Break-even Analysis / Cost Volume Profit Analysis :-

Break-even analysis shows the relationships between the costs and Profit with sales volume.

Sales = costs + Profit

= Fixed cost + variable cost + Profit

It is very useful in knowing —

1) The effect of increase or decrease in selling Price.
2) The effect of changes in sales mix.
3) Determination of sales volume to earn the required Profit.
4) The effect on net Profit of introducing new line or discontinuing existing line of Product.

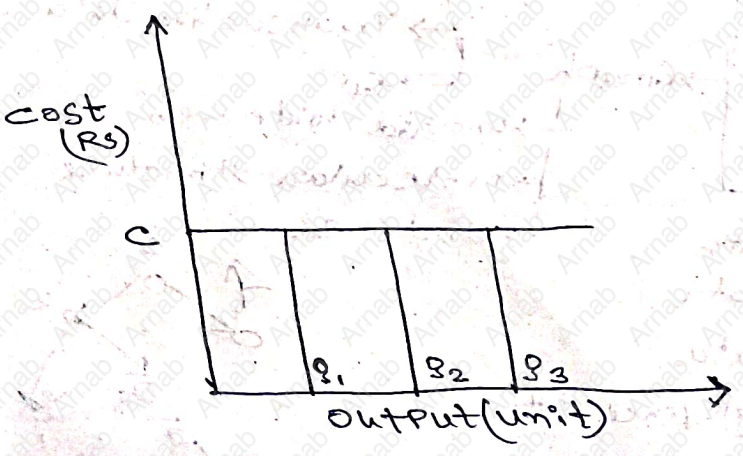
Fixed cost :-

It represent those expenses which do not vary in total with the change in the volume of output for a given Period of time.

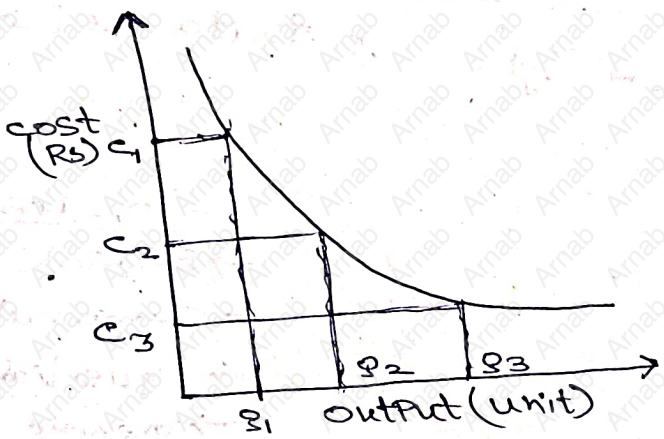
Fixed cost Per unit will fluctuate with change in the volume of output.

Ex - Salary, Rent, fire insurance etc.

Total Fixed cost



Per unit Fixed cost



Rent RS 10,000

1000 units → $\frac{10,000}{1000}$ = Rs 10 / unit

2000 units → $\frac{10,000}{2000}$ = Rs. 5 / unit

10,000 " → $\frac{10,000}{10,000}$ = RS 1 / unit

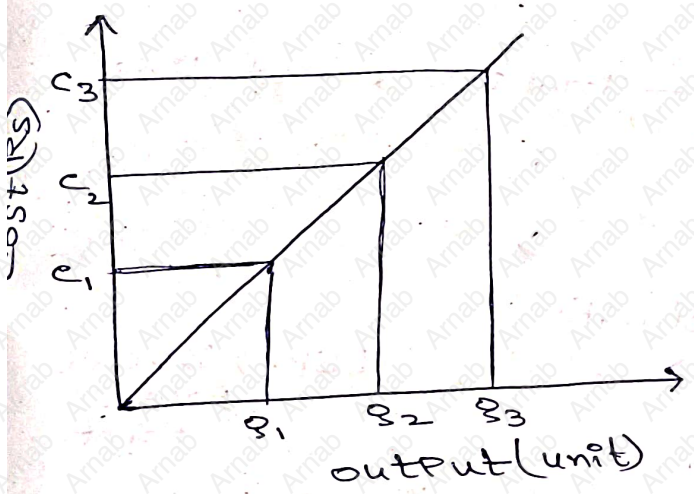
variable cost :-

variable cost represent those expenses which directly vary in total with the change in the volume of output.

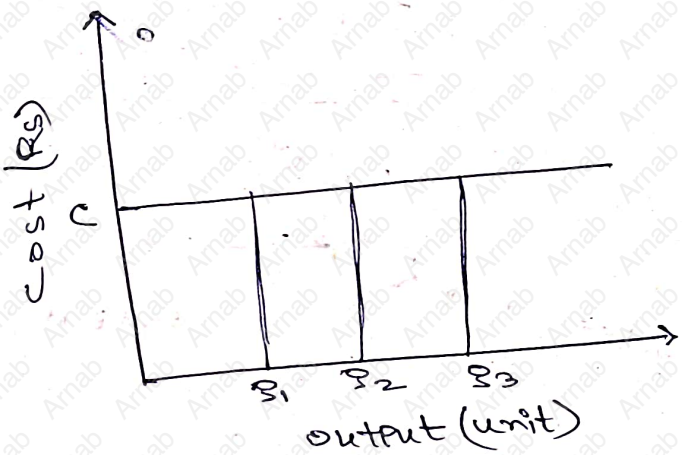
variable cost per unit will not fluctuate with change in the volume of output.

Ex: Materials, Direct labour, Direct expenses etc.

Total variable cost



Per unit variable cost



Variable cost per unit RS 10

1000 units → 1000 × 10 = 10,000

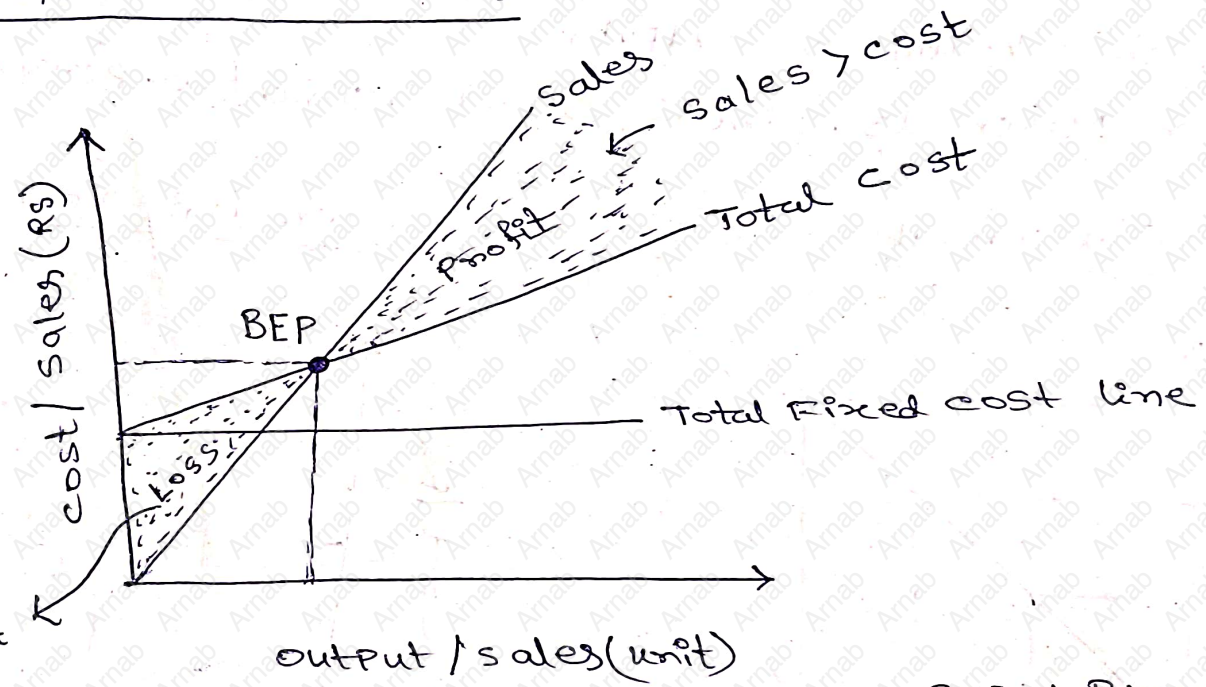
2000 units → 2000 × 10 = 20,000

10,000 units → 10,000 × 10 = 1,00,000

2. Discuss the behaviour of fixed cost & variable cost in respect of volume of output.

- **Break-even Point :-** (BEP) (cost = sell) (No Profit No Loss)

Break even point may be defined as that point at which the total sales is equal to total cost or fixed cost & is exactly equal to contribution. It represents that level of output and sales whether neither Profit nor loss is incurred. It is also called "no-Profit no-loss Point"



BEP ⇒ Break Even Point

3) Explain Break-even Point with suitable example.

Economics

24th Jan, 25

Contribution :-

It is the excess of sales over variable cost. In other word, it is the portion of sales remains after recovering variable cost to that extent of sales. It is available towards fixed cost & Profit.

Contribution = Sales − Variable cost

Sales = Fixed cost + Profit + variable cost

Sales − VC = FC + Profit

Contribution = FC + Profit

Profit- Volume Ratio :-

It is the ratio between contribution and sales. It is generally expressed in percentage. It exhibits the percentage of profit included in sales. It is an indicator of rate at which the profit is being earned by a concern. It can be improved by increasing selling price per unit.

Higher Profit volume ratio indicates higher profitability.

$$\text{Profit-volume (P/v) ratio} = \frac{\text{contribution}}{\text{sales}} \times 100$$

1> Sales = Fc + Vc + Profit

2> contribution = Sales − Vc
= Fc + Profit

3> P/V ration = $\frac{\text{Total contribution}}{\text{Total Sales}} \times 100$

$= \frac{\text{contribution per unit}}{\text{Selling Price per unit}} \times 100$

$= \frac{\text{change in Profit}}{\text{change in sales}} \times 100$

4> Break-Even Point (BEP) :-

a> BEP (value) $= \frac{Fc}{P/V \text{ ratio}}$

b> BEP (unit) $= \frac{Fc}{\text{contribution per unit}}$

5> Estimated sales or Profit :-

a> Sales (value) $= \frac{Fc + \text{Profit}}{P/V \text{ ratio}}$

b> Sales (unit) $= \frac{Fc + \text{Profit}}{\text{contribution per unit}}$

6> Margin of safety :-

a> Actual sales − BEP sales

b> $\frac{\text{Actual profit}}{P/V \text{ ratio}}$

Problem:

Sales Rs 10,00,000

Fixed cost Rs 3,00,000

variable cost Rs. 6,00,000

Profit Rs 1,00,000

Calculate :- 1) Contribution = Sales − VC

= 10,00,000 − 6,00,000

= 4,00,000

2) Profit-Volume ration = $\frac{\text{Total contribution}}{\text{Total sales}} \times 100$

= $\frac{4,00,000}{10,00,000} \times 100$

= 40 % ≡ $\frac{4}{10} = \left(\frac{2}{5}\right)$

3) Break-Even Point, BEP = $\frac{FC}{P/V \text{ ratio}}$

= $\frac{3,00,000}{(2/5)}$ = $\frac{15,00,000}{3,00,000} \times \frac{5}{2}$

= 7,50,000

4) Profit when sales value = 15,00,000

= 15,00,000

$15,00,000 = \frac{3,00,000 + \text{Profit}}{\left(\frac{40}{100}\right)}$

∴ Profit = 3,00,000

5) Sales value when Profit = 2,00,000

Sales = $\frac{3,00,000 + 2,00,000}{\left(\frac{40}{100}\right)}$ = 5,00,000 × $\frac{5}{2}$

= 12,50,000

6) Marginal safety = 10,00,000 − 7,50,000

= 2,50,000

Q> Sales volume 80,000 units
Selling Price Per unit Rs 20
variable cost Per unit Rs 10
Fixed cost 4,00,000

① ↳ contribution Per unit $= \frac{(80,000 \times 20) - (80,000 \times 10)}{80,000}$

$= \frac{8,00,000}{80,000}$

$= 10$

= Selling Price Per unit - Vc Per unit

$= 20 - 10$

$= 10$

② ↳ Profit volume ratio $= \frac{\text{contribution Per unit}}{\text{selling Price Per unit}} \times 100$

$= \frac{10}{20} \times 100$

$= 50\ \%$

③ ↳ Break Even Point (value) $= \frac{FC}{P/V \text{ ratio}}$

$= \frac{4,00,000}{\left(\frac{50}{100}\right)}$

$= 8,00,000$

BEP (unit) $= \frac{FC}{\text{cont. Per unit}}$

$= \frac{4,00,000}{10}$

$= 40,000$

(4) ↳ Profit when sales value is Rs. 20,00,000 or 1,00,000 unit

$$\text{Sales (value)} = \frac{\text{FC + Profit}}{\text{P/V ratio}}$$

$$20,00,000 = \frac{4,00,000 + \text{Profit}}{\left(\frac{50}{100}\right)}$$

$$\Rightarrow \boxed{\text{Profit} = 6,00,000}$$

$$\text{Sales (unit)} = \frac{\text{FC + Profit}}{\text{cont. per unit}}$$

$$1,00,000 = \frac{4,00,000 + \text{Profit}}{10}$$

$$\Rightarrow \boxed{6,00,000 = \text{Profit}}$$

(5) ↳ Sales value when Profit is Rs 2,00,000

$$\text{Sales (value)} = \frac{\text{FC + Profit}}{\text{P/V ratio}}$$

$$= \frac{4,00,000 + 2,00,000}{(50/100)}$$

$$\boxed{\text{Sales(value)} = 12,00,000}$$

↳ Margin of safety = Actual sales − BEP sales

$$= (80,000 \times 20) - 8,00,000$$

$$= 16,00,000 - 8,00,000$$

$$= 8,00,000$$

Margin of safety = $\frac{\text{Actual Profit}}{\text{P/V ratio}}$

$= \frac{\text{Selling Price} - \text{FC} - \text{VC}}{(50/100)}$

~~$= \frac{80 \times 6,00,000 - 4,00,000}{}$~~

$= \frac{(80,000 \times 20) - 4,00,000 - (80,000 \times 10)}{(1/2)}$

$= \frac{4,00,000}{(1/2)}$

$= 8,00,000$

What would be the new selling price per unit if BEP is reduced to 32,000 unit?

Problem

Sales = 1000 units

Selling Price Per Unit = 25

Variable cost = Rs 12,000

Fixed cost = 16,800

Find out –

1) P/V ratio

2) Break even Point (unit & value)

3) what additional unit should be sold to obtain the same amount of Profit if selling price per unit is reduced to Rs 20,

(1) $P/V = \frac{\text{Contribution}}{\text{Sales}} \times 100$

$= \frac{28,000}{1,00,000} \times 100$

$= 28\%$.

$= \frac{25-18}{25} \times 100$

$= \frac{7}{25} \times 100$

$= 28\%$

(2) $BEP = \frac{FC}{P/V \text{ ratio}}$

$= \frac{16,800}{28} \times 100 = 6,00,00 = 60,000$

$BEP = \frac{FC}{\text{Cont. Per unit}} = \frac{16,800}{7} = 2400$

(3) Contrib = FC + Profit

$28,000 = 16,800$

Profit = 11,200

$28,000 - 16,800 = 11,200$

Cont. Per unit = 20 − 18 = 2

$\text{Sales} = \frac{FC + \text{Profit}}{\text{Cont. Per unit}} = \frac{16800 + 11200}{2}$

$= \frac{28000}{2}$

$= 14,000$ units

Additional (14,000 − 4,000) = 10,000 units need to be sold.

Year	Sales (Rs)	Profit (Rs)
2023	1,20,000	9,000
2024	1,40,000	13,000

Calculate

1) P/V ratio =
2) Fixed cost
3) Variable cost for 2023 and 2024
4) BEP
5) Profit when sales value is 2,00,000
6) Margin of safety (2023 & 2024)

① P/V ration $= \frac{\Delta \text{Profit}}{\Delta \text{sales}} \times 100$

$= \frac{4,000}{20,000} \times 100$

$= 20\ \%$

② Sales $= \frac{\text{Fc} + \text{Profit}}{\text{P/V ration}}$

$1,20,000 = \frac{\text{Fc} + 9000}{\left(\frac{20}{100}\right)}$

$\Rightarrow 1,20,000 \times \frac{20}{100} = \text{Fc} + 9000$

$\Rightarrow 24,000 - 9,000 = \text{Fc}$

$\Rightarrow$ **15,000 = Fc**

$1,40,000 = \frac{\text{Fc} + 13,000}{(20/100)}$

$\Rightarrow 28,000 - 13,000 = \text{Fc}$

$\Rightarrow$ **Fc = 15,000**

③ Sales = FC + VC + Profit

1,20,000 = 15,000 + VC + 9,000

96,000 = $(VC)_{2023}$

1,40,000 = ~~13000~~ 15000 + VC + 13,000

⇒ **1,12,000 = $(VC)_{2024}$**

④ BEP (value) = $\frac{FC}{P/V \text{ ratio}}$

$= \frac{15,000}{\frac{20}{100}}$

$= 15000 \times \frac{\cancel{100}}{\cancel{20}} 5$

$= ₹5,000$

⑤ Sales = $\frac{FC + Profit}{P/V \text{ ratio}}$

$2,00,000 = \frac{15,000 + Profit}{\left(\frac{20}{100}\right)}$

→ 40,000 − 15,000 = Profit

⇒ **Profit = 25,000**

⑥ Margin of safety = 1,20,000 − ₹5,000

= $(45,000)_{2023}$

= 1,40,000 − ₹5,000

= $(65,000)_{2024}$

■ Capital Budgeting or Investment Decision

Capital Budgeting is the process of identifying, designing, evaluating planning & financing major investment project of an organization. Decision to expand production facilities, starting new business, acquiring new machine, constructing Road and buildings are all example of capital expenditure decision.

It includes modification, addition, disposition and replacement of fixed assets.

In most cases there are always more than one alternative available decision taker has to consider the cost & benefit of all possible alternatives & choose that one which will be more profitable.

■ Objective of capital Building :-

1> Improving quality of Product & creating new document.
2> Expansion of Production facilities etc.
3> cost reduction
4> Meeting satisfaction of consumers
5> Improvement of Efficiency
6> Achievement of other social objectives.
7> Maximisation of Profit.
8> to ensure the selection of right sources of financial at right time.
9> To ensure the selection of Profitable Project.
10> To ensure Proper control over capital expenditure.
11> To make ~~capital expenditures~~ estimation of capital expenditure during budget Period.

Methods of Capital Budgeting :-

1) Pay Back Period
2) Net Present value
3) Profitability index
4) Internal Rate of ~~return~~ return.

Pay Back Period (PBP) :-

It is defined as the no. of years required to recover the initial investment in full with the help of annual cash inflows generated by the Project.

$$PBP = \frac{\text{Initial Investment}}{\text{Annual cash Inflows}}$$

Cost of a machine Rs. 50,000
Annual cash inflows (after tax) = 10,000
Life of Project = 10 years

$$\text{Pay Back period} = \frac{50,000}{10,000} = 5$$

The machine is profitable & can be accepted

9. There are two alternatives Project available A & B. Each requires initial investment Rs. 80,000. Life of each Project is 6 years and generates annual cash inflows (after tax) as under :-

Year	A	B
1.	30,000	20,000
2.	25,000	25,000
3.	23,000	30,000
4.	22,000	22,000
5.	20,000	18,000
6.	18,000	16,000

Calculate Pay Back Period & offer your comment.

Year	A	B	Cumulative cash Inflows A	Cumulative cash Inflows B
1	30,000	20,000	30,000	20,000
2.	25,000	25,000	55,000	45,000
3.	23,000	30,000	78,000	75,000
4.	22,000	22,000	1,00,000	97,000
5.	20,000	18,000	1,20,000	1,15,000
6.	18,000	16,000	1,38,000	1,31,000

$$PBP(A) = \frac{(80,000 - 78,000)}{22,000} + 3$$

$$= \frac{2000}{22000}$$

$$= \frac{1}{11}$$

$$= 0.09 + 3$$

$$= 3.09$$

$$PBP(B) = 3 + \frac{(80,000 - 75,000)}{22,000}$$

$$= 3 + \frac{5000}{22,000}$$

$$= 3 + 0.227$$

$$= 3.22 \text{ years}$$

Project A has shorter PBP. So A can be selected.

If, PBP(A) = 3 year
PBP(B) = 3 year

Profitability

A = 1,38,000 − 80,000 = 58,000

B → 1,31,000 − 80,000 = 51,000

Management

Payback Period

PBP

A — 4 yrs

B — 4 yrs

C — 4 yrs

Profitability

1,38,000 − 80,000 = 58,000

1,31,000 − 80,000 = 51,000

▪ Net Present Value (NPV) :-

Year = 2000 ⇒ ₹ 50,000

Year = 2025 = ₹ 50,000

Under this method, a specific compound rate of interest is given. Net cash inflows are discounted to present value using this rate of interest. The total present value of cash inflows is deducted from initial investment. The resulting surplus is called Net Present value (NPV)

NPV = Total PV of cash inflows − Initial Investment

If NPV > 0 ⇒ Project accepted

NPV < 0 ⇒ Project rejected

▪ Time value of Money :-

It is considered that money received immediately is of greater value than an equivalent sum to be received at some future.

If the rate of interest is not zero, money has a net productivity over time. A given sum of money at two point of time do not have same value. So, there is a general preference to receive money at Present than at future rate.

- Calculate Present value factor of Rs 1 at 10% compound ~~rate~~ interest for first 6 years.

$$y_n = \frac{1}{(1+r)^n}$$

$$y_1 = \frac{1}{(1+0.10)^1} = \frac{1}{(1.10)} = 0.91$$

$$y_2 = \frac{1}{(1+0.10)^2} = \frac{1}{1.10)} = 0.83$$

$$y_3 = \frac{1}{\quad} = 0.75$$

$y_4 =$ $= 0.68$

$y_5 =$ $= 0.62$

$y_6 =$ $= 0.56$

	PV
10,000	9100
10,000	8300
10,000	7500
10,000	6800
10,000	6200
10,000	5600

Inumerical (4 mark) = 4

2 short (2×1) = 2

2 short (2×2) = 4

- what is contribution
- BEP (Break Even Point)
- P/V ratio
- Fixed cost, variable cost
- Pay Back Period
- Net Present value
- time value of Money.
- capital Budgeting. what are it's objectives
-