VIVEKANANDA COLLEGE
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NAAC ACCREDITED 'A' GRADE

Topic: Break-Even Analysis
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Break-Even Analysis

Break-even point is the level of output at which the total revenue (TR) is equal to the total cost (TC).

TR = TC (at break-even point).

A profit-maximising firm's initial objective is to cover up all its costs and reach the break-even point, and subsequently make profit thereafter.

Graphical representation of Break-even model.

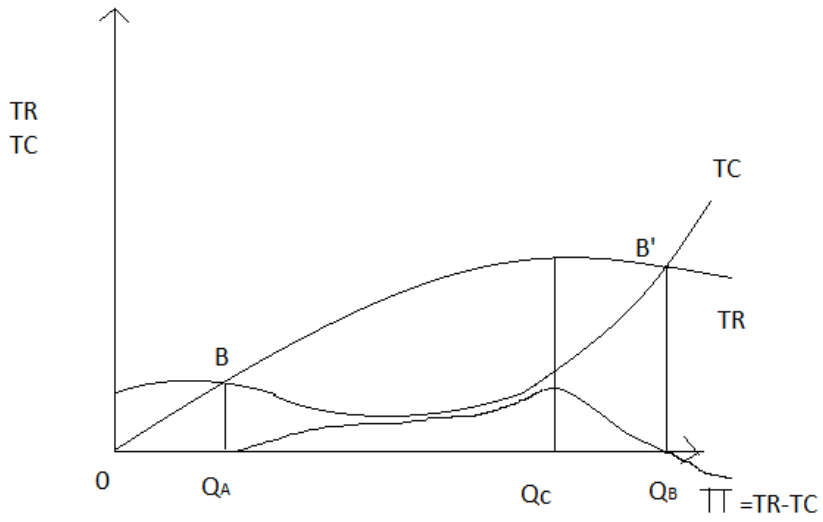

FIG.A. BREAK-EVEN ANALYSIS.

In the figure above, the horizontal axis measures the rate of output and the vertical axis measures the total revenue and total costs. The TR curve is inverted U- shaped and TC curve is S-shaped.

The inverted U shape of TR curve is because of the assumption that the firm faces a downward-sloping demand curve and must reduce its price to be able to sell more output. Whereas, the TC curve is S-shaped due to law of diminishing returns.

The vertical distance between the TR and TC curve measures the profit or loss associated with a given level of output. To the left of Q_A and to the right of Q_B, TC exceeds TR and represents loss.

In the figure there are two break-even points B and B' at which TR= TC. In between B and B', TR> TC and hence shows positive profits. At output level Qc, the profit level is maximum as the vertical distance between TR and TC is largest.

Assumptions of Break-even analysis:-

In order to simplify the process of computing the following assumptions are taken into consideration.

(i) The total fixed costs (TFC) remains constant at all the output levels.

(ii) The sales price per unit is constant throughout the output levels.

(iii) The TR and TC curve is considered to be linear (i.e. MR and MC is constant).

(iv)The inventory remains constant at the start and the end of the accounting period.

(v) The other factors such as efficiency, production and technology do not change.

(1)Graphical Method:-

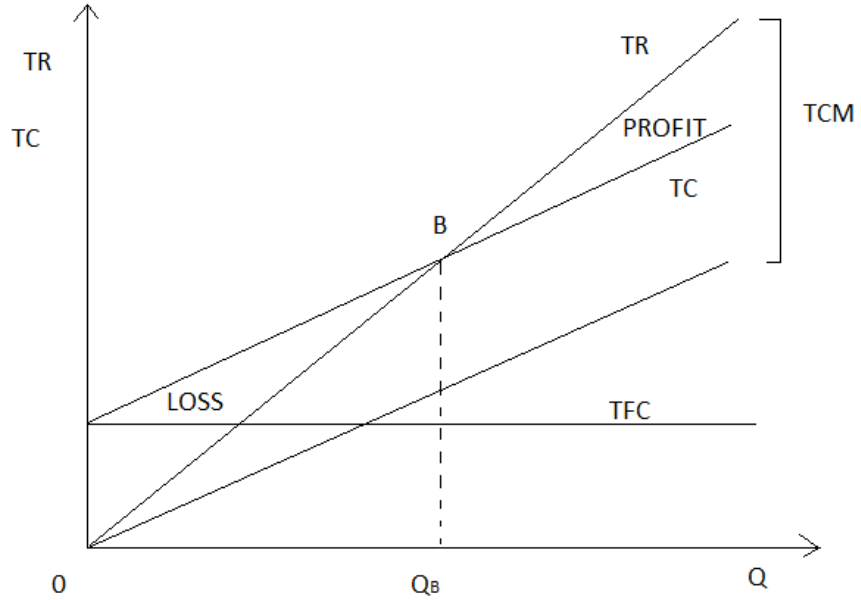

FIG. B. LINEAR BREAK-EVEN AND CONTRIBUTION MARGIN CHART.

The vertical distance between TC and TFC line equals the TVC. As the quantity of output increases, the vertical distance between TC and TFC also increases. This implies that TVC increases with an increase in TC.

At the production level below Q_B, the total cost exceeds the total revenue. It implies that a firm will suffer losses if it produces output less than Q_B. At Q_B output level, the total revenue is equal to the total cost. At this point the firm neither makes profit nor makes loss, implying that it is a break-even point. Thus, Q_B is a break-even level of output. If the firm produces more than Q_B level of output, it will be profitable for the firm as the total revenue will be greater than total cost.

(2) Algebraic Method:-

(I) Break-Even Quantity:-

In a linear Cost-Volume-Profit analysis model (where marginal cost and marginal revenues are constant), the break-even point (BEP) can be directly computed in terms of Total Revenue (TR) and Total Costs (TC).

TR = TC

⇨ $P * Q_B = TFC + TVC$; Q_B = Break-even quantity.

⇨ $P * Q_B = TFC + AVC * Q_B$

⇨ $(P – AVC) * Q_B = TFC$

⇨ $Q_B = TFC/(P – AVC)$

(II) Break-Even Sales (S_B):-

Multiplying the above equation by 'P' we get;

$P * Q = P * [TFC/ (P – AVC)]$

⇨ $S_B = TFC /[1 – (AVC/P)]$

(III) Break-Even point in terms of percentage utilisation of plant capacity (%B):-

$\%B = (Q_B/Q_{CAP}) * 100$; Q_{CAP} = maximum capacity of the plant output)

⇨ $\%B = [TFC/((P – AVC)* Q_{CAP})] * 100$

Total Contribution Margin:-

In the short-run, a firm's initial objective is to cover variable cost. If this cannot be covered, it would prefer to close down its operations. If the price of the product exceeds the variable cost, the firm would attempt to expand production with a view to cover its fixed cost and make profits, thereafter. Hence, output will expand if price (P) exceeds average variable cost (i.e. if P > AVC). The difference between the price and AVC is called the contribution margin per unit or average contribution margin (ACM). If the average contribution margin at a particular price point is excessively low or negative, it would be unwise to continue selling a product at that price.

Therefore, ACM = P – AVC

- ⇨ ACM * Q = (P – AVC) * Q (multiplying by Q on both sides of the equation).
- ⇨ TCM = PQ – TVC
- ⇨ TCM = TR – TVC

Therefore,

Total Contribution Margin = Total Revenue – Total Variable Cost.

Again, Total Net Profit (TNP) = Total Revenue (TR) – Total Cost (TC)

= TR – (TFC + TVC)

= TR – TFC –TVC

- ⇨ TNP + TFC = TR – TVC

Therefore, TCM = TR – TVC = TNP + TFC

& ACM =P – AVC = ANP + AFC

Profit- Volume ratio:-

Marginal Income ratio or Profit – Volume ratio is the percentage of the sales which is available as a contribution to fixed costs and profits after direct costs are deducted.

Therefore,

P-V ratio = (TCM/Sales)*100

⇨ P-V ratio = [(TNP+ TFC)/Sales]*100

Margin of Safety:-

In break-even analysis, margin of safety is the extent by which the actual or projected sales exceed the break-even sales. In other words, all sales revenue that a company collects over and above its break-even point represents the margin of safety.

MOS = π / TFC

⇨ MOS = $(Q_S - Q_B)/Q_S$

The larger the ratio of profits to total fixed costs, the better it is for the firm from the stand point of safety.

Uses of Break- Even Analysis:-

- Helps in determining the sales volume.
- Forecasts profits if estimates of revenue and cost are available.
- Helps in appraising the effects of change on volume of sales and cost of production.
- Assists in making choice of products and determining the product mix.
- Highlights the impact of increase or decrease in the fixed and variable costs.

Limitations of Break-Even Analysis:-

- It fails to be applied effectively in the multiple products situation.
- It fails to be implemented in the situation where cost and price cannot be ascertained and where historical data is not available.
- It assumes fixed cost to be constant.
- It assumes that quantity of goods produced is equal to the quantity of goods sold, which may not be always true.
- It ignores the changes in selling prices.
- It ignores the market conditions.