



INDUSTRIAL ECONOMICS & FOREIGN TRADE

Module 2 | **Part 3**

HUT300

COST OF PRODUCTION



Cost refers to the expenditure incurred by a firm in the production of goods or services. It includes the money spent on factors of production like land, labour, capital, and organization.

Explicit Cost : Explicit costs are the actual out-of-pocket payments a firm makes to others for resources, like wages, rent, raw materials,etc.

Example:

Paying ₹50,000 as salary to an employee.

Implicit Cost : Implicit costs are the opportunity costs of using resources the firm already owns. These are not directly paid out but represent income the firm forgoes.

Example:

If the owner could earn ₹40,000 working elsewhere but runs their own business instead, ₹40,000 is the implicit cost.

1. Real Costs

- **Definition:** Real costs refer to the efforts, sacrifices, and resources used in the production of goods and services.
- **Example:** The physical labor of workers, time spent, and mental effort.

2. Accounting Costs

- **Definition:** These are the actual monetary expenses recorded in the books of accounts.
- **Also known as:** Explicit Costs.
- **Example:** Salaries, electricity bills, rent, and other direct payments.

3. Sunk Costs

- **Definition:** Costs that have already been incurred and cannot be recovered, regardless of future actions.
- **Example:** Money spent on advertising last year or R&D on a failed product.

4. Social Costs

- **Definition:** The total cost to society, including both private costs and external costs.

- Formula: Social Cost=Private Cost+External Cost
- Example: Money spent on advertising last year or R&D on a failed product.

5. Private Costs

- Definition: Costs directly borne by the producer or consumer involved in an economic activity.
- Example: Cost of raw materials paid by a manufacturer.

6. External Costs

- **Definition:** Costs that are not borne by the producer but are imposed on third parties.
- **Also known as:** Negative externalities.
- **Example:** Air pollution affecting nearby towns.

7. Replacement Costs

- **Definition:** The cost to replace an existing asset with a new one of similar kind and quality.
- **Example:** Replacing an old factory machine with a new one of the same capacity.

**Distinguish between explicit and implicit cost.
(3)(Jan 2024)**



SHORT RUN COSTS VS LONG RUN COSTS



ASPECT	SHORT RUN COSTS	LONG RUN COSTS
Time Frame	Short period where some inputs are fixed	Long period where all inputs are variable
Types of Costs	- Fixed Cost (TFC) - Variable Cost (TVC) - Total Cost ($TC = TFC + TVC$)	- All costs are variable - No fixed cost
Flexibility	Limited flexibility in production due to fixed inputs	Greater flexibility in production and cost adjustments
Cost Curves	U-shaped due to Law of Variable Proportions	U-shaped due to Returns to Scale

SHORT RUN COSTS



1. Total Cost (TC)

- **Definition:** It is the sum of all costs a firm incurs to produce a given level of output.
- **Formula :** $TC = TFC + TVC$

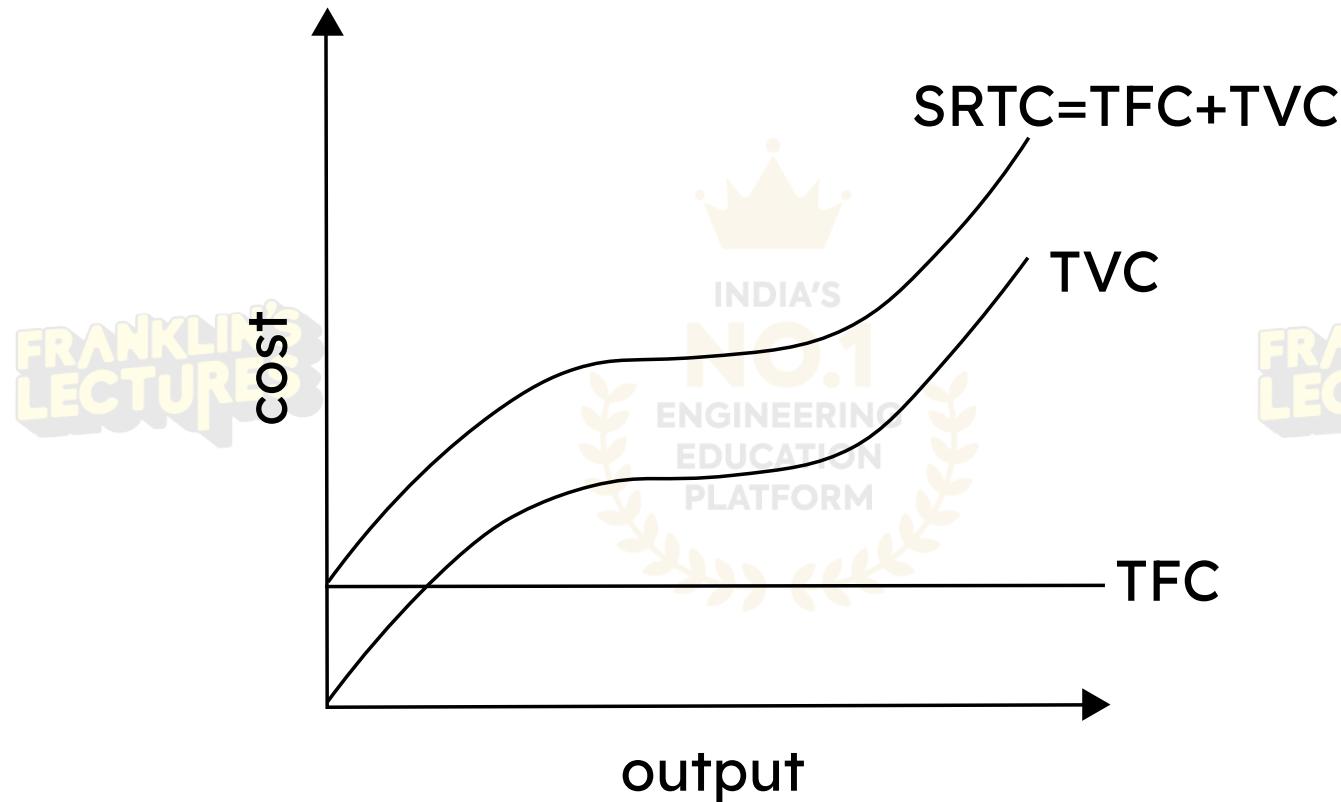
2. Total Fixed Cost (TFC)

- **Definition:** These are the costs that do not change with the level of output. Even if output is zero, the firm still has to pay them.
- **Example:**
 - Rent of factory
 - Salaries of permanent staff
 - Insurance

- Machinery depreciation
- TFC is constant at all output levels

3. Total Variable Cost (TVC)

- **Definition:** These are the costs that change with the level of output. When output increases, TVC increases; when output is zero, TVC is also zero.
- **Example:**
 - Raw materials
 - Wages of casual workers
 - Electricity for production
 - TVC varies directly with output.



1. Average Cost (AC)

Also called Average Total Cost (ATC)

It is the total cost per unit of output.

Formula : $AC = TC / Q$

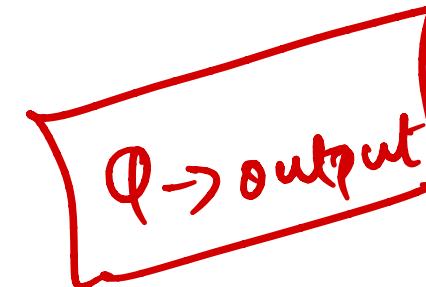
OR

$$AC = AFC + AVC$$

2. Average Fixed Cost (AFC)

It is the fixed cost per unit of output.

As output increases, AFC decreases (because fixed cost is spread over more units).



Formula : $AFC = TFC / Q$

3. Average Variable Cost (AVC)

It is the variable cost per unit of output. AVC changes with output – it usually first decreases due to increasing returns, then increases due to diminishing returns.

Formula : $AVC = TVC / Q$

MARGINAL COST (MC)



Marginal Cost is the additional cost incurred to produce one more unit of output.

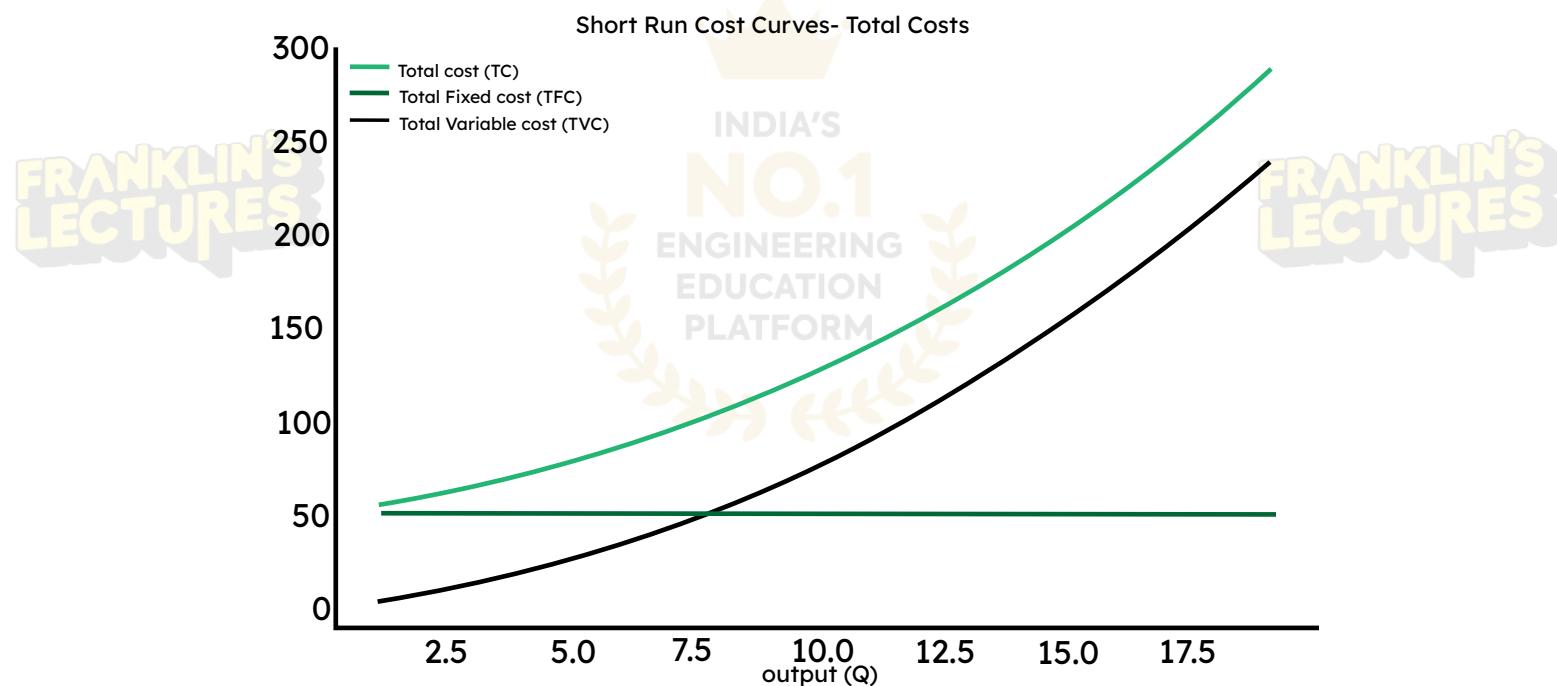
$$MC = \Delta TC / \Delta Q$$

Where:

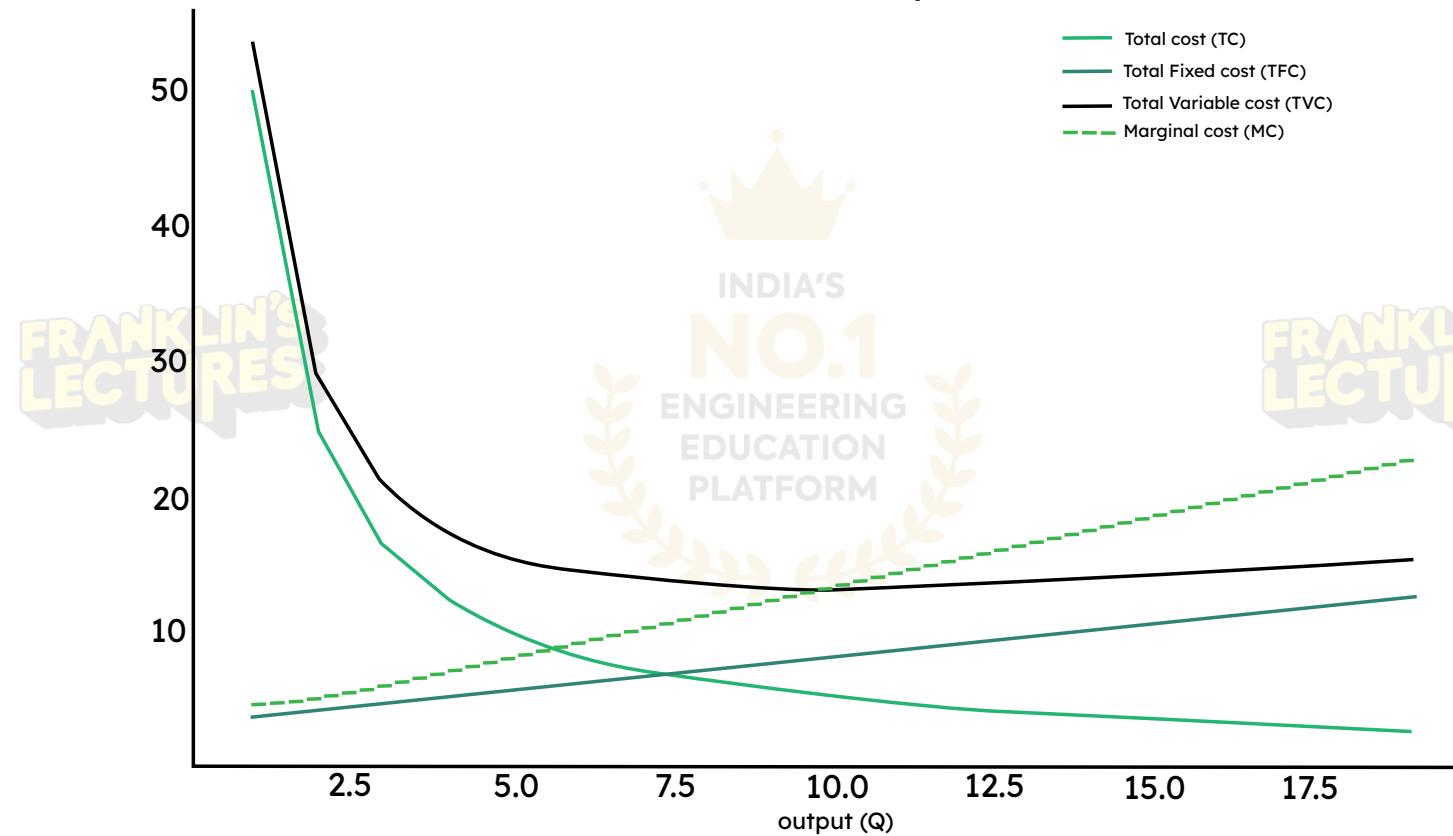
- ΔTC = Change in Total Cost
- ΔQ = Change in Output



In the short run, some factors are fixed (like capital), while others are variable (like labor). This creates specific cost behavior and curves.



Short Run Cost curves - per unit costs



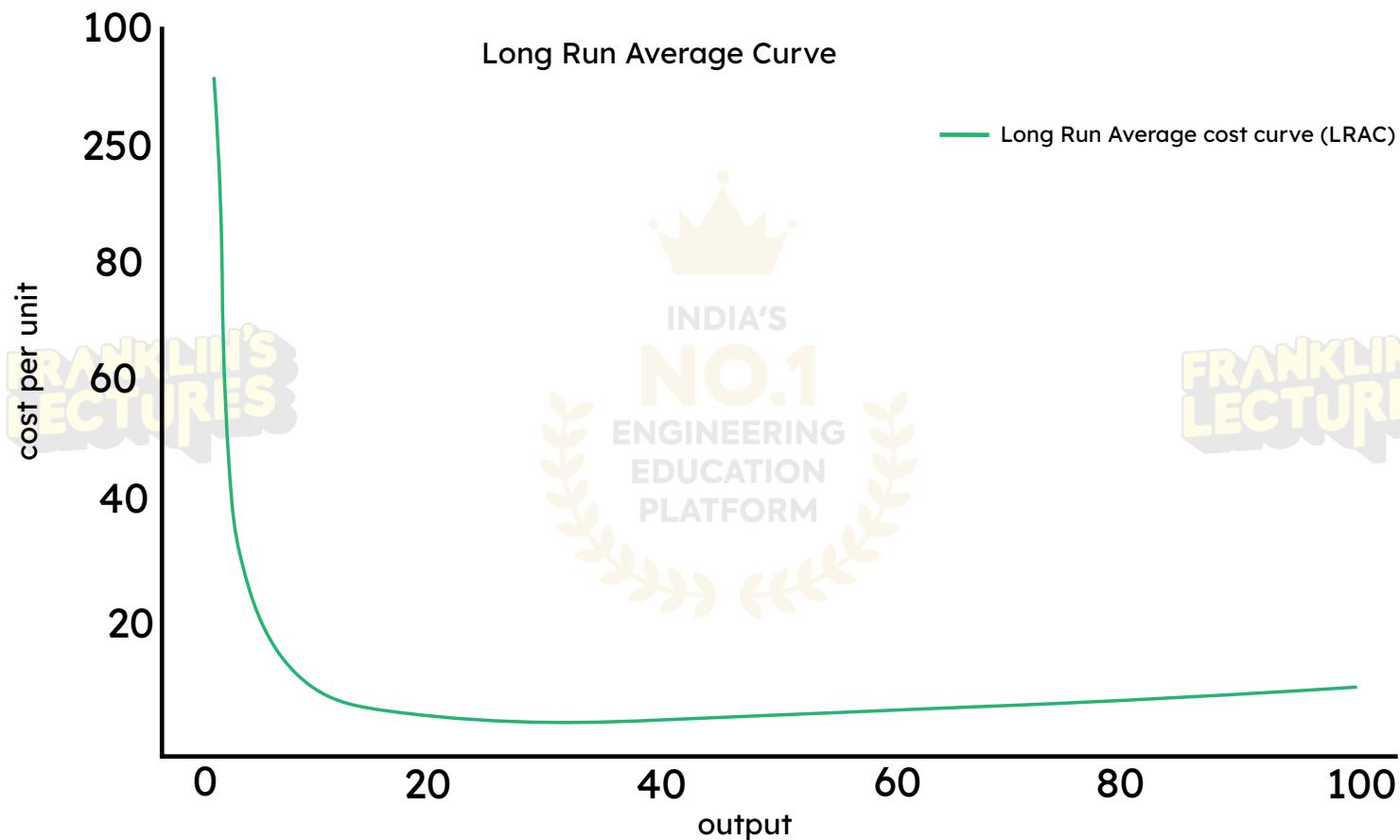
LONG RUN COSTS



Long Run Average Cost

Long Run Average Cost (LRAC) is the cost per unit of output when all inputs (factors of production) are variable in the long run. It shows the lowest possible average cost of producing each output level when a firm can choose any scale of production.

- Key Characteristics:
 - U-shaped curve (typically).
 - It is derived from the short-run average cost curves (SACs).
 - It is also known as the "Envelope Curve" because it touches the minimum points of all possible SAC curves.
 - In the long run, there are no fixed costs—everything is variable.



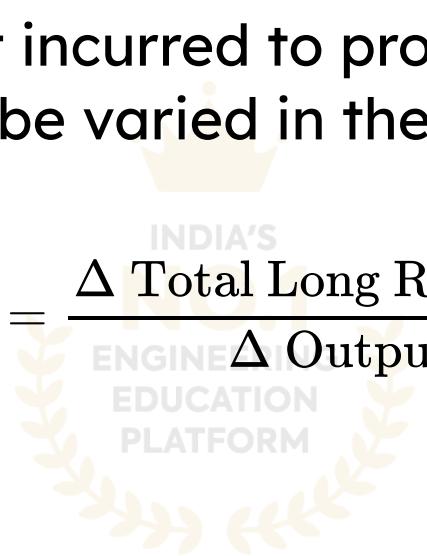
LONG RUN MARGINAL COST (LRMC)

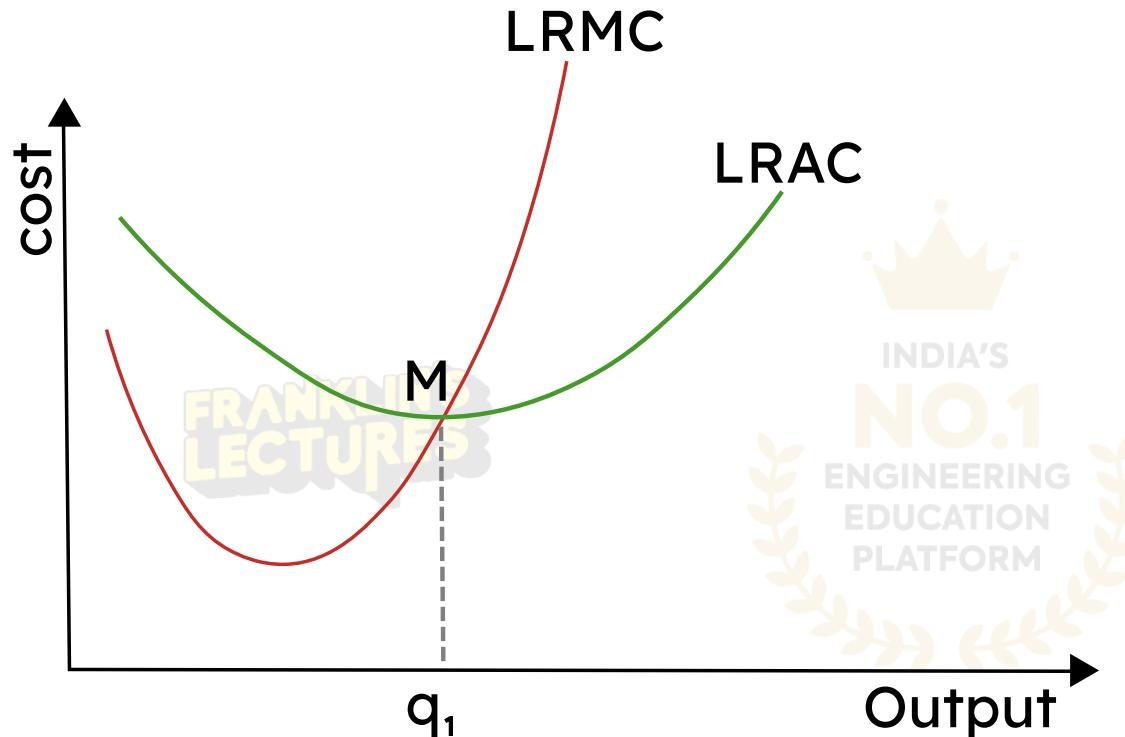


LRMC is the additional cost incurred to produce one more unit of output when all inputs can be varied in the long run.



$$LRMC = \frac{\Delta \text{ Total Long Run Cost}}{\Delta \text{ Output}}$$



**Point M (Intersection Point):**

- Point M is where $LRMC = LRAC$.
- This is the minimum point of the LRAC curve.
- At this point, the firm is producing at the most efficient scale (also called the optimum scale).

REVENUE



Revenue refers to the income a firm earns from selling its goods or services.

Total Revenue (TR) : Total earnings from selling a given quantity of goods or services.

$$TR = \text{Price (P)} \times \text{Quantity (Q)}$$

Average Revenue (AR) : Revenue per unit sold.

$$AR = TR / Q \text{ or simply Price (P)}$$

$$AR = \frac{TR}{Q} = \frac{P \times Q}{Q} = P$$

$$AR = P$$

Marginal Revenue (MR) : Additional revenue earned by selling one more unit.

$$MR = \Delta TR / \Delta Q$$

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



SHUTDOWN POINT

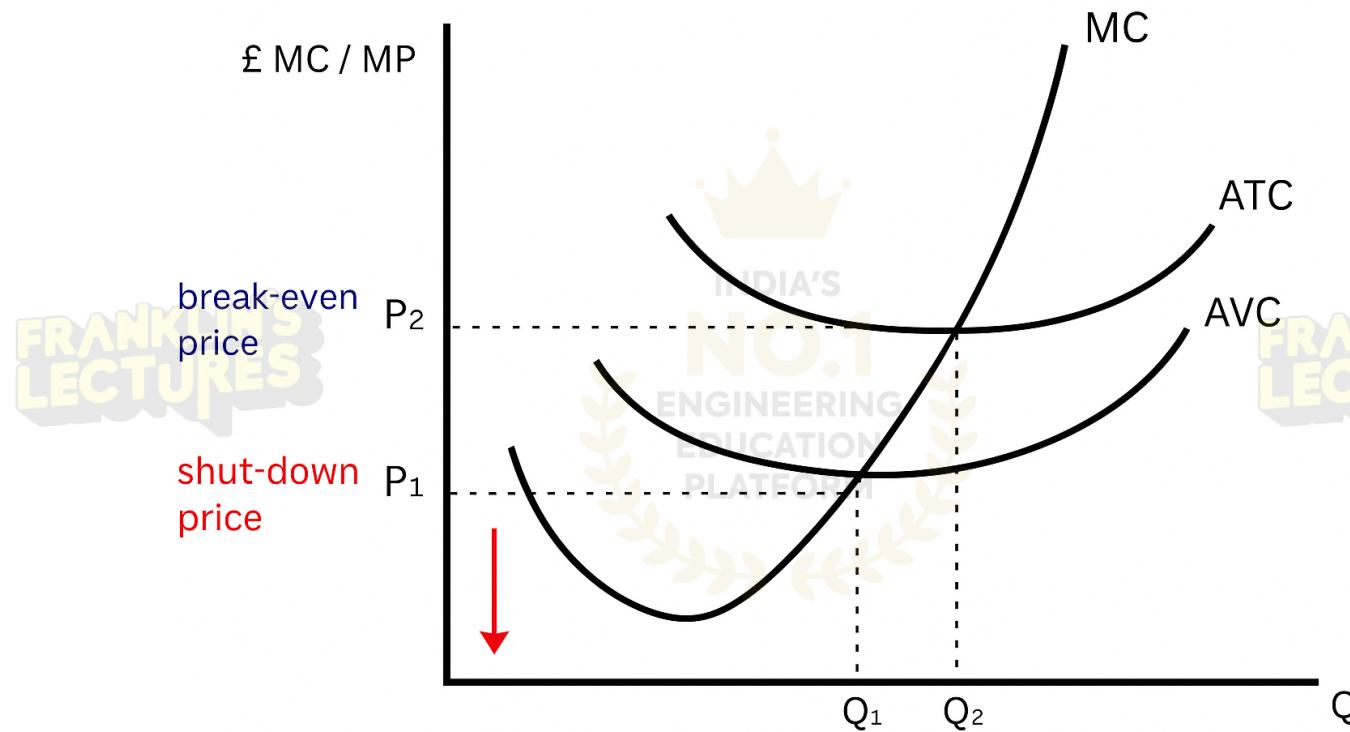


A shutdown point is a level of operations at which a company experiences no benefit for continuing operations and therefore decides to shut down temporarily—or in some cases permanently. At the shutdown point, there is no economic benefit to continuing production.

The shut down point is the minimum point of the Average Variable Cost (AVC) curve. A shutdown arises when price or average revenue (AR) falls below average variable cost (AVC) at the profit-maximizing output level.

Continued production will incur additional variable costs but will not generate enough revenue to cover them. At the same time, the firm will still have fixed costs to pay, further increasing the losses.

$$\text{Price (P)} = \text{Minimum AVC}$$



CHARACTERISTICS OF SHUT DOWN POINT



1. It is the output and price point where a firm is able to just cover its total variable cost.
2. The average variable cost (AVC) is at its minimum point.
3. It is where the marginal cost (MC) curve intercepts the average variable cost (AVC) curve.
4. The firm is indifferent between shutting down and continuing production where losses equal to the total fixed costs are incurred regardless of either decision.

**Q. Suppose $AC > \text{Price} > AVC$. Will a producer produce or shut down in the short run?
Give reason. (3)**

(Dec 2022)

$AC > \text{Price} \rightarrow$ firm is making/giving through loss

$\text{Price} > AVC \rightarrow$ Price is covering all VC & contributing something towards fixed cost

Firm will continue production in the short run because the price covers average variable cost.

Although the firm incurs loss, it can still cover variable cost and part of fixed cost -
Shutting down would increase the loss to the full fixed cost -

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BREAK-EVEN POINT (BEP)



The Break-Even Point is the level of sales at which total revenue = total cost, i.e., no profit, no loss.

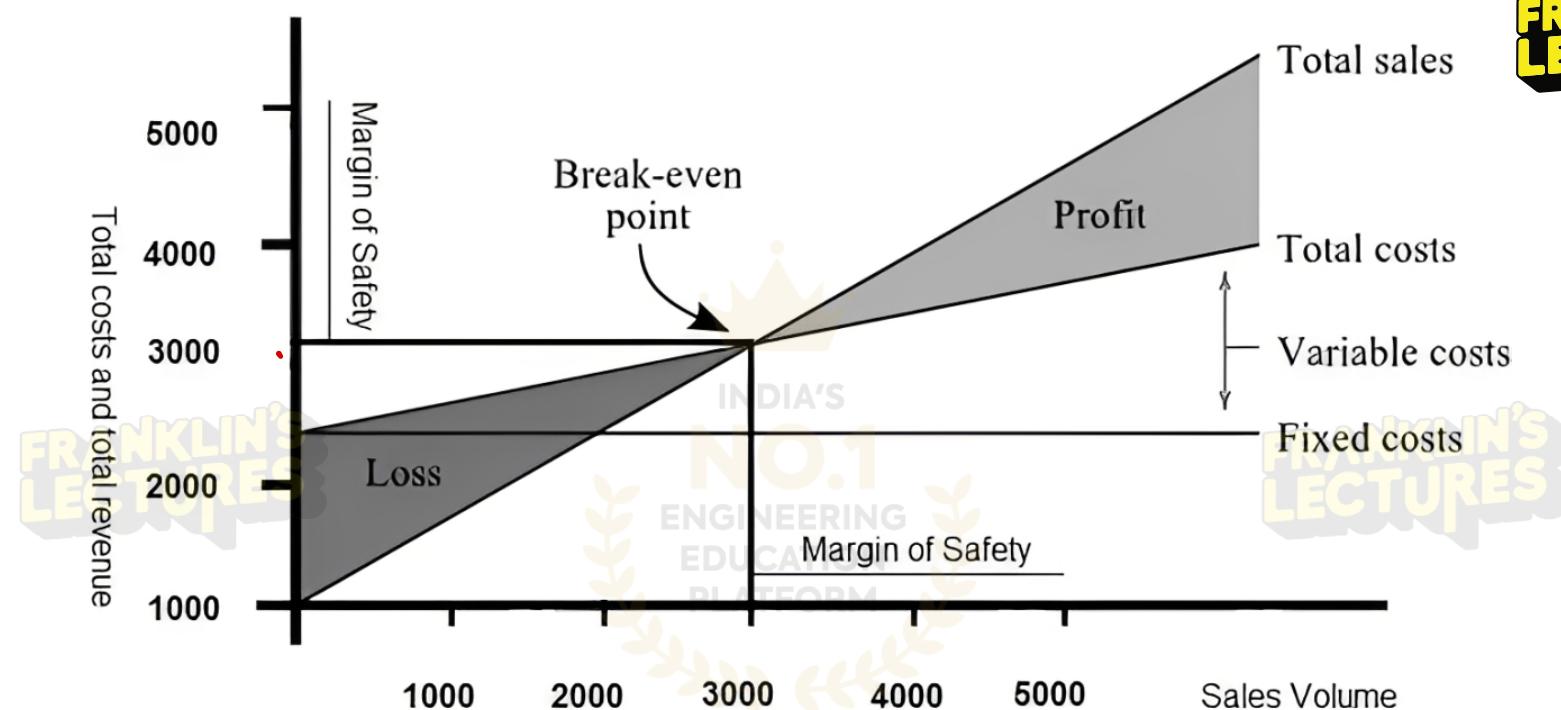
$$\text{Break-Even Point (Units)} = \frac{\text{Fixed Costs}}{\text{Selling Price per Unit} - \text{Variable Cost per Unit}}$$

$$\text{Break-Even Sales (₹)} = \frac{\text{Fixed Costs}}{\text{Contribution Margin Ratio}}$$

- 1) At BEP, it is zero profit
- 2) When no of units sold is lesser than BEP, it is loss
- 3) When no of units sold is greater than BEP, it is profit

$$SP - VC = CM$$

$$SP_u - VC_u = CM_{u_e}$$



Observations:

$TC > TR$, it is Loss

$TC < TR$, it is Profit

$TC = TR$, No Profit , No Loss (BEP)

P/V RATIO (PROFIT/VOLUME RATIO)



The Profit/Volume Ratio (P/V Ratio), also known as Contribution Margin Ratio, shows the relationship between contribution and sales.

It indicates how much contribution is earned per ₹1 of sales.

Contribution = Selling Price – Variable Cost

Contribution=Fixed Cost+Profit

$$P/V \text{ Ratio} = \frac{\text{Contribution}}{\text{Sales}}$$

$$P/V \text{ Ratio} = \frac{\text{Selling Price} - \text{Variable Cost}}{\text{Selling Price}}$$

$$P/V \text{ Ratio} = \frac{\text{Fixed Cost} + \text{Profit}}{\text{Sales}}$$

Break-Even Sales

At break-even, profit = 0. So, Contribution = Fixed Cost

$$\text{Break-Even Sales} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$$

Break Even Output = $\frac{\text{Fixed Cost}}{\text{CMU}} \rightarrow \text{Output / units}$

MARGIN OF SAFETY (MOS)



Margin of Safety is the difference between the actual sales and the break-even sales.

It shows how much sales can drop before the business starts making a loss.

$$\text{MOS (₹)} = \text{Actual Sales} - \text{Break-Even Sales}$$

- Example:

- Actual Sales = ₹1,00,000
- Break-Even Sales = ₹75,000
- $\text{MOS} = 1,00,000 - 75,000 = ₹25,000$

$$\text{MOS} \Rightarrow \frac{25000}{100000} \times 100 = \underline{\underline{25\%}}$$

Q. What is margin of safety? What happens when margin of safety is low? (Dec 2021)

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- When MOS is low
 - 1) Firm is at high risk of loss.
 - 2) Even a small fluctuation in demand can cause sales to drop below break-even.
 - 3) Low profitability & poor cost control
 - 4) Less stability for business

ADVANTAGES OF BREAK-EVEN POINT (BEP)



1. Helps in Determining Minimum Sales Requirement

- BEP tells how much you must sell to avoid losses.
- It helps in setting sales targets.

2. Useful for Profit Planning

- Shows the relationship between cost, volume, and profit.
- Helps estimate expected profits at different sales levels.

3. Supports Decision Making

- Helps in deciding:

- Pricing strategy
- Expansion plans
- Product mix
- Whether to accept special orders or not

4. Cost Control

- BEP analysis clearly separates fixed and variable costs.
- This helps identify which costs can be controlled or reduced.□

5. Simple and Easy to Understand

- Graphical or numerical BEP is easy to calculate and interpret.
- Even non-finance managers can understand business risk through BEP.

6. Helps in Assessing Business Risk

- A higher BEP means higher risk.
- Business can plan better by knowing how close or far it is from BEP

7. Used in Margin of Safety Calculation

- Helps in measuring how much cushion a business has before it starts making losses.

Q. The total sales of a manufacturing firm is Rs 20000 in this year. Its variable costs are Rs 8000 while its fixed costs are Rs 6000 for that year. Find the breakeven point of this firm.

(Dec 2021)

BreakEven point = $\frac{\text{Fixed Cost}}{\text{P/V Ratio}}$

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

Sales \Rightarrow ₹ 20000

VC \Rightarrow ₹ 8000

Fe \rightarrow ₹ 6000

Contribution \Rightarrow Sales - VC
 $= 20000 - 8000$
 $= ₹ 12000$

$$2 \frac{12000}{2000} \times \frac{5}{10}$$

$$2 \frac{60\%}{0.6} = \frac{0.6}{0.6} \rightarrow P/V$$

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$$BEP_2 \frac{6000}{0.6} \times \frac{1}{2} = \underline{\underline{21000}}$$

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Q. 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

- i) PV Ratio
- ii) Break even sales
- iii) Break-even output
- iv) Profit earned
- v) Margin of safety

(7)

(Dec 2022)

$$1 \text{ FC} = ₹20000$$

$$TVC = ₹40000$$

$$\text{Sales} = ₹80000$$

$$\text{Contribution} = \text{Sales} - VC = ₹80000 - ₹40000$$

$$= \frac{₹40000}{₹80000} \times 100$$

$$= 50\% = \underline{\underline{0.5}}$$

$$BES = \frac{FC}{P/V \text{ ratio}} = \frac{₹20000}{0.5} = ₹40000$$

$$BE \text{ Output} = \frac{\text{Fixed costs}}{CMU}$$

$$CMU = Sp_u - VC_u$$

$$Sp_u = ₹ 40$$

$$\text{Total costs} = \frac{8000}{40}$$

$$2 \xrightarrow{1000 \text{ units}}$$

$$VC_u = \frac{10000}{2000} = \underline{\underline{20 \text{ ₹}}}$$

$$CMU = Sp_u - VC_u$$

$$= 40 - 20 = \underline{\underline{₹ 20}}$$

$$B.E \text{ Output} = \frac{\text{Fixed Costs}}{C M P}$$

$$= \frac{20000}{20}$$

$$= \underline{\underline{1000 \text{ units}}}$$

Profit earned = Contribution - TFC

$$< \underline{\underline{40000}} - 20000$$

$$= \underline{\underline{20000}}$$

$$MOS = \frac{\text{Actual Sales} - \text{Break-even Sales}}{\text{Actual Sales}} \times 100$$

$$= \frac{40000}{80000} \times 100 = \underline{\underline{50\%}} \rightarrow \underline{\underline{0.5}}$$

**Q. The total cost function of firm is given as
 $TC = 500 + 5Q - 4Q^2 + Q^3$ Estimate TVC, TFC and
MC when output equals 10 units. (7)
(Dec 2022)**

1. $TFC = \underline{\text{₹}500}$

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$$\begin{aligned}TVC &= 5 \times 10 - 4 \times 10^2 + 10^3 \\&= 50 - 400 + 1000 \\&= \underline{\underline{\text{₹}650}}\end{aligned}$$

$$MC = \frac{d TC}{d q}$$

$$= 500 + 5q - 4q^2 + q^3$$

$$= 0 + 5 - 4 \times 2q + 3 \times q^2$$

$$= 5 - 4 \times 2 \times 10 + 3 \times 10^2$$

$$= 5 - 80 + 300$$

$$= \underline{\underline{225}}$$



THANK YOU