

Introduction to Mathematics

Break Even Analysis

Agenda

01

Economic Efficiency

02

Break Even Analysis

03

Contribution

04

Margin of Safety

Learning Outcomes

After completion you will be able

- Discuss the elements of economics and the interaction between its various components followed by an analysis of the need and scope.
- Discuss Elements of cost and break-even analysis.

Economic Efficiency

$$\text{Economic efficiency (\%)} = \frac{\text{Output}}{\text{Input}} \times 100 = \frac{\text{Worth}}{\text{Cost}} \times 100$$

For Survival and Growth: Economic Efficiency > 100%

Break-Even Analysis

The main objective of break-even analysis is to find the cut-off production volume from where a firm will make profit. Let,

s = selling price per unit

v = variable cost per unit

FC = fixed cost per period

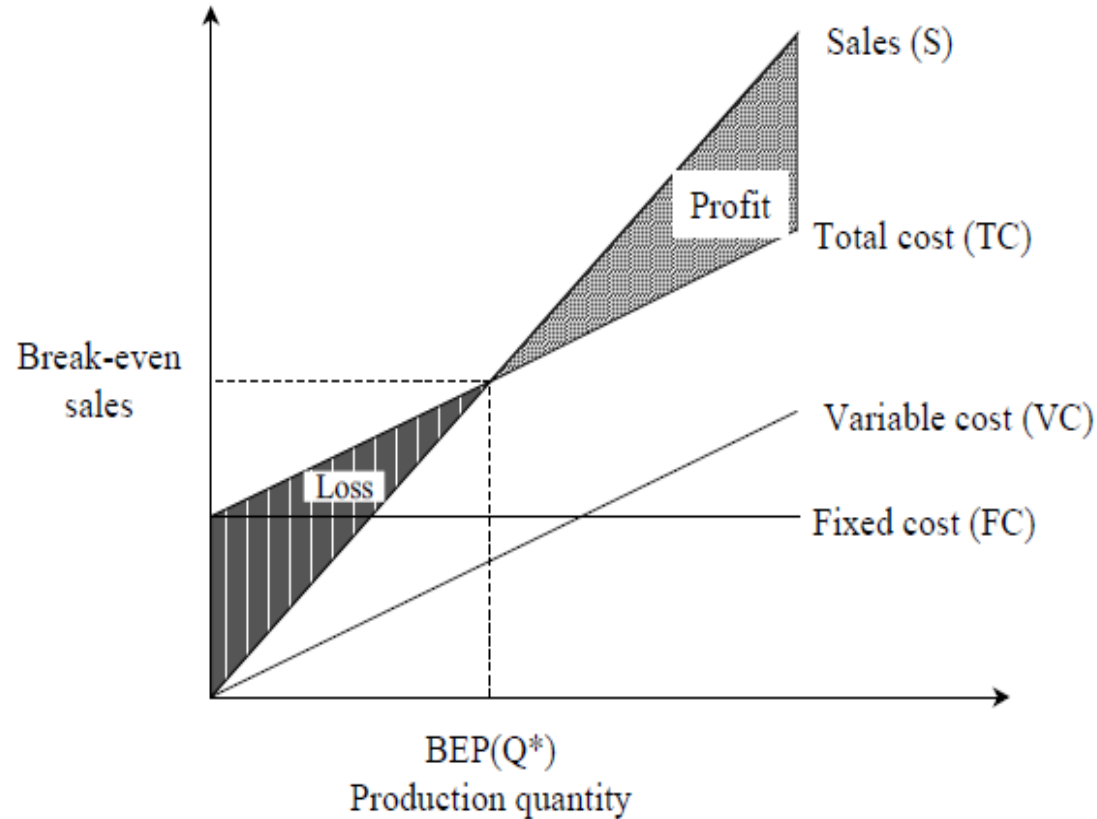
Q = volume of production

The total sales revenue (S) of the firm is given by the following formula: $S = s \times Q$

The total cost of the firm for a given production volume is given as: $TC = \text{Total variable cost} + \text{Fixed cost}$,

$$TC = v \times Q + FC$$

Break-Even Analysis



Break-Even Analysis

$$\begin{aligned}\text{Profit} &= \text{Sales} - (\text{Fixed cost} + \text{Variable costs}) \\ &= s \times Q - (FC + v \times Q)\end{aligned}$$

The formulae to find the break-even quantity and break-even sales quantity

$$\begin{aligned}\text{Break-even quantity} &= \frac{\text{Fixed cost}}{\text{Selling price/unit} - \text{Variable cost/unit}} \\ &= \frac{FC}{s - v} \text{ (in units)}\end{aligned}$$

$$\begin{aligned}\text{Break-even sales} &= \frac{\text{Fixed cost}}{\text{Selling price/unit} - \text{Variable cost/unit}} \times \text{Selling price/unit} \\ &= \frac{FC}{s - v} \times s \text{ (Rs.)}\end{aligned}$$

Contribution and Margin of Safety

$$\text{Contribution} = \text{Sales} - \text{Variable costs}$$

$$\text{Contribution/unit} = \text{Selling price/unit} - \text{Variable cost/unit}$$

$$\text{M.S.} = \text{Actual sales} - \text{Break-even sales}$$

$$= \frac{\text{Profit}}{\text{Contribution}} \times \text{sales}$$

$$\text{M.S. as a per cent of sales} = (\text{M.S./Sales}) \times 100$$

Practice Problem

The Textile Services Company has following details.

Fixed cost = Rs. 20,00,000

Variable cost per unit = Rs. 100

Selling price per unit = Rs. 200

Find

- (a) The break-even sales quantity,
- (b) The break-even sales
- (c) If the actual production quantity is 60,000, find (i) contribution; and
(ii) margin of safety by all methods.

Solution

Solution:

$$\begin{aligned} \text{(a) Break-even quantity} &= \frac{FC}{s - v} = \frac{20,00,000}{200 - 100} \\ &= 20,00,000/100 = 20,000 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{(b) Break-even sales} &= \frac{FC}{s - v} \times s \text{ (Rs.)} \\ &= \frac{20,00,000}{200 - 100} \times 200 \\ &= \frac{20,00,000}{100} \times 200 = \text{Rs. } 40,00,000 \end{aligned}$$

$$\begin{aligned} \text{(c) (i) Contribution} &= \text{Sales} - \text{Variable cost} \\ &= s \times Q - v \times Q \\ &= 200 \times 60,000 - 100 \times 60,000 \\ &= 1,20,00,000 - 60,00,000 \\ &= \text{Rs. } 60,00,000 \end{aligned}$$

Solution

(ii) Margin of safety

Solution:

METHOD I

$$\begin{aligned}\text{M.S.} &= \text{Sales} - \text{Break-even sales} \\ &= 60,000 \times 200 - 40,00,000 \\ &= 1,20,00,000 - 40,00,000 = \text{Rs. } 80,00,000\end{aligned}$$

METHOD II

$$\text{M.S.} = \frac{\text{Profit}}{\text{Contribution}} \times \text{Sales}$$

$$\begin{aligned}\text{Profit} &= \text{Sales} - (FC + v \times Q) \\ &= 60,000 \times 200 - (20,00,000 + 100 \times 60,000) \\ &= 1,20,00,000 - 80,00,000 \\ &= \text{Rs. } 40,00,000\end{aligned}$$

$$\text{M.S.} = \frac{40,00,000}{60,00,000} \times 1,20,00,000 = \text{Rs. } 80,00,000$$

$$\text{M.S. as a per cent of sales} = \frac{80,00,000}{1,20,00,000} \times 100 = 67\%$$

Profit / Volume Ratio

P/V ratio is a valid ratio which is useful for further analysis. The different formulae for the *P/V* ratio are as follows:

$$P/V \text{ ratio} = \frac{\text{Contribution}}{\text{Sales}} = \frac{\text{Sales} - \text{Variable costs}}{\text{Sales}}$$

The relationship between BEP and *P/V* ratio is as follows:

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

The following formula helps us find the M.S. using the *P/V* ratio:

$$\text{M.S.} = \frac{\text{Profit}}{P/V \text{ ratio}}$$

Practice Problem

Consider the data of Galaxy Associates,

Sales = Rs. 1,20,000

Fixed cost = Rs. 25,000

Variable cost = Rs. 45,000

Find the following:

- (a) Contribution
- (b) Profit
- (c) BEP
- (d) M.S.

Solution

$$\begin{aligned} \text{(a) Contribution} &= \text{Sales} - \text{Variable costs} \\ &= \text{Rs. } 1,20,000 - \text{Rs. } 45,000 \\ &= \text{Rs. } 75,000 \end{aligned}$$

$$\begin{aligned} \text{(b) Profit} &= \text{Contribution} - \text{Fixed cost} \\ &= \text{Rs. } 75,000 - \text{Rs. } 25,000 \\ &= \text{Rs. } 50,000 \end{aligned}$$

(c) BEP

$$\text{BEP} = \frac{\text{Fixed cost}}{P/V \text{ ratio}} = \frac{25,000}{62.50} \times 100 = \text{Rs. } 40,000$$

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

$$\text{M.S.} = \frac{\text{Profit}}{P/V \text{ ratio}} = \frac{50,000}{62.50} \times 100 = \text{Rs. } 80,000$$

$$= \frac{75,000}{1,20,000} \times 100 = 62.50\%$$

YouTube Link

<https://www.youtube.com/watch?v=r8Blz5l-aDc>

<https://www.youtube.com/watch?v=ar7mVYY-AO0>

Thank you

Question Answers Session

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