

## UNIT-2

# production and cost Analysis

cost? cost refers to the expenditure incurred to produce an output (or) provide service. the cost includes raw materials, labour and other expenses which are useful in production.

### cost concepts :-

1. opportunity cost vs outlay cost.
2. fixed cost vs variable cost.
3. total cost, average cost and marginal cost.
4. explicit cost vs implicit cost.
5. out of pocket vs book cost.

## BREAK-EVEN ANALYSIS

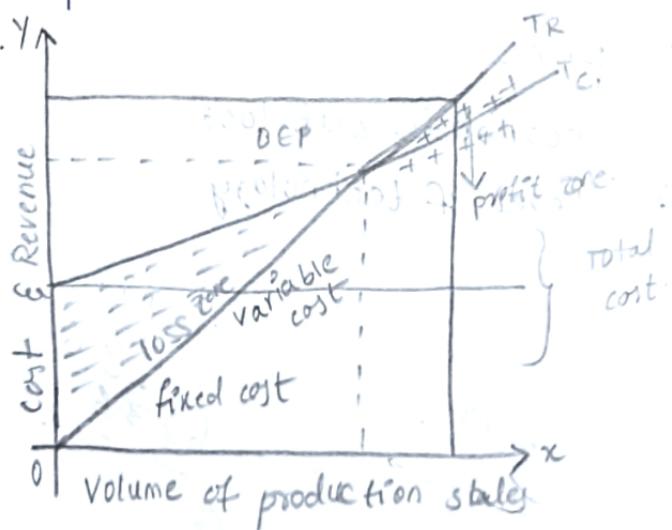
### introduction:-

It refers to analysis of break even point. It is important because it denotes the minimum volume of production to be undertaken to avoid losses. a firm is said to attain the break even when its total revenue is equal to total cost. It also called as "cost - volume - profit analysis".

### Definition :-

Break-even analysis is defined as analysis of cost and their possible impacts on revenue and volume of the firm. It refers no profit (0) no loss point.

### Break - even chart.



### Assumptions:-

- \* cost can be classified into fixed cost and variable cost.
- \* selling price doesn't change with volume of change. It remains fixed. It means it does not considerate price discounts.
- \* all the goods produced are sold. there is no closing stock.
- \* there is only one produce available ~~for~~ sale in case of multi produce firms the produce mix do not change.

### Significance:-

- to ascertain the profit and particular level of sales volume / a given capacity of productions.
- ⇒ to calculate sales required to earn a particular desired level of profit.
- ⇒ to compare the product lines, sales areas, method of sales for individual company.
- ⇒ to compare the efficiency of the different firms.
- ⇒ to decide whether to add a particular product to the existing product line or drop one from it.
- ⇒ to decide to "make or buy" a spare part.
- ⇒ to decide what promotion mix will yield optimum sales.
- ⇒ to assess the impact of changes in fixed cost, variable cost or selling price on BEP in a given period.

### Limitations of BEA:

- \* BEP is based on fixed cost, variable cost and total revenue. A change in one variable is going to affect the BEP.
- \* All costs cannot be classified into fixed cost and variable cost we have semi variable cost also.
- \* In case of multi product form a single chart can not be of any use. Series of charts made up off.
- \* It is based on fixed cost concepts and hence holds good only in the short run.
- \* Total cost and total revenue lines are not always straight as shown in the figure. the quantity and price discounts as usual financial effecting the total revenue line.
- \* where the business conditions are volatile BEP can not give stable results.

### Formula:-

#### \* BEP in units:-

BEP in units = Fixed cost / contribution margin per unit.

contribution margin per unit = selling price per unit - variable cost per unit

#### \* BEP in sales value :-

BEP in sales value = Fixed cost / contribution margin ratio.

contribution margin ratio =  $\frac{\text{Selling price per unit} - \text{variable price per unit}}{\text{Selling price per unit}}$

\*  $BEP = \frac{\text{fixed cost}}{P/V \text{ ratio}}$

Key terms used in the Break even analysis:-

1) contribution:-

contribution is the difference b/w selling price and variable cost.

$$\text{contribution} = \text{selling price} - \text{variable cost}$$

(Q)

$$\text{fixed cost} + \text{profit}$$

(Q)

$$\text{sales} \times P/V \text{ ratio}$$

margin of Safety:-

the excess of actual sales - the break even sales. Higher the margin safety leads to higher profit to the firm.

$$\text{margin of safety} = \text{actual sales} - BEP \text{ in units}$$

(Q)

$$\text{net profit} / P/V \text{ ratio}$$

P/V ratio:-

It is popularly known as profit volume ratio. the ratio b/w the contribution and sales.

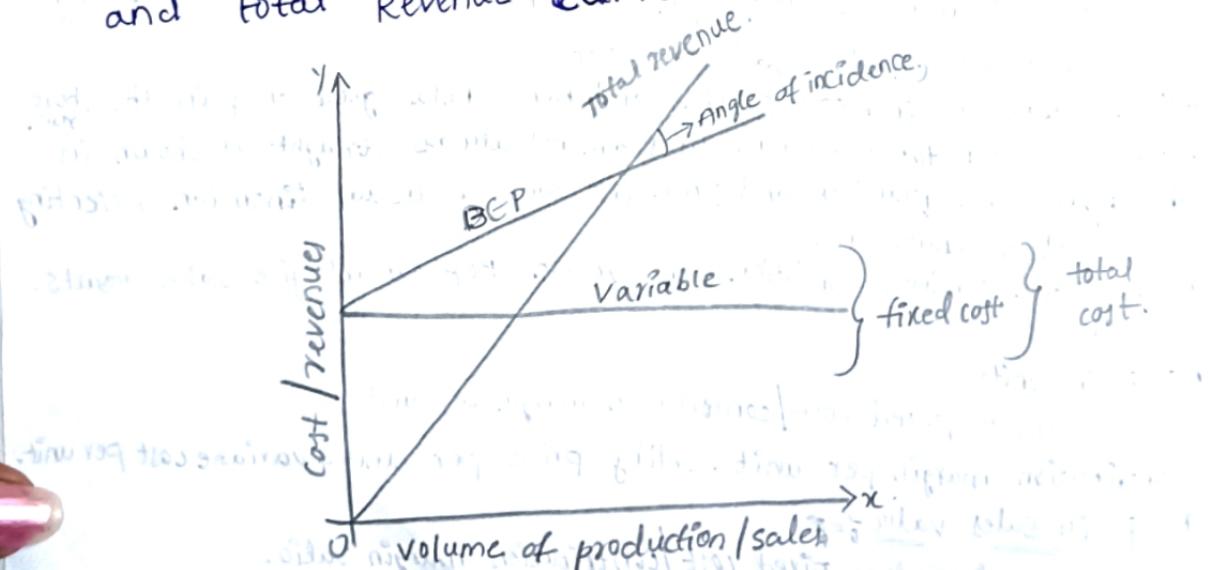
$$P/V \text{ ratio} = \frac{\text{contribution}}{\text{Sales}} \times 100$$

(Q)

$$\frac{\text{change in profit}}{\text{change in sales}} \times 100$$

Angle of incidence:-

the angle formed where the total cost curve and total Revenue curve.



$$\text{Desired Sales} = \frac{\text{fixed cost} + \text{Desired profit}}{SPPU - VCPU}$$

from the following information, you are required to calculate

(a) BEP in units

(b) BEP in sales value

(c) Sales to get a profit of 10,000 rupees.

(d) P/V ratio.

(e) margin of safety (if actual production is 20,000 units)

~~data~~ fixed cost 60,000 rupees

~~data~~ selling price per unit 10 rupees.

~~data~~ variable cost per unit 6 rupees.

Sol: Given data

$$\text{Fixed cost} = \text{₹ } 60,000/-$$

$$\text{Variable cost} = \text{₹ } 6/-$$

$$\text{SPPU} = \text{₹ } 10/-$$

$$(a) \text{BEP in units} = \frac{\text{FC}}{\text{CMU}} = \frac{60,000}{4} = 15000 \text{ units.}$$

$$\text{CMU} = \text{SPPU} - \text{VCPU}$$

$$= 10 - 6$$

$$= \text{₹ } 4/-$$

$$(b) \text{BEP in sales value} = \frac{\text{FC}}{\text{CMR}} = \frac{60,000}{4} \times 10 = \text{₹ } 150000$$

$$\text{CMR} = \frac{10 - 6}{10} = 4/6 = 66.67\%$$

(c) Sales to get a profit of 10,000 rupees.

$$\text{Desired sales} = \frac{\text{FC} + \text{DP}}{\text{SPPU} - \text{VCPU}}$$

$$= \frac{60,000 + 10,000}{10 - 6}$$

$$= 17,500 \text{ units.}$$

$$(d) \text{P/V ratio} = \frac{\text{contribution}}{\text{Sales} / \text{OV}} \times 100$$

$$\text{contribution} = \text{Sp} - \text{VC}$$

$$= \frac{4}{10} \times 100 = 40\%$$

$$= 10 - 6 \\ = 4$$

$$\text{CMR} = \frac{\text{Sp} - \text{VC}}{\text{Sp}} \times 100$$

$$(e) M/S = \text{Actual Sales} - \text{BEP in units} \times \text{SPPU}$$

$$= 20,000 \text{ units} - 15000 \text{ units} \times 500/-$$

$$= 5000 \text{ units.}$$

~~(f)~~  
A firm has a fixed cost of 5 lakh rupees. Selling price per unit is 500/- variable cost per unit is 250/- present value of production is 5000 units. Calculate:

- (a) BEP in terms of value and volume.
- (b) Margin of Safety.
- (c) change in BEP & margin of safety if fixed cost increased by 10% basis.

Sol: Given data is as follows

(Before change)  $\text{BEP} = \frac{\text{Fixed}}{\text{SPPU} - \text{VCPU}}$

$$\text{Fixed} = ₹ 500,000/-$$

$$\text{SPPU} = ₹ 500/-$$

$$\text{VCPU} = ₹ 250/-$$

(a) BEP in terms of value and volume.

$$\text{BEP in units} = \frac{\text{fixed cast}}{\text{CMPU}}$$

$$= \frac{5,00,000}{250} = 2000 \text{ units.}$$

$$\text{CMPU} = \text{SPPU} - \text{VCPU}$$

$$= 500 - 250$$

$$= 250/-$$

$$\text{BEP in terms of volume} = \frac{\text{FC}}{\text{CMR}} = \frac{5,00,000 \times 2}{250} = 4000 \text{ units.}$$

$$\Delta =$$

$$\text{CMR} = \frac{500 - 250}{500} = \frac{1}{2}$$

$$= ₹ 10,00,000$$

$$\begin{aligned}
 (b) \text{ Margin of Safety} &= \text{Actual Sales} - \text{BEP in units.} \\
 &= 5000 - 2000 \\
 \text{MOS} &= 3000 \text{ units.}
 \end{aligned}$$

(c) After change

$$\begin{aligned}
 \text{fixed cost} &= 5,00,000 \times \frac{110}{100} \\
 &= ₹ 5,50,000/-
 \end{aligned}$$

$$\text{SPPU} = ₹ 500/-$$

$$\text{VCPU} = ₹ 250/-$$

$$\begin{aligned}
 \text{BEP in units} &= \frac{5,50,000}{250} \\
 &= 2200 \text{ units.}
 \end{aligned}$$

$$\begin{aligned}
 \text{BEP in sales value} &= \frac{5,50,000}{0.5} \\
 &= ₹ 11,00,000/-
 \end{aligned}$$

$$\begin{aligned}
 \text{Margin of Safety} &= \text{Actual Sales} - \text{BEP in units.} \\
 &= 5000 - 2200 \\
 \text{MOS} &= 2800 \text{ units}
 \end{aligned}$$

PNG electrical company manufacturing a no. of electric products rechargeable light is one of the PNG's product that sells \$180 per unit total fixed expenses related to rechargeable

Srikanth enterprises deals in the supply of hardware parts of computer. The following cost data is available for two successive ~~data~~ periods.

particulars	period 1	period 2
Sales	50,000/-	1,20,000/-
fixed cost	10,000/-	20,000/-
variable cost	30,000/-	60,000/-

determine   
 (a) BEP  
 (b) margin of safety.

SOL:

particulars	period 1	period 2
Sales	50,000	1,20,000
(-) Variable cost	<u>30,000</u>	<u>60,000</u>
contribution $\rightarrow$	20,000	60,000
(-) Fixed cost	<u>10,000</u>	<u>20,000</u>
Net profit $\rightarrow$	<u>10,000</u>	<u>40,000</u>

$$\text{Plv ratio} \left( \frac{\text{contribution}}{\text{sales}} \times 100 \right) = \frac{20,000}{50,000} \times 100 = 40\%$$

$$= \frac{60,000}{1,20,000} \times 100 = 50\%$$

$$(a) \text{BEP} = \frac{\text{fixed cost}}{\text{Plv ratio}} = \frac{10,000}{40} \times 100 = \frac{20,000}{50} \times 100 = ₹ 25,000/- = ₹ 40,000/-$$

$$(b) \text{M/S} = \frac{\text{net profit}}{\text{Plv ratio}} = \frac{10,000}{40} \times 100 = \frac{40,000}{50} \times 100 = ₹ 25,000/- = ₹ 80,000/-$$

# Determine BEP and Margin of Safety

Year	Sales	Profit
2016	₹ 2,00,000/-	₹ 20,000/-
2017	₹ 3,00,000/-	₹ 75,000/-

SOL

$$\text{PLV ratio} = \frac{\text{change in profit}}{\text{change in sales}} \times 100$$

$$= \frac{55,000}{3,00,000} \times 100$$

$$= 18.33\%$$

$$\text{contribution} = \text{sales} \times \text{PLV ratio}$$

$$= ₹ 2,00,000 \times \frac{18.33}{100}$$

$$= ₹ 36,660/-$$

$$\text{contribution} = FC + \text{profit}$$

$$36,660 = FC + 20,000$$

$$FC = 36,660 - 20,000$$

$$FC = ₹ 16,660/-$$

$$(a) \text{BEP} = \frac{FC}{\text{PLV ratio}}$$

$$= \frac{16,660}{18.33} \times 100$$

$$= ₹ 90,889.26$$

$$(b) M/S = \frac{\text{net profit}}{\text{PLV ratio}}$$

$$= \frac{20,000}{18.33} \times 100$$

$$= ₹ 109110.7474/-$$

Determine BEP, and margin of safety.

year	Sales <del>prof</del>	profit
2017	₹ 1,00,000/-	₹ 50,000/-
2018	₹ 6,00,000/-	₹ 80,000/-

sol

$$\Delta p/v \text{ ratio} = \frac{\text{change in profit}}{\text{change in sales}} \times 100$$

$$= \frac{30,000}{2,00,000} \times 100$$

$$= 15\%$$

$$\text{contribution} = \text{sales} \times \text{profit ratio}$$

$$= ₹ 1,00,000 \times \frac{15}{100}$$

$$= ₹ 15,000/-$$

$$\text{contribution} = \text{fixed cost} + \text{profit}$$

$$= ₹ 1,00,000 \times \frac{15}{100}$$

$$= ₹ 15,000$$

$$\text{contribution} = \text{fixed cost} + \text{profit}$$

$$60,000 = \text{fixed cost} + 50,000$$

$$\text{fixed} = 60,000 - 50,000$$

$$= ₹ 10,000/-$$

$$(a) \text{BEP} = \frac{\text{fixed cost}}{\text{p/v ratio}} = \frac{10,000}{15} \times 100$$

$$= ₹ 66,666$$

$$(b) \text{margin of safety} = \frac{\text{net profit}}{\text{p/v ratio}} = \frac{50,000}{15}$$

$$= 3333.33$$

From the following information you are required to calculate (a) BEP  
 (b) Margin of Safety

particulars	Year 1	Year 2
Sales	3,00,000/-	5,00,000/-
fixed cost	1,00,000/-	1,50,000/-
variable cost	1,80,000/-	2,50,000/-
particular	period I	period II
sales	3,00,000	5,00,000
variable cost	1,80,000	2,50,000
contribution	1,20,000	2,50,000
fixed cost	1,00,000	1,50,000
net profit	20,000	1,00,000

$$\text{PLV ratio} \left( \frac{\text{contribution}}{\text{sales}} \times 100 \right) = \frac{1,20,000}{3,00,000} \times 100 = 40\% \quad \frac{2,50,000}{5,00,000} \times 100 = 50\%$$

$$(a) \text{BEP} = \frac{\text{fixed cost}}{\text{PLV ratio}} = \frac{1,00,000}{40\%} \times 100 = \frac{1,50,000}{50\%} \times 100 = 2,50,000/- = 3,00,000/-$$

$$(b) \text{margin of safety} = \frac{\text{net profit}}{\text{PLV ratio}} = \frac{20,000}{40\%} \times 100 = \frac{1,00,000}{50\%} \times 100 = 50,000/- = 2,00,000/-$$

A fixed cost of producing motto mobile is ₹ 1,00,000/- variable cost of motto mobile is ₹ 3,500/- The selling price of motto mobile is ₹ 4,500/- what would be the sales volume of company to get ₹ 20,000/- profit.

Solution: Given

$$\text{fixed cost} = ₹ 1,00,000/-$$

$$\text{also let variable cost} = ₹ 3,500/-$$

$$\text{selling price} = ₹ 4,500/-$$

$$\text{desired profit} = ₹ 20,000/-$$

$$\text{Desired Sales} = \frac{\text{fixed cost} + \text{Desired profit}}{\text{Selling price per unit} - \text{variable cost per unit}}$$

$$= \frac{1,00,000 + 20,000}{4,500 - 3,500}$$

$$= \underline{1,20,000}$$

∴ 1000

$$= 120 \text{ units.}$$

∴ Required sales

$$\underline{\underline{120,000}}$$

∴ Pf =

A company makes a single product with sales price of ₹ 100/- and variable cost of ₹ 65,000/- per unit. Fixed cost of ₹ 5,50,000/- calculate

- (a) BEP in units
- (b) BEP sales volume
- (c) Sales to get a profit of ₹ 1,00,000/-
- (d) P/V ratio
- (e) margin of safety where actual sales are 20,000 units.

SOL

Sales price ₹ 100/-

variable cost ₹ 65,000/-

fixed cost ₹ 5,50,000/-

contribution = selling price - variable cost

$$= 100 - 65,000$$

$$= 64,900$$

contribution margin ratio =  $\frac{\text{selling price per unit} - \text{variable price per unit}}{\text{Selling price per unit}}$

$$= \frac{100 - 65,000}{100}$$

$$= 64.9$$

(a) BEP units =  $\frac{\text{fixed cost}}{\text{contribution margin per unit}}$

$$= \frac{5,50,000}{64900}$$

$$= 8.4746$$

(b) BEP sales volume =  $\frac{\text{fixed cost}}{\text{contribution margin ratio}}$

$$= \frac{5,50,000}{649}$$

$$= 847.45$$

(c) Sales to get profit ₹ 1,00,000

Desired Sales =  $\frac{\text{fixed cost} + \text{desired profit}}{\text{Selling price per unit} - \text{variable cost per unit}}$

$$= \frac{5,50,000 + 1,00,000}{100 - 65,000}$$

$$= \frac{6,50,000}{35,000}$$

$$= 18.5714$$

$$= 10.015$$

(d) P/V ratio =  $\frac{\text{contribution}}{\text{Sales}} \times 100 = \frac{64900}{100} \times 100$

$$= 64900$$

(e) margin of safety actual sales are 20,000 units

$$\begin{aligned} &= \text{actual sales} - \text{BEP in units} \\ &= 20,000 - 8.4746 \\ &= 19.991 \text{ units.} \end{aligned}$$

A hi-tech train can carry a maximum of 36,000 passengers per annum. at the fixed fair of selling price ₹ 400/- . The variable cost for passenger is ₹ 150/- while the fixed cost is ₹ 25,00,000/- per annum.

Find the BEP in terms of number of passengers and also in terms of fair collections.

SOL

Given

$$\text{fixed cost} = ₹ 25,00,000/-$$

$$\text{variable cost} = ₹ 150/-$$

$$\text{selling price} = ₹ 400/-$$

$$\begin{aligned}\text{contribution} &= \text{selling price} - \text{variable cost} \\ &= ₹ 400 - ₹ 150 \\ &= ₹ 250\end{aligned}$$

$$\text{BEP number of passenger} = \frac{\text{fixed cost}}{\text{contribution}}$$

$$= 10,000 \text{ passengers.}$$

$$\text{BEP in (sales) fair collection} = \frac{\text{fixed cost}}{\text{contribution margin ratio.}}$$

$$\begin{aligned}\text{contribution margin ratio} &= \frac{\text{selling price} - \text{variable cost}}{\text{selling price}} \\ &= \frac{400 - 150}{400} \\ &= 0.625\end{aligned}$$

$$\text{BEP collection} = \frac{25,00,000}{0.625} = ₹ 40,00,000/-$$