Objectives

In this lecture you will learn the following

Cost Volume Profit (CVP)

- Introduction.
- Fixed costs.
- Variable costs.
- Semi variable costs.
- Contribution margin.
- Break even point.
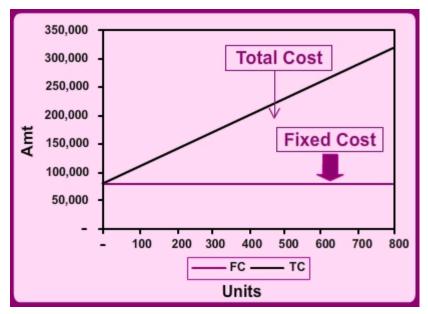- PV Ratio.

CVP Analysis

CVP analysis is the analysis of three variable viz. cost, volume and profit. Such analysis explores the relationship existing amongst costs, revenue, activity level and resulting profit. It aims at measuring variation of cost with profit.

Fixed Cost

These are the costs which incurred for a period and which within certain output and turnover limits, tend to be unaffected by fluctuations in the levels of activity (Output or turnover).

For example: Rent, insurance of factory building etc. remain the same for different levels of production.
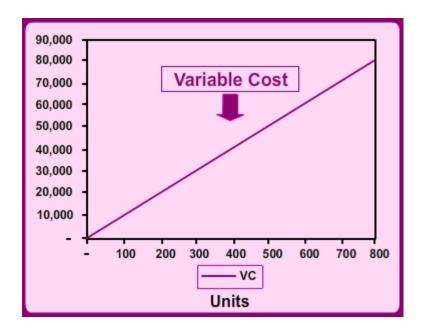
Fixed Cost Graph

Variable Cost

These costs tend to very with the volume of activity. Any increase in activity results in an increase in the variable cost and vice versa.

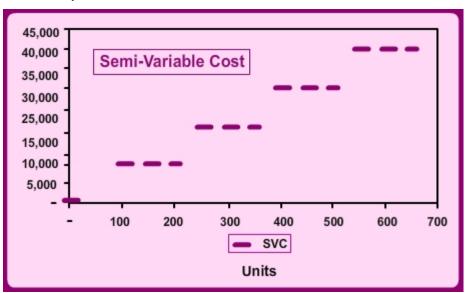For example: Cost of direct labour, direct material, etc.

Variable Cost Graph

Semi-Variable Cost

These costs contain both fixed and variable components and thus partly affected by fluctuation in the level of activity.

Examples of semi variable costs are telephone bill, gas and electricity etc.

Semi-Variable Cost Graph

Cost-Volume-Profit Analysis

CVP analysis:

- Takes into account
  - the total costs (fixed and variable)
  - the total sales revenues
  - desired profits vis-a-vis the sales volume

It is used for forecasting or predicting how the changes in costs and sales volume affect profit. It is also known as 'Break-Even Analysis'.

CVP analysis could be helpful in the following situations:

Budget planning: for forecasting profit by considering cost and profit relation, and volume of production volume. This will help in determining the sales volume required to make a profit.

- To make decisions regarding pricing and sales volume.

Determining the sales mix of different products, in what proportions each of the products can be sold.
- Preparing flexible budget considering costs at different levels of production.

Objectives of CVP Analysis

- Understand the interaction among

  - Prices of products.
  - Volume or level of activity.
  - Per unit variable cost.
  - Total fixed cost.
  - Mix of product sold.

Assumptions of CVP Analysis

- Expenses can be classified as either variable or fixed.
- CVP relationships are linear over a wide range of production and sales.
- Sales prices, unit variable cost, and total fixed expenses will not vary within the relevant range.
- Volume is the only cost driver.
- The relevant range of volume is specified.
- Inventory levels will be unchanged.
- The sales mix remains unchanged during the period.

Calculations

Profit Equation and Contribution Margin

1. Profit = Sales -Total costs
2. Profit = Sales -Total variable costs - Total Fixed costs
3. Contribution margin = Total revenue – Total variable costs

Sales	**XX**
-Variable Cost	**(XX)**
Contribution	**XX**
-Fixed Cost	**(XX)**
Profit	**XX**

- Profit = (S-V)*Q – FC
- $Q = \dfrac{(FC + \text{Expected Profit})}{(S - VC)}$
- Q is the no. of units required to be sold to obtain target profit.
- S = Selling Price p.u.
  VC = Variable cost p.u.
  FC = Fixed Cost.

Example:

Suppose that Super Bikes wants to produce a new mountain bike called Hero1 and has forecast the following information.

- Price per bike = ₹800
- Variable cost per bike = ₹300
- Fixed costs related to bike production = ₹55,00,000
- Target profit = ₹2,00,000
- Estimated sales = 12,000 bikes

We determine the quantity of bikes needed for the target profit as follows:

- Quantity = (₹55,00,000 + ₹2,00,000) / (₹800 - ₹300) = 11,400 bikes

Profit Volume Ratio (PV)

The contribution margin ratio (CMR) i.e. PV ratio is the percentage by which the selling price (or revenue) per unit exceeds the variable cost per unit, or contribution margin as a percentage of revenue.

Example

For Hero1, we could use the forecast information about volume (12,000 bikes) to determine the contribution margin ratio.

- Total revenue = ₹800 * 12,000
  = ₹96,00,000
- Total variable cost = ₹300* 12,000
  = ₹36,00,000
- Total contribution margin = ₹9,600,000 - ₹3,600,000
  = ₹6,000,000
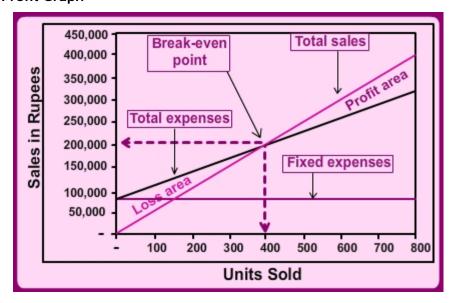- Contribution margin ratio = ₹6,000,000 / ₹9,600,000
  = 0.625

BEP analysis

- Breakeven analysis is used to find the minimum level of production required.
- Evaluates both fixed and variable costs.
- Uses:
  1. To find a suitable product mix.
  2. To find the sales required to reach a desired revenue.
  3. The profits at certain price level and sales.

Break even Point (BEP)

- A CVP analysis can be used to determine the BEP, or level of operating activity at which revenues cover all fixed and variable costs, resulting in zero profit.
- In other words this is the point where no profit or losses have been made.

Cost-Volume-Profit Graph

Break even Applications

- New Product decisions : -
  Enables   to determine the sale volume required for   a firm (or an individual product) to breakeven, given expected sales price and expected costs.
- Pricing decisions: -

Enables to study the effect of changing price and volume relationship on total profits.
- Modernizations or automation decisions: -
  Analysis the profit in implication of a modernization or automation programme.
- Expansion Decisions : -
  studies the aggregate effect of a general expansion in production and sales.

Formulae

- BEP in units = $\dfrac{\text{Total fixed costs}}{\text{(Sales price – variable cost p.u.)}}$

  $= \dfrac{\text{Fixed cost}}{\text{Contribution per unit}}$
- BEP in sales value = $\dfrac{\text{Fixed cost}}{\text{PV Ratio}}$

Example

- Sales 5000 units.
- Sales price per unit Rs. 50.
- Variable cost per unit Rs. 30.
- Fixed cost Rs. 35000.
- Therefore, contribution per unit = 50 - 30 = Rs. 20
  BEP in units = 35000/20
  $\qquad\qquad$ = 1750 units
  $\qquad$ 1750 * 50 = Rs. 87500
- BEP in sales value = 35000 * 250000 / 87500
  $\qquad\qquad\qquad$ = Rs. 100000

Margin of safety

- Represents the strength of the business.
- Margin of Safety = Actual Sale – BEP Sale
- Margin of safety % = (Sales - BEP) / Sales x 100
- Margin of safety = $\dfrac{(5000 - 1750)}{5000}$
  $\qquad\qquad$ = 65 %
- Hence even if the sales decrease by 65%, the business wont face any loss.