

Lesson-15

Breakeven Analysis

Learning Objectives

- To describe as to how the concepts of fixed and variable costs are used in C-V-P analysis
- To segregate semi-variable expenses in C-V-P analysis
- To identify the limiting assumptions of C-V-P analysis
- To work out the breakeven analysis, contribution analysis and margin of safety
- To understand how to draw a breakeven chart
- To compute breakeven point

Introduction

In this lesson, we will discuss in detail the highlights associated with cost function and cost relations with the production and distribution system of an economic entity.

C-V-P analysis is broadly known as cost-volume-profit analysis. Specifically speaking, we all are concerned with in-depth analysis and application of CVP in practical world of industry management.

Cost-Volume-Profit (C-V-P) Relationship

We have observed that in marginal costing, marginal cost varies directly with the volume of production or output. On the other hand, fixed cost remains unaltered regardless of the volume of output within the scale of production already fixed by management. In case if cost behavior is related to sales income, it shows cost-volume-profit relationship. In net effect, if volume is changed, variable cost varies as per the change in volume. In this case, selling price remains fixed, fixed remains fixed and then there is a change in profit.

Being a manager, you constantly strive to relate these elements in order to achieve the maximum profit. Apart from profit projection, the concept of Cost-Volume-Profit (CVP) is relevant to virtually all decision-making areas, particularly in the short run.

The relationship among cost, revenue and profit at different levels may be expressed in graphs such as breakeven charts, profit volume graphs, or in various statement forms.

Profit depends on a large number of factors, most important of which are the cost of manufacturing and the volume of sales. Both these factors are interdependent. Volume of sales depends upon the volume of production and market forces which in turn is related to costs. Management has no control over market. In order to achieve certain level of profitability, it has to exercise control and management of costs, mainly variable cost. This is because fixed cost is a non-controllable cost. But then, cost is based on the following factors:

- Volume of production
- Product mix
- Internal efficiency and the productivity of the factors of production
- Methods of production and technology
- Size of batches
- Size of plant

Thus, one can say that cost-volume-profit analysis furnishes the complete picture of the profit structure. This enables management to distinguish among the effect of sales, fluctuations in volume and the results of changes in price of product/services.

In other words, CVP is a management accounting tool that expresses relationship among sale volume, cost and profit. CVP can be used in the form of a graph or an equation. Cost-volume-profit analysis can answer a number of analytical questions. Some of the questions are as follows:

1. What is the breakeven revenue of an organization?
2. How much revenue does an organization need to achieve a budgeted profit?
3. What level of price change affects the achievement of budgeted profit?
4. What is the effect of cost changes on the profitability of an operation?

Cost-volume-profit analysis can also answer many other “what if” type of questions.

Cost-volume-profit analysis is one of the important techniques of cost and management accounting. Although it is a simple yet a powerful tool for planning of profits and therefore, of commercial operations. It provides an answer to “what if” theme by telling the volume required to produce.

Following are the three approaches to a CVP analysis:

- Cost and revenue equations
- Contribution margin
- Profit graph

Objectives of Cost-Volume-Profit Analysis

1. In order to forecast profits accurately, it is essential to ascertain the relationship between cost and profit on one hand and volume on the other.
2. Cost-volume-profit analysis is helpful in setting up flexible budget which indicates cost at various levels of activities.
3. Cost-volume-profit analysis assist in evaluating performance for the purpose of control.
4. Such analysis may assist management in formulating pricing policies by projecting the effect of different price structures on cost and profit.

Assumptions and Terminology

Following are the assumptions on which the theory of CVP is based:

1. The changes in the level of various revenue and costs arise only because of the changes in the number of product (or service) units produced and sold, e.g., the number of television sets produced and sold by Sigma Corporation. The number of output (units) to be sold is the only revenue and cost driver. Just as a cost driver is any factor that affects costs, a revenue driver is any factor that affects revenue.
2. Total costs can be divided into a fixed component and a component that is variable with respect to the level of output. Variable costs include the following:
 - Direct materials
 - Direct labor
 - Direct chargeable expenses

Variable overheads include the following:

- Variable part of factory overheads
 - Administration overheads
 - Selling and distribution overheads
3. There is linear relationship between revenue and cost.
 4. When put in a graph, the behavior of total revenue and cost is linear (straight line), i.e. $Y = mx + C$ holds good which is the equation of a straight line.
 5. The unit selling price, unit variable costs and fixed costs are constant.
 6. The theory of CVP is based upon the production of a single product. However, of late, management accountants are functioning to give a theoretical and a practical approach to multi-product CVP analysis.
 7. The analysis either covers a single product or assumes that the sales mix sold in case of multiple products will remain constant as the level of total units sold changes.
 8. All revenue and cost can be added and compared without taking into account the time value of money.
 9. The theory of CVP is based on the technology that remains constant.
 10. The theory of price elasticity is not taken into consideration.

Many companies, and divisions and sub-divisions of companies in industries such as airlines, automobiles, chemicals, plastics and semiconductors have found the simple CVP relationships to be helpful in the following areas:

- Strategic and long-range planning decisions
- Decisions about product features and pricing

In real world, simple assumptions described above may not hold good. The theory of CVP can be tailored for individual industries depending upon the nature and peculiarities of the same.

For example, predicting total revenue and total cost may require multiple revenue drivers and multiple cost drivers. Some of the multiple revenue drivers are as follows:

- Number of output units
- Number of customer visits made for sales
- Number of advertisements placed

Some of the multiple cost drivers are as follows:

- Number of units produced
- Number of batches in which units are produced

Managers and management accountants, however, should always assess whether the simplified CVP relationships generate sufficiently accurate information for predictions of how total revenue and total cost would behave. However, one may come across different complex situations to which the theory of CVP would rightly be applicable in order to help managers to take appropriate decisions under different situations.

Limitations of Cost-Volume Profit Analysis

The CVP analysis is generally made under certain limitations and with certain assumed conditions, some of which may not occur in practice. Following are the main limitations and assumptions in the cost-volume-profit analysis:

1. It is assumed that the production facilities anticipated for the purpose of cost-volume-profit analysis do not undergo any change. Such analysis gives misleading results if expansion or reduction of capacity takes place.
2. In case where a variety of products with varying margins of profit are manufactured, it is difficult to forecast with reasonable accuracy the volume of sales mix which would optimize the profit.
3. The analysis will be correct only if input price and selling price remain fairly constant which in reality is difficult to find. Thus, if a cost reduction program is undertaken or selling price is changed, the relationship between cost and profit will not be accurately depicted.
4. In cost-volume-profit analysis, it is assumed that variable costs are perfectly and completely variable at all levels of activity and fixed cost remains constant throughout the range of volume being considered. However, such situations may not arise in practical situations.
5. It is assumed that the changes in opening and closing inventories are not significant, though sometimes they may be significant.
6. Inventories are valued at variable cost and fixed cost is treated as period cost. Therefore, closing stock carried over to the next financial year does not contain any component of fixed cost. Inventory should be valued at full cost in reality.

Sensitivity Analysis or What If Analysis and Uncertainty

Sensitivity analysis is relatively a new term in management accounting. It is a “what if” technique that managers use to examine how a result will change if the original predicted data are not achieved or if an underlying assumption changes.

In the context of CVP analysis, sensitivity analysis answers the following questions:

- a. What will be the operating income if units sold decrease by 15% from original prediction?
- b. What will be the operating income if variable cost per unit increases by 20%?

The sensitivity of operating income to various possible outcomes broadens the perspective of management regarding what might actually occur before making cost commitments.

A spreadsheet can be used to conduct CVP-based sensitivity analysis in a systematic and efficient way. With the help of a spreadsheet, this analysis can be easily conducted to examine the effect and interaction of changes in selling prices, variable cost per unit, fixed costs and target operating incomes.

Example

Following is the spreadsheet of Dolphy Software Ltd., Chennai:

Statement showing CVP Analysis for Dolphy Software Ltd.

Fixed cost	Variable cost per unit	Revenue required at Rs. 200 Selling Price per unit to earn Operating Income of			
		0	1,000	1,500	2,000
2,000	100	4,000	6,000	7,000	8,000
	120	5,000	7,500	8,750	10,000
	140	6,667	10,000	11,667	13,333
2,500	100	5,000	7,000	8,000	9,000
	120	6,250	8,750	10,000	11,250
	140	8,333	11,667	13,333	15,000
3,000	100	6,000	8,000	9,000	10,000
	120	7,500	10,000	11,250	12,500
	140	10,000	13,333	15,000	16,667

From the above example, one can immediately see the revenue that needs to be generated to reach a particular operating income level, given alternative levels of fixed costs and variable costs per unit. For example, revenue of Rs. 6,000 (30 units @ Rs. 200 each) is required to earn an operating income of Rs. 1,000 if fixed cost is Rs. 2,000 and variable cost per unit is Rs. 100. You can also use exhibit 3-4 to assess what revenue the company needs to breakeven (earn operating income of Re. 0) if, for example, one of the following changes takes place:

- The booth rental at the Chennai convention raises to Rs. 3,000 (thus increasing fixed cost to Rs. 3,000)
- The software suppliers raise their price to Rs. 140 per unit (thus increasing variable costs to Rs. 140)

An aspect of sensitivity analysis is the margin of safety which is the amount of budgeted revenue over and above breakeven revenue. The margin of safety is sales quantity minus breakeven quantity. It is expressed in units. The margin of safety answers the “what if” questions, e.g., if budgeted revenue are above breakeven and start dropping, how far can they fall below budget before the breakeven point is reached? Such a fall could be due to competitor’s better product, poorly executed marketing programs and so on.

Assume you have fixed cost of Rs. 2,000, selling price of Rs. 200 and variable cost per unit of Rs. 120. For 40 units sold, the budgeted point from this set of assumptions is 25 units (Rs. 2,000 ÷ Rs. 80) or Rs. 5,000 (Rs. 200 x 25). Hence, the margin of safety is Rs. 3,000 (Rs. 8,000 – 5,000) or 15 (40 – 25) units.

Sensitivity analysis is an approach to recognizing uncertainty, i.e. the possibility that an actual amount will deviate from an expected amount.

Marginal Cost Equations and Breakeven Analysis

From the marginal cost statements, one might have observed the following:

$$\text{Sales} - \text{Marginal cost} = \text{Contribution} \quad \dots\dots(1)$$

$$\text{Fixed cost} + \text{Profit} = \text{Contribution} \quad \dots\dots(2)$$

By combining these two equations, we get the fundamental marginal cost equation as follows:

$$\text{Sales} - \text{Marginal cost} = \text{Fixed cost} + \text{Profit} \quad \dots\dots(3)$$

This fundamental marginal cost equation plays a vital role in profit projection and has a wider application in managerial decision-making problems.

The sales and marginal costs vary directly with the number of units sold or produced. So, the difference between sales and marginal cost, i.e. contribution, will bear a relation to sales and the ratio of contribution to sales remains constant at all levels. This is profit volume or P/V ratio. Thus,

$$\text{P/V Ratio (or C/S Ratio)} = \frac{\text{Contribution (c)}}{\text{Sales (s)}} \quad \dots\dots(4)$$

It is expressed in terms of percentage, i.e. P/V ratio is equal to (C/S) x 100.

$$\text{Or, Contribution} = \text{Sales} \times \text{P/V ratio} \quad \dots\dots(5)$$

$$\text{Or, Sales} = \frac{\text{Contribution}}{\text{P/V ratio}} \quad \dots\dots(6)$$

The above-mentioned marginal cost equations can be applied to the following heads:

1. Contribution

Contribution is the difference between sales and marginal or variable costs. It contributes toward fixed cost and profit. The concept of contribution helps in deciding breakeven point, profitability of products, departments etc. to perform the following activities:

- Selecting product mix or sales mix for profit maximization

- Fixing selling prices under different circumstances such as trade depression, export sales, price discrimination etc.

2. Profit Volume Ratio (P/V Ratio), its Improvement and Application

The ratio of contribution to sales is P/V ratio or C/S ratio. It is the contribution per rupee of sales and since the fixed cost remains constant in short term period, P/V ratio will also measure the rate of change of profit due to change in volume of sales. The P/V ratio may be expressed as follows:

$$\begin{aligned} \text{P/V ratio} &= \frac{\text{Sales} - \text{Marginal cost of sales}}{\text{Sales}} = \frac{\text{Contribution}}{\text{Sales}} \\ &= \frac{\text{Changes in contribution}}{\text{Changes in sales}} = \frac{\text{Change in profit}}{\text{Change in sales}} \end{aligned}$$

A fundamental property of marginal costing system is that P/V ratio remains constant at different levels of activity.

A change in fixed cost does not affect P/V ratio. The concept of P/V ratio helps in determining the following:

- Breakeven point
- Profit at any volume of sales
- Sales volume required to earn a desired quantum of profit
- Profitability of products
- Processes or departments

The contribution can be increased by increasing the sales price or by reduction of variable costs. Thus, P/V ratio can be improved by the following:

- Increasing selling price
- Reducing marginal costs by effectively utilizing men, machines, materials and other services
- Selling more profitable products, thereby increasing the overall P/V ratio

3. Breakeven Point

Breakeven point is the volume of sales or production where there is neither profit nor loss. Thus, we can say that:

$$\text{Contribution} = \text{Fixed cost}$$

Now, breakeven point can be easily calculated with the help of fundamental marginal cost equation, P/V ratio or contribution per unit.

a. Using Marginal Costing Equation

S (sales) – V (variable cost) = F (fixed cost) + P (profit)

At BEP $P = 0$, BEP $S - V = F$

By multiplying both the sides by S and rearranging them, one gets the following equation:

$$S_{\text{BEP}} = F.S/S-V$$

b. Using P/V Ratio

$$\text{Sales } S_{\text{BEP}} = \frac{\text{Contribution at BEP}}{\text{P/ V ratio}} = \frac{\text{Fixed cost}}{\text{P/ V ratio}}$$

Thus, if sales is Rs. 2,000, marginal cost Rs. 1,200 and fixed cost Rs. 400, then:

$$\text{Breakeven point} = \frac{400 \times 2000}{2000 - 1200} = \text{Rs. } 1000$$

$$\text{Similarly, } \frac{\text{P/V ratio}}{800} = 2000 - 1200 = 0.4 \text{ or } 40\%$$

$$\text{So, breakeven sales} = \text{Rs. } 400 / .4 = \text{Rs. } 1000$$

c. Using Contribution per unit

$$\text{Breakeven point} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = 100 \text{ units or Rs. } 1000$$

4. Margin of Safety (MOS)

Every enterprise tries to know how much above they are from the breakeven point. This is technically called margin of safety. It is calculated as the difference between sales or production units at the selected activity and the breakeven sales or production.

Margin of safety is the difference between the total sales (actual or projected) and the breakeven sales. It may be expressed in monetary terms (value) or as a number of units (volume). It can be expressed as profit / P/V ratio. A large margin of safety indicates the soundness and financial strength of business.

Margin of safety can be improved by lowering fixed and variable costs, increasing volume of sales or selling price and changing product mix, so as to improve contribution and overall P/V ratio.

Margin of safety = Sales at selected activity – Sales at BEP

$$= \frac{\text{Profit at selected activity}}{\text{P/V ratio}}$$

Margin of safety is also presented in ratio or percentage as follows:

$$= \frac{\text{Margin of safety (sales)}}{\text{Sales at selected activity}} \times 100 \%$$

The size of margin of safety is an extremely valuable guide to the strength of a business. If it is large, there can be substantial falling of sales and yet a profit can be made. On the other hand, if margin is small, any loss of sales may be a serious matter. If margin of safety is unsatisfactory, possible steps to rectify the causes of mismanagement of commercial activities as listed below can be undertaken.

- a. Increasing the selling price-- It may be possible for a company to have higher margin of safety in order to strengthen the financial health of the business. It should be able to influence price, provided the demand is elastic. Otherwise, the same quantity will not be sold.
- b. Reducing fixed costs
- c. Reducing variable costs
- d. Substitution of existing product(s) by more profitable lines
- e. Increase in the volume of output
- f. Modernization of production facilities and the introduction of the most cost effective technology

Problem 1

A company earned a profit of Rs. 30,000 during the year 2000-01. Marginal cost and selling price of a product are Rs. 8 and Rs. 10 per unit respectively. Find out the margin of safety.

Solution

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

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

$$= \frac{\text{Rs. 2}}{\text{Rs. 10}} \times 100 = 20\%$$

$$\text{Margin of safety} = \frac{\text{Rs. 30000}}{20\%} = \text{Rs. 1,50,000}$$

Problem 2

A company producing a single article sells it at Rs. 10 each. The marginal cost of production is Rs. 6 each and fixed cost is Rs. 400 per annum. You are required to calculate the following:

- Profits for annual sales of 1 unit, 50 units, 100 units and 400 units
- P/V ratio
- Breakeven sales
- Sales to earn a profit of Rs. 500
- Profit at sales of Rs. 3,000
- New breakeven point if sales price is reduced by 10%
- Margin of safety at sales of 400 units

Solution

Marginal Cost Statement

Particulars	Amount	Amount	Amount	Amount
Units produced	1	50	100	400
Sales (units * 10)	10	500	1000	4000
Variable cost	6	300	600	2400
Contribution (sales- VC)	4	200	400	1600
Fixed cost	400	400	400	400
Profit (Contribution – FC)	-396	-200	0	1200

Profit Volume Ratio (PVR) = Contribution/Sales * 100 = 0.4 or 40%

Breakeven sales (Rs.) = Fixed cost / PVR = 400/ 40 * 100 = Rs. 1,000

Sales at BEP = Contribution at BEP/ PVR = 100 units

Sales at profit Rs. 500

Contribution at profit Rs. 500 = Fixed cost + Profit = Rs. 900

Sales = Contribution/PVR = 900/.4 = Rs. 2,250 (or 225 units)

Profit at sales Rs. 3,000

Contribution at sale Rs. 3,000 = Sales x P/V ratio = 3000 x 0.4 = Rs. 1,200

Profit = Contribution – Fixed cost = Rs. 1200 – Rs. 400 = Rs. 800

New P/V ratio = Rs. 9 – Rs. 6/Rs. 9 = 1/3

Sales at BEP = Fixed cost/PV ratio = $\frac{\text{Rs. } 400}{1/3}$ = Rs. 1,200

Margin of safety (at 400 units) = $\frac{4000-1000}{4000} \times 100 = 75\%$

(Actual sales – BEP sales/Actual sales * 100)

Breakeven Analysis-- Graphical Presentation

Apart from marginal cost equations, it is found that breakeven chart and profit graphs are useful graphic presentations of this cost-volume-profit relationship.

Breakeven chart is a device which shows the relationship between sales volume, marginal costs and fixed costs, and profit or loss at different levels of activity. Such a chart also shows the effect of change of one factor on other factors and exhibits the rate of profit and margin of safety at different levels. A breakeven chart contains, inter alia, total sales line, total cost line and the point of intersection called breakeven point. It is popularly called breakeven chart because it shows clearly breakeven point (a point where there is no profit or no loss).

Profit graph is a development of simple breakeven chart and shows clearly profit at different volumes of sales.

Construction of a Breakeven Chart

The construction of a breakeven chart involves the drawing of fixed cost line, total cost line and sales line as follows:

1. Select a scale for production on horizontal axis and a scale for costs and sales on vertical axis.
2. Plot fixed cost on vertical axis and draw fixed cost line passing through this point parallel to horizontal axis.
3. Plot variable costs for some activity levels starting from the fixed cost line and join these points. This will give total cost line. Alternatively, obtain total cost at different levels, plot the points starting from horizontal axis and draw total cost line.
4. Plot the maximum or any other sales volume and draw sales line by joining zero and the point so obtained.

Uses of Breakeven Chart

A breakeven chart can be used to show the effect of changes in any of the following profit factors:

- Volume of sales
- Variable expenses
- Fixed expenses
- Selling price

Problem

A company produces a single article and sells it at Rs. 10 each. The marginal cost of production is Rs. 6 each and total fixed cost of the concern is Rs. 400 per annum.

Construct a breakeven chart and show the following:

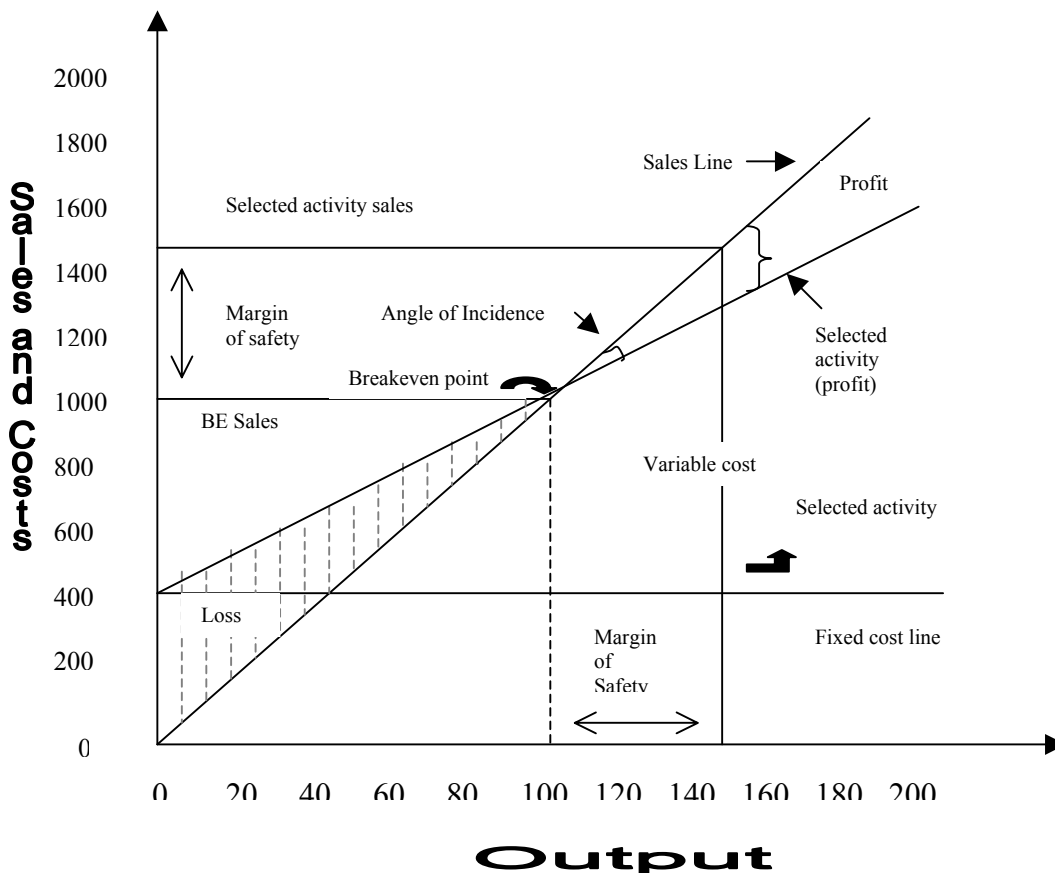
- Breakeven point
- Margin of safety at sale of Rs. 1,500
- Angle of incidence
- Increase in selling price if breakeven point is reduced to 80 units

Solution

A breakeven chart can be prepared by obtaining the information at these levels:

Output units	40	80	120	200
Sales	Rs. 400	Rs. 800	Rs. 1,200	Rs. 2,000
Fixed cost	400	400	400	400
Variable cost	240	480	400	720
Total cost	640	880	1,120	1,600

Fixed cost line, total cost line and sales line are drawn one after another following the usual procedure described herein:



This chart clearly shows the breakeven point, margin of safety and angle of incidence.

- Breakeven point-- Breakeven point is the point at which sales line and total cost line intersect. Here, B is breakeven point equivalent to sale of Rs. 1,000 or 100 units.
- Margin of safety-- Margin of safety is the difference between sales or units of production and breakeven point. Thus, margin of safety at M is sales of (Rs. 1,500 - Rs. 1,000), i.e. Rs. 500 or 50 units.
- Angle of incidence-- Angle of incidence is the angle formed by sales line and total cost line at breakeven point. A large angle of incidence shows a high rate of profit being made. It should be noted that the angle of incidence is universally denoted by data. Larger the angle, higher the profitability indicated by the angle of incidence.

- d. At 80 units, total cost (from the table) = Rs. 880. Hence, selling price for breakeven at 80 units = Rs. 880/80 = Rs. 11 per unit. Increase in selling price is Re. 1 or 10% over the original selling price of Rs. 10 per unit.

Limitations and Uses of Breakeven Charts

A simple breakeven chart gives correct result as long as variable cost per unit, total fixed cost and sales price remain constant. In practice, all these factors may change and the original breakeven chart may give misleading results.

But then, if a company sells different products having different percentages of profit to turnover, the original combined breakeven chart fails to give a clear picture when the sales mix changes. In this case, it may be necessary to draw up a breakeven chart for each product or a group of products. A breakeven chart does not take into account capital employed which is a very important factor to measure the overall efficiency of business. Fixed costs may increase at some level whereas variable costs may sometimes start to decline. For example, with the help of quantity discount on materials purchased, the sales price may be reduced to sell the additional units produced etc. These changes may result in more than one breakeven point, or may indicate higher profit at lower volumes or lower profit at still higher levels of sales.

Nevertheless, a breakeven chart is used by management as an efficient tool in marginal costing, i.e. in forecasting, decision-making, long term profit planning and maintaining profitability. The margin of safety shows the soundness of business whereas the fixed cost line shows the degree of mechanization. The angle of incidence is an indicator of plant efficiency and profitability of the product or division under consideration. It also helps a monopolist to make price discrimination for maximization of profit.

Multiple Product Situations

In real life, most of the firms turn out many products. Here also, there is no problem with regard to the calculation of BE point. However, the assumption has to be made that the sales mix remains constant. This is defined as the relative proportion of each product's sale to total sales. It could be expressed as a ratio such as 2:4:6, or as a percentage as 20%, 40%, 60%.

The calculation of breakeven point in a multi-product firm follows the same pattern as in a single product firm. While the numerator will be the same fixed costs, the denominator now will be weighted average contribution margin. The modified formula is as follows:

$$\text{Breakeven point (in units)} = \frac{\text{Fixed costs}}{\text{Weighted average contribution margin per unit}}$$

One should always remember that weights are assigned in proportion to the relative sales of all products. Here, it will be the contribution margin of each product multiplied by its quantity.

Breakeven Point in Sales Revenue

Here also, numerator is the same fixed costs. The denominator now will be weighted average contribution margin ratio which is also called weighted average P/V ratio. The modified formula is

as follows:

$$\text{B.E. point (in revenue)} = \frac{\text{Fixed cost}}{\text{Weighted average P/V ratio}}$$

Problem

Ahmedabad Company Ltd. manufactures and sells four types of products under the brand name Ambience, Luxury, Comfort and Lavish. The sales mix in value comprises the following:

Brand name	Percentage
Ambience	33 1/3
Luxury	41 2/3
Comfort	16 2/3
Lavish	<u>8 1/3</u>
	100

The total budgeted sales (100%) are Rs. 6,00,000 per month.

The operating costs are:

Ambience	60% of selling price
Luxury	68% of selling price
Comfort	80% of selling price
Lavish	40% of selling price

The fixed costs are Rs. 1,59,000 per month.

- Calculate the breakeven point for the products on an overall basis.
- It has been proposed to change the sales mix as follows, with the sales per month remaining at Rs. 6,00,000:

Brand Name	Percentage
Ambience	25
Luxury	40
Comfort	30
Lavish	<u>05</u>
	100

Assuming that this proposal is implemented, calculate the new breakeven point.

Solution

a. Computation of the Breakeven Point on Overall Basis

	Ambience	Luxury	Comfort	Lavish	Total
Sales Mix	33 1/3 %	41 2/3 %	16 2/3 %	8 1/3 %	100

	Rs.	Rs.	Rs.	Rs.	Rs.
Sales	2,00,000	2,50,000	1,00,000	50,000	6,00,000
Less: Variable (operating) cost	1,20,000	1,70,000	80,000	20,000	3,90,000
Contribution	80,000	80,000	20,000	30,000	2,10,000

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

$$= \frac{\text{Rs. } 2,10,000}{6,00,000} \times 100$$

$$= 35\%$$

$$\text{Breakeven point (sales value)} = \frac{\text{Fixed costs}}{\text{P/V ratio}} \times 100$$

$$= \frac{\text{Rs. } 1,59,000}{35\%} \times 100$$

$$= 4,54,286$$

b. Computation of the New Breakeven Point

The revised contribution after new sales mix is as follows:

	Ambience	Luxury	Comfort	Lavish	Total
Sales mix	25 %	40%	30%	5%	100
	Rs	Rs	Rs	Rs	Rs
Sales	1,50,000	2,40,000	1,80,000	30,000	6,00,000
Less: Variable (operating) cost	90,000	1,63,200	1,44,000	12,000	4,09,200
Contribution	80,000	80,000	20,000	30,000	2,10,000

$$\text{New P/V ratio} = \frac{\text{Rs. } 1,90,800}{\text{Rs. } 6,00,000} \times 100 = 31.8\%$$

$$\text{New breakeven point (sales value)} = \frac{\text{Rs. } 1,59,000}{31.8\%} = \text{Rs. } 5,00,000$$

Profit Graph

Profit graph is an improvement of a simple breakeven chart. It clearly exhibits the relationship of profit to volume of sales. The construction of a profit graph is relatively easy and the procedure involves the following:

1. Selecting a scale for the sales on horizontal axis and another scale for profit and fixed costs or loss on vertical axis. The area above horizontal axis is called profit area and the one below it is called loss area.
2. Plotting the profits of corresponding sales and joining them. This is profit line.

Summary

1. Fixed and variable cost classification helps in CVP analysis. Marginal cost is also useful for such analysis.
2. Breakeven point is the incidental study of CVP. It is the point of no profit and no loss. At this specific level of operation, it covers total costs, including variable and fixed overheads.
3. Breakeven chart is the graphical representation of cost structure of business.
4. Profit/Volume (P/V) ratio shows the relationship between contribution and value/volume of sales. It is usually expressed as terms of percentage and is a valuable tool for the profitability of business.
5. Margin of safety is the difference between sales or units of production and breakeven point. The size of margin of safety is an extremely valuable guide to the financial strength of a business.

Questions

1. Discuss the concept of fixed and variable cost.
2. CVP analysis is a useful technique for managerial decision-making. Discuss.
3. CVP analysis has no limitation. Discuss.
4. What is a breakeven chart?
5. What questions can a breakeven chart answer to?
6. Provide a formula to determine the breakeven point of a single product, multi-product and different divisions and subdivisions of an organization.
7. What are the disadvantages of using breakeven analysis?
8. Define contribution margin.
9. Explain-- Margin of safety shows the financial strength of a business.

Activities

1. CVP analysis in particular and management accounting in general have a wider application in industry, trade and commerce. You are, therefore, advised to visit industries of different nature and become familiar with the application of CVP in day-to-day managerial decision-making process undertaken by the respective management. You can meet the concerned executives who are the master of subject and gain practical experience. Then, blend the same with the theoretical phenomenon demonstrated by us.
2. Familiarize yourself with case studies and industrial visits to understand the application of breakeven analysis in real life situation. Also, you are advised to make a project on cost-volume-profit analysis of a multi-product company.