity manufactured (or) no of units produced) increase or decrease cost remains same.

Ex: Rent of the building, salary of the manager etc.

⇒ Fixed cost line is ||<sup>u</sup> to X-Axis



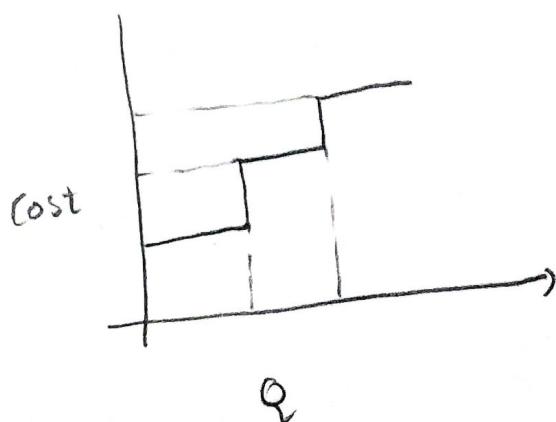
- 2) Variable cost: or varies  
 ⇒ Cost which changes direct proportion with the volume of output is known as variable cost.  
 ⇒ That means if  $Q$  is the output variable cost will also be null & it directly increases with the output.

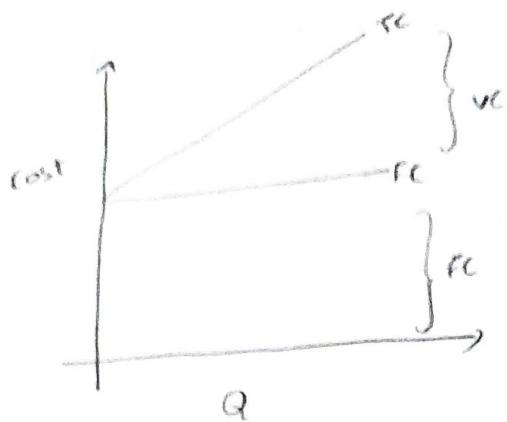


Ex: Material cost, wages of labour (direct labour)

- 3) Semi-variable cost:  
 ⇒ Semi-variable cost is one which varies with the production but not in direct proportion with the volume of output. This shows a step-up approach, - the cost is constant upto a certain level and increases to the next level with the raise in the output.  
 NOTE: SVC (or) SFC they can be divided into fixed cost and variable cost.

Ex: Electricity bill, water bills.  
 Therefore total cost = fixed cost + variable cost





→ Cost on the basis of Controllability:

⇒ Controllable cost vs Uncontrollable cost:

-> when a cost can be reduced (or) increased by managerial decision it is called controllable cost otherwise uncontrollable.

⇒ Explicit cost vs Implicit cost:

→ Explicit cost are known as out of pocket cost and Implicit cost are known as opportunity cost.

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→ Cost on basis of function:

Examples of implicit cost:

1) Rent on his own house.

2) Salary for himself, 3) Interest on his own capital

→ Cost on basis of function:

1) Factory cost

2) Administrative cost

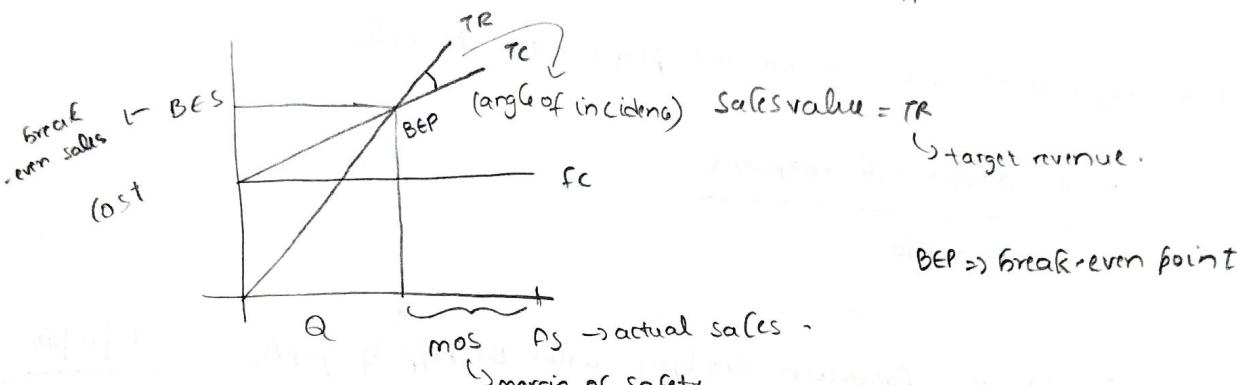
3) Selling and distribution cost

### Questions

- What is cost
- Explain the classification of cost
- Break-even analysis.

→ Every manufacturer is required to know the information about how many no of units are required to be sold inorder to recover the cost and how much should be the sales inorder to avoid the losses.

→ Break-even analysis helps to analyse the cost volume profit relationship and it uses the cost classification on the basis of variable.



BEP  $\Rightarrow$  break-even point

angle of incidence  $\Rightarrow$  profitability

→ Formulas to calculate Break-even point:

1) As per the marginal costing equation

$$\text{Sales} - \text{Variable Cost} = \text{Fixed Cost} + \text{Profit}$$

$$2) \text{Contribution} = S - V \quad (\text{or}) \quad f + p$$

$$3) \text{Profit Volume Ratio} = \left( \frac{\text{Contribution}}{\text{Sales}} \right) \times 100 \quad (\text{or}) \quad \frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100$$

$$4) \text{Break-even point (in units)} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}}$$

$$5) \text{Break-even point (in sales value (RS sales))} = \frac{\text{Fixed Cost}}{\text{P.V. Ratio}} \quad (\text{P.V. ratio in } \text{voil.} = 0.40)$$

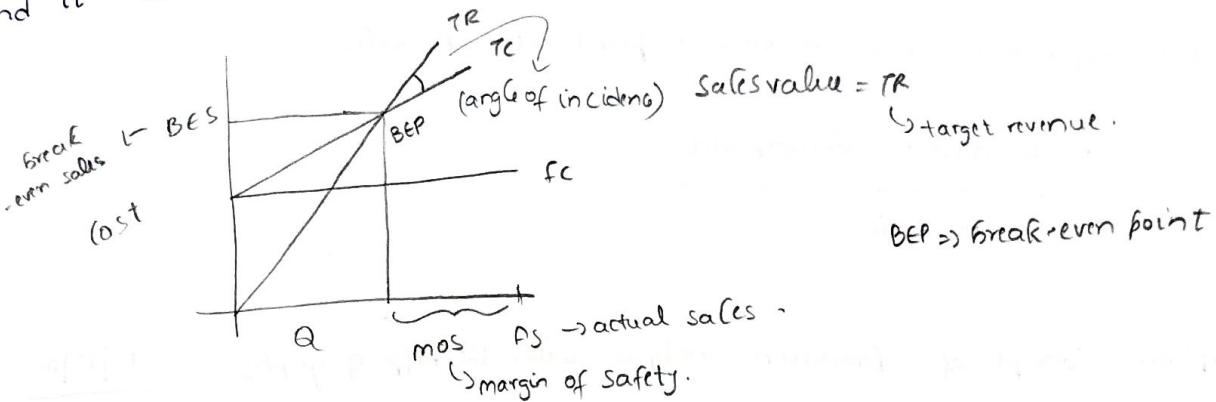
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angle of incidence / profitability

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(PV ratio)

$$4) \text{Break even point (in units)} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}}$$

$$5) \text{Break-even point (in sales value (Rs sales))} = \frac{\text{fixed cost}}{\text{PV ratio}} \quad (\text{PV ratio in decimal value}), \quad 40\% = 0.40$$

decimal value } , 40\% = 0.40 ) .

o) Margin of safety = actual sales - breakeven sales

(or)

Profit/PV ratio

→ Sales required to earn a desired level of profit (in units)

$$= \frac{\text{fixed cost} + \text{desired profit}}{\text{Contribution per unit}}$$

8) Sales required to earn a desired profit in Rs sales

$$= \frac{\text{fixed cost} + \text{desired profit}}{\text{PV ratio}}$$

→ Explain concept of break-even analysis with the help of graphs

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Q what are its assumptions and limitations.

Q) For the following data you are required to calculate break-even point in units and in Rs value, margin of safety ratio and sales required to earn a profit of 50000. Both in units & in Rs sales.

Selling price: 50Rs per unit

Variable cost  $\Rightarrow$  20Rs per unit

Actual no of units sold = 4000 units

fixed cost  $\Rightarrow$  60000Rs per annum

Sol) Contribution = SP - VC = 30

$$\text{PV ratio} = \frac{30}{50} \times 100 = 60\% \text{ (never use)}$$

$= 0.6$  (Convert it into decimal)

$$FC = 60000$$

$$BEP \Rightarrow \frac{FC}{\text{in units}} = \frac{60000}{30} \\ = 2000 \text{ units}$$

$$\text{BEP in Rs sales} = \frac{FC}{PVR} = \frac{60000}{0.60} \\ = 100000 \quad (\text{or}) \quad 2000 \times 50 \text{ Rs/unit} \\ = 100000$$

$$RS = 4000 \text{ unit} \times 50 \\ = 200000$$

$$BES = 100000 \text{ (BEP in rupee)}$$

$$MOS = 20000 - 100000 \\ = 100000$$

$$\text{MOS ratio} = \frac{\text{MOS}}{\text{AS}} \times 100 \\ = \frac{100000}{200000} \times 100 \\ = 50 \%$$

$$\text{Desired profit} = 50000$$

$$\begin{aligned} \text{Sales required to} \\ \text{earn a profit} &= \frac{FC + DP}{\text{Contri}} \\ 50000 \text{ in units} &= \frac{60000 + 50000}{30} \\ &= \frac{110000}{30} \end{aligned}$$

$$\text{Sales required to earn profit of } 50000 \text{ in Rs sales} = \frac{FC + DP}{PVR}$$

$$= \frac{60000 + 50000}{0.60}$$

=

- Q) BEP
- a) MOS
- b) sales required to earn a profit of 100000
- c) profit when sales = 200000
- d) sales = 80000
- e) VC is estimated to be 40% of selling price.
- f) FC = 25000

$$\text{Sol) Contribution} = S - VC \\ = 80000 - \frac{40}{100} (80000)$$

$$\rightarrow = 80000 - 32000 \\ f = 48000$$

$$Q) \text{ BEP PV} = \frac{C}{S} \times 100 \\ = \frac{25000}{80000} \times 100 = 60\% \\ e = 0.60$$

$$\text{BEP} = \frac{\text{fixed cost}}{\text{PV ratio}} = \frac{25000}{0.60} = 150 \frac{41666.67}{150}$$

$$\text{MOS} = PS - BEP \\ = 80000 - 41667 \\ = 38333$$

$$\text{MOS ratio} = \frac{38333}{80000} \times 100 \\ = 47.92\%$$

Profit when sales = 200000

$$\Rightarrow \text{Contribution} = \text{Sales} \times \text{PV ratio}$$
$$= 200000 \times 0.60$$
$$= 120000$$

Contribution  $\Rightarrow$  FC + Profit

$$\text{Profit} = 120000 - 25000$$
$$= 95000$$

$\Rightarrow$  For the following data you are required to calculate

- 1) PV ratio
- 2) BEP
- 3) M&S during a accountive periods

Particular	Jan-June	July-Dec
Sales	200000	250000
Profit	20000	30000

Sol) PV ratio =  $\frac{\text{change in profit}}{\text{change in sales}} \times 100$   $M&S \Leftarrow$

$$= \frac{10000}{50000} \times 100$$
$$FC = 40000 - 20000$$
$$= 20\%$$
$$= 20000$$

$$BEP = \frac{FC}{PV\%} = \frac{20000}{0.2} = 100000$$

M&S: I period  $\Rightarrow 200000 - 100000$  II period  $\Rightarrow 250000 - 200000$

$$= 100000$$
$$= 150000$$

and not related to "goal" and not related by classification and still have some that

### -> Cost sheet:

- > Cost sheet is used to ascertain cost per unit and it is based on functional classification of cost.

