BACHELOR OF COMPUTER APPLICATIONS

SEMESTER 4

DCA2204

PRINCIPLES OF FINANCIAL ACCOUNTING AND MANAGEMENT

Unit 13

Marginal Costing & Break-even Analysis

Table of Contents

1. INTRODUCTION

We have studied in the earlier chapter that cost can be classified into two groups viz. fixed cost and variable cost. Variable cost varies with the changes in the volume of output or level of activity. As against this, fixed cost relates to time and does not vary with the changes in the level of activity, Because of inclusion of fixed cost in determination of total cost of a product, the cost per unit or process varies from period to period according to the volume. This has given rise to the concept of marginal costing. We shall study more regarding this Unit.

1.1 Learning Objectives:

After studying this chapter, you should be able to understand:

- *Concept of marginal costing.*
- *Understand difference between profit and Contribution.*
- *Understand the concept and use of break even point*

2. BASIC CONCEPT OF MARGINAL COSTING

Marginal costing is concerned with determination of product cost which consists of direct material, direct labour, direct expenses and variable overheads. *It should be kept in mind that variable costs per unit are fixed and fixed costs per unit are variable. This method of costing is generally known as marginal costing.* Marginal costing is also known as direct costing, contributory costing and incremental costing.

Marginal costing is **the increase or decrease in the overall cost of production due to changes in the quantity of desired output.** Managers can use it to make resource allocation decisions, optimize production, streamline operations, control manufacturing costs, plan budgets and profits, and so on

2.1 Meaning And Features Of Marginal Costing

Meaning: The ICMA has defined marginal cost "as the amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased or decreased by one unit." From the analysis of this definition, it is clear that increase/decrease in one unit of output increases/reduces the total cost from the existing level to the new level. This increase/decrease in variable cost from existing level to the new level. is called as marginal cost.

Suppose the cost of producing 100 units is Rs. 200. If 101 units are manufactured the cost goes up by Rs. 2 and becomes Rs. 202. If 99 units are manufactured, the cost is reduced by Rs. 2 i.e. to Rs. 198. with the increase or decrease in the volume the cost is increased or decreased by Rs. 2 respectively. Thus Rs. 2 will be called as the marginal cost.

Marginal costing means "the ascertainment of marginal costs and of the effect on profit of changes in volume or type of output by differentiating between fixed and variable costs".

Marginal costing is not a method of costing. It is a technique of controlling by bringing out relationship between profit and volume.

Features of Marginal Costing:

1. The elements of cost are differentiated between fixed costs and variable costs.

2. Only the variable or marginal cost is considered while calculating product costs.
3. Stock of finished products and work-in-progress are valued at variable cost.
4. Contribution is the difference between sales and marginal cost.
5. Fixed costs do not find place in the product cost.
6. Prices are based on marginal cost-plus contribution.
7. It is a technique of cost recording and cost reporting.
8. Profitability of various products is determined in terms of marginal contribution.
9. Presentation of data is oriented to highlight the total contribution and contribution from each product.

2.2 Advantages Of Marginal Costing

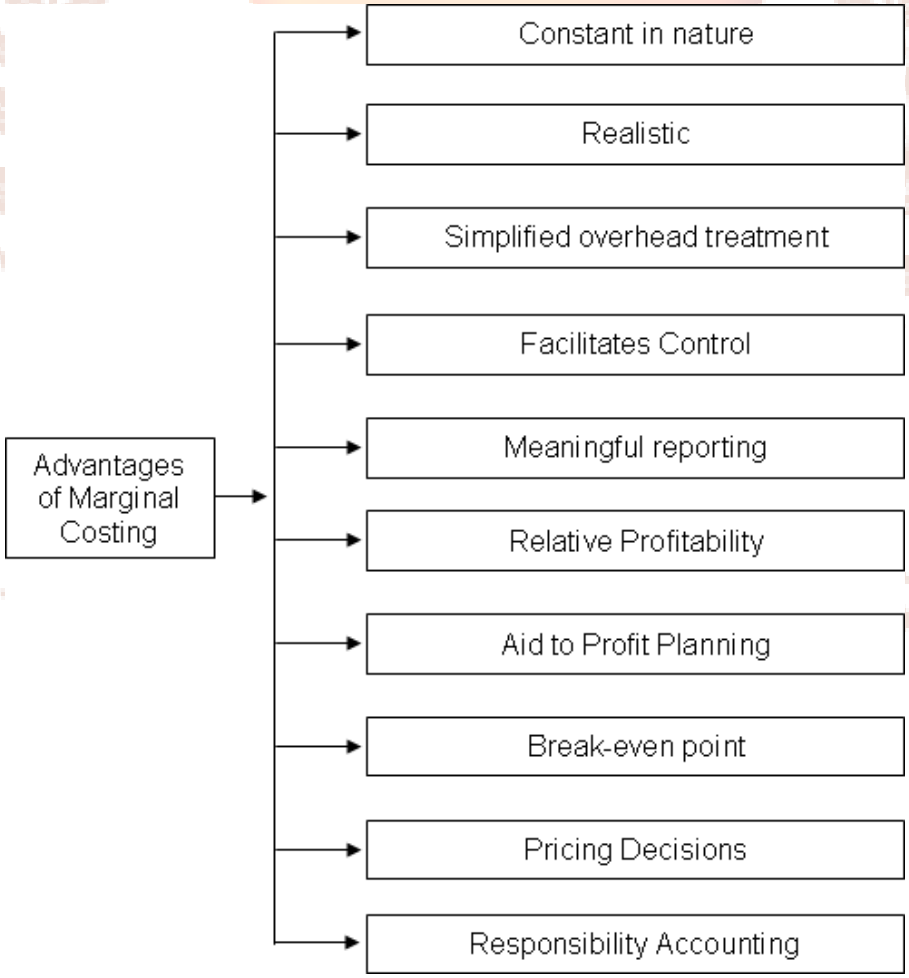


Fig. 13.1

1. **Constant in nature:**

   Marginal cost remains the same per unit of output whether there is increase or decrease in production.

2. **Realistic:**

   It is realistic as fixed cost is eliminated. Inventory is valued at marginal cost. Therefore, it is more realistic and uniform. No fictitious profit arises.

3. **Simplified overhead Treatment:**

   There is no complication of over-absorption and under-absorption of overheads.

4. **Facilitates control:**

   Classification of cost as fixed and variable helps to have greater control over costs.

5. **Meaningful Reporting:**

   The reporting made to management is more meaningful as the reports are based on sales figures rather than production. Comparison of efficiency can be done in a better way.

6. **Relative Profitability:**

   In case a number of products are manufactured, marginal costing helps management in the determination of relative profitability of each product.

7. **Aid to Profit Planning:**

   The technique of marginal costing helps management in profit planning. The management can plan the volume of sales for earning a required profit.

8. **Break-even point:**

   Break Even Point can be determined only on the basis of marginal costing.

9. **Pricing decisions:**

These decisions can be based on contribution levels of individual products.

10. **Responsibility Accounting:**

It becomes more effective when based on marginal costing. Managers can identify their responsibilities clearly.

2.3 Limitations Of Marginal Costing

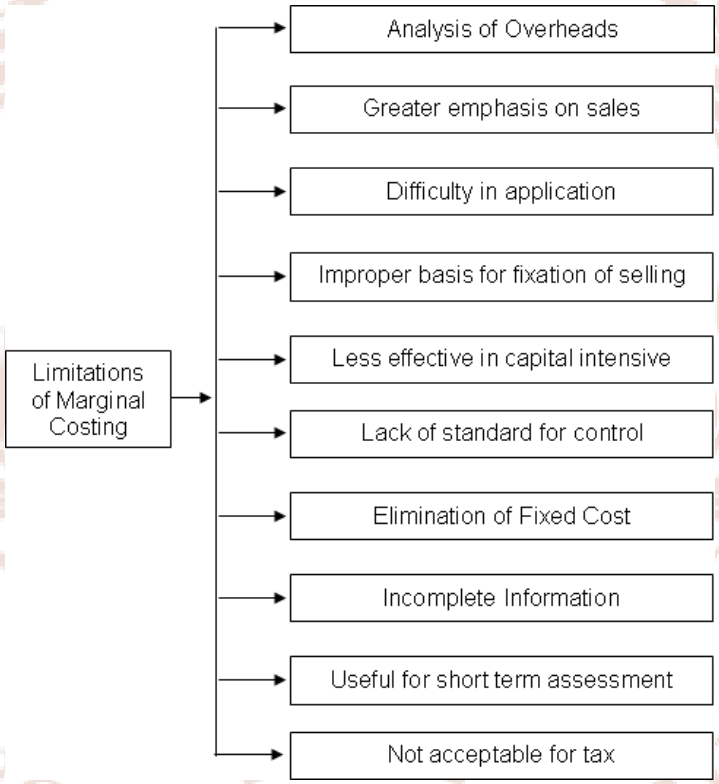


Fig. 13.2

1. **Analysis of overheads:**

In marginal costing, costs are to be classified into fixed and variable costs. Considerable difficulties are experienced in analysing overheads into fixed and variable categories. Therefore, segregation of costs into fixed and variable is rather difficult and cannot be done with precision.

2. **Greater emphasis on Sales:**

   Marginal costing technique lays greater emphasis on sales rather than production. In fact, efficiency of business is to be judged by considering both sales and production.

3. **Difficulty in Application:**

   Marginal costing is not applicable in those concerns where large stocks have to be carried by way of work-in-progress.

4. **Improper basis for fixation of selling price:**

   In marginal costing selling price is fixed on the basis of contribution alone which is not proper.

5. **Less effective in Capital Intensive Industry:**

   Marginal costing technique is less effective in capital intensive industry where fixed cost is huge.

6. **Lack of standard for control:**

   Marginal costing does not provide any standard for control purpose. In fact, budgetary control and standard costing are more effective tools in controlling costs.

7. **Elimination of Fixed Cost:**

   In marginal costing technique fixed costs are not included in the value of finished goods and work-in-progress. Since fixed costs are incurred, these should also form part of the costs of the product. Elimination of fixed costs from finished stock and work-in-progress results into the understatement of the stocks. The uner valuationsof the stocks affects the profit and loss account and the balance sheet, which leads to deflation of profits.

8. **Incomplete Information:**

Marginal cost does not give complete information. For example, increase in production and sales may be due to so many factors such as extensive use of machinery, expansion of resources and by automation. The exact cause is not disclosed by marginal costing.

9. **Useful only for short term assessment:**

Marginal costing is useful for short-term assessment of profitability. However, long-term assessment of profit can be correctly determined on full costs basis only.

10. **Not acceptable for tax:**

Income tax authorities do not recognise marginal costing for inventory valuation.

Self-Assessment Questions - 1

1. In marginal costing, costs are to be classified into fixed and variable costs. State True/False
2. _____ is useful for short-term assessment of profitability

3. CONCEPT OF PROFIT AND CONTRIBUTION

Concept of Profit

Profit is known as 'Net Margin calculated after deducting fixed cost from total contribution or gross margin'. Profit is an excess of contribution over fixed cost.

Profit = Contribution – Fixed Cost

Or

P = C – F

Contribution

Contribution is the excess of selling price over variable costs. It is known as contribution because it contributes towards recovery of the fixed costs and profits. Contribution is a pool of amount from which total fixed costs will be deducted to arrive at the profit or loss. By equation the concept of contribution can be stated as follows:

C = S – V

C = Contribution

S = Sales

V = Variable Cost

Distinction between Contribution and Profit

	Contribution	Profit
1.	It includes fixed cost and profit.	It does not include fixed cost.
2.	This concept is used by marginal costing.	This concept decides profit or loss of a business organisation.
3.	It is equal to fixed cost at Break-even-point.	It is the result of excess of sales over break-even-point.
4.	It is used in managerial decision making.	It is used in deciding profitability of an organisation.

Illustration 1

	Rs.
Sales	12,000
Variable Cost	7,000
Fixed Cost	4,000

Calculate contribution and Profit.

Solution

C = S –V
= 12,000 – 7,000
= 5,000
P = C – F
= 5,000 – 4,000
= 1,000

Contribution is not profit. It covers fixed cost and the balance left out is profit. Contribution plays a very important role in decision making. It is the criteria of deciding profitability of various alternatives. The alternative which gives maximum contribution is considered as most profitable.

Marginal Cost Equation

We have seen in the earlier paragraphs that contribution is the difference between sales and variable cost. In other words, products sold provide fund to meet fixed costs and profits. Therefore, contribution is equal to fixed cost plus profit. From this the following equation has been derived:

$$S - V = F + P$$

i.e. C = F + P Contribution (c)

where S = Sales
V = Variable Cost;
F = Fixed Costs,
P = Profit

If any three factors are given, the fourth can be ascertained. This equation is also used for ascertainment of "Break-Even-Point" (B.E.P.) i.e. the point or level where there is no profit or no loss.

Self-Assessment Questions - 2

3. _____ is the excess of selling price over variable costs
4. BEP stands for

4. CONCEPT OF PROFIT/VOLUME RATIO

This is popularly known as P/V Ratio. It expresses the relationship between contribution and sales. It is expressed in percentage. P/V ratio can be calculated in either of the following ways.

$P/V\ Ratio\ \frac{S-V}{S} \times 100$	$\frac{C}{S}X100$

where C = Contribution (being the difference between sales and variable costs)

S = Sales

V = Variable Costs

P/V ratio can be determined by expressing change in profit or loss in relation to change in sales. P/V ratio indicates the relative profitability of different products, processes and departments.

If information about two periods is given, P/V ratio is calculated as follows

$$P/VRatio = \frac{Change\ of\ Profit}{Change\ in\ sales} \times 100$$

Illustration 2

	Rs.
Sales	20,000
Variable cost	16,000

Calculate P/V Ratio

Solution

$$P/V\ Ratio = \frac{\text{Contribution}}{\text{Sales}} \text{x}100$$

$$= \frac{4,000}{20,000} \text{ x } 100$$

$$= 20\%$$

P/V ratio is most important to watch in business. It is the indicator of the rate at which the organisation is earning profit. A high ratio indicates high profitability and a low ratio

indicates low profitability. It is useful for calculating Break Even Point, and at a given level of sales, what sales are required to earn a certain amount of profit etc.

Higher P/V Ratio is an index of sound financial health of company. P/V Ratio can be improved by improving contribution which can be improved by taking the following steps :

a) Increase in sales
b) Reduction in marginal cost
c) Concentration on sale of profitable product.

Limitations of P/V Ratio

Following limitations should be kept in mind while using P/V Ratio.

a) It heavily depends on contribution.
b) It fails to consider the capital outlays required by additional productive capacity.
c) It indicates only relative profitability.
d) Over simplification may lead to erroneous conclusion.
e) Higher ratio will show the most profitable item, only when other conditions are constant.

Factors Influencing P/V Ratio

Factors	P/V Ratio
A. Fixed Cost	
i) Increase	No Impact
ii) Decrease	No Impact
B. Sales Volume	
i) Increase	No Impact
ii) Decrease	No Impact
C. Selling Price	
i) Increase	Increase
ii) Decrease	Decrease
D. Variable Cost / Unit	
i) Increase	Decrease
ii) Decrease	Increase

5. BREAK EVEN POINT (B.E.P.)

Break-even-point is the point at which total revenue is equal to total cost. It is that level of output (or sale) where *there is no profit or no loss*. At this stage contribution is *just* sufficient to absorb fixed cost. The organisation starts earning profit when the output or sales activity crosses this point. Output or sales below this point results in a loss. Calculation of Break Even Point for different levels of output or profit is called Break Even Analysis.

5.1 Methods Of Calculating Break Even Point

There are two ways of calculating break even point:

Contribution Approach:

Following formulae are used in this approach:

$$\text{B. E. P. (units)} = \frac{\text{Fixed cost}}{\text{Selling Price per unit} \quad \text{Variable Costper unit}}$$

$$OR = \frac{\text{Fixed cost}}{\text{Contribution per unit}}$$

$$OR = \frac{\text{Break Even Sales (Rs.)}}{\text{Selling price per unit}}$$

$$B.E.P\ (in\ value) = \frac{\text{Fixed cost x Sales}}{\text{Sales Variable Cost}}$$

$$OR = \frac{\text{Fixed cost x Selling price per unit}}{\text{Contribution per unit}}$$

$$OR = \frac{\text{Fixed Cost}}{\text{P/V ratio}}$$

$$\text{OR} = \text{B. E. P. Units x Selling price per unit}$$

Equation Approach:

We know that

Sales – Fixed Cost – Variable Cost = Net Profit

Sales – Total Cost = Net Profit

Sales = Fixed Cost + Variable Cost + Net Profit

Sales – Variable cost = Fixed Cost + Net Profit

Contribution = Fixed Cost + Net Profit

Therefore

At Break Point Contribution = Fixed Cost

Contribution – Fixed Cost = 0

$$Required\ Sales = \frac{Fixed\ cost + Expected\ Profit}{P.V.Ratio}$$

Relationship between Contribution and BEP

A. At BEP

Contribution	=	Fixed Cost
Profit / Loss	=	Contribution – Fixed Cost
	=	Nil

B. At above BEP

Contribution	>	Fixed Cost
Profit	=	Contribution – Fixed Cost

C. At below BEP

Contribution	<	Fixed Cost
Loss	=	Fixed Cost – Contribution

Illustration 3

Total Fixed Cost	Rs. 12,000
Selling Price	12 per unit
Variable cost	9 per unit

Calculate Break Even Point.

Solution

Contribution = S – V

= 12 – 9

= 3

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

$$= \frac{3}{12} \times 100 = 25\%$$

$$B.E.P. = \frac{Total\ Fixed\ Cost}{P/V\ Ratio}$$

$$= \frac{12{,}000}{25\%} = \text{Rs. } 45{,}000$$

5.2 Assumptions, Uses And Limitations Of Break-Even Analysis

Assumptions:

Break Even Analysis is based on the following assumptions:

i) Costs can be classified into fixed and variable categories.
ii) Fixed Costs remain fixed for the entire volume.
iii) Variable costs change according to the changes in output.
iv) Selling price per unit remains the same for the entire volume.
v) Market is sufficient to absorb the entire output.

Uses of Break-even analysis:

It facilitates determination of selling price which will give the desired profits.

i) It makes it possible to divide the sales volume to cover a given rate of return on capital employed.
ii) The management can forecast profit and volume at levels of activity.
iii) It suggests to make a change in sales mix.
iv) It helps management to do inter-firm comparison of profitability.
v) It shows the impact of changes in costs on profits.
vi) It enables the management to plan for the optimum utilisation of capacity.

Limitations:

Break Even Analysis is subject to certain limitations which are as follows:

i) B.E. Analysis is based on the assumption that costs can be classified into fixed and variable categories. In practice it is very difficult to have such a clear-cut distinction.
ii) It assumes that fixed cost remains constant. However, in practice it may change.
iii) Variable costs may not vary in direct proportion to the volume.
iv) Selling price may not remain constant.
v) The assumption that only one product is produced does not hold true in practice.
vi) The assumption regarding production and sales does not realise in practice.
vii) The analysis is static. However, circumstances are dynamic. Break Even Analysis becomes complicated when all these changes are to be incorporated.
viii) It does not consider capital employed in business. It presents only one fact of profit planning.

5.3 Factors Affecting Break Even Point And Margin Of Safety:

There are three factors viz. fixed cost, variable cost and selling price which affect Break Even as follows:

Factors			Effect on BEP	
A.	Fixed Cost			
	i)	Increase	i)	BEP will go up
	ii)	Decrease	ii)	BEP will come down
B.	Variable Cost			
	i)	Increase per unit	i)	BEP will go up
	ii)	Decrease per unit	ii)	BEP will come down
C.	Selling Price			
	i)	Increase per unit	i)	BEP will come down
	ii)	Decrease per unit	ii)	BEP will go up

Margin of safety:

Margin Of Safety (MOS) is the difference between actual sales and BreakEven sales. It is given by formula

MOS = Actual Sales – B.E.P. Sales

Or

$$\text{MOS} = \frac{\text{Profit}}{\text{P/V Ratio}}$$

Illustration 4

	Rs.
Sales	1,00,000
Fixed Cost	20,000
Variable Cost	60,000

Solution

1. P/V $= \frac{S-V}{S} \times 100$

$$= \frac{1,00,000 - 60,000}{1,00,000} \times 100$$

$$= 40\%$$

2. B.E.P. $= \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$

$$= \frac{20,000}{40\%}$$

$$= 20,000 \times \frac{100}{40}$$

$$= 50000$$

3. MOS = Actual Sales – B.E.P. Sales

= 1,00,000 – 50,000

= 50,000

OR

$$\text{MOS} = \frac{\text{Profit}}{\text{P/V Ratio}}$$

$$= \frac{20,000}{40\%}$$

= 50,000

5.4 Break-Even Chart

The break-even chart is a graphical representation of marginal costing. It indicates the graphic relationship between costs, volume and profits. It shows not only the BEP but also the costs and revenue at varying levels of sales. Therefore, it can be more appropriately called as the cost-volume- profit graph (CVP graph). Thus, the Break-even chart indicates the following information:

i) Fixed Cost.
ii) Variable Costs.
iii) Total Cost
iv) Sales Value.

v) Profit or Loss.
vi) Break-even point.
vii) Margin of safety.

Assumptions of Break-Even Chart

However, the construction of Break-Even chart is based on certain important assumptions. These assumptions are as listed below:

i) Fixed cost will remain constant.
ii) Prices of variable cost factors will remain unchanged.
iii) Semi-variable cost is segregated into variable and fixed costs.
iv) Method of production will not change.
v) Operating efficiency will remain unchanged.
vi) There will be no changes in pricing policy.
vii) Sales equal production.
viii) Product-mix will remain constant.

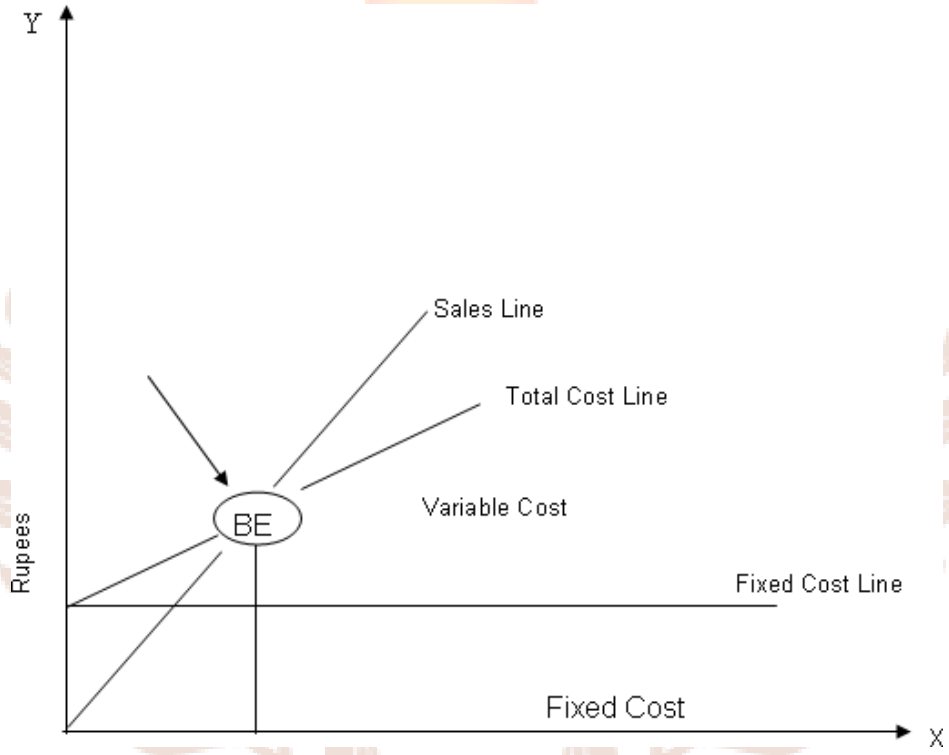
Graphical chart can help to do Break Even analysis. Break-Even chart indicates profit or loss at different levels of sales volume. It shows fixed cost, variable cost, sales revenue and profit or loss at a given level of production.

Steps to draw Break Even Chart:

1. Select a scale for sales on horizontal axis.
2. Select a scale for cost and revenue on vertical axis.
3. Draw fixed cost line parallel to horizontal axis.
4. Draw total cost line.
5. Draw the sales line starting from the point of origin and finishing at point of maximum sales.
6. The point of intersection of two lines i.e. sales line and total cost line is the Break-Even Point.
7. Draw the line from intersection to vertical axis and horizontal axis to get sales value and number of units produced at break-even point.

8. Show the loss area when production is less than the break-even point and profit area when production is more than the break-even point.
9. Show margin of safety by deducting break even sales from total sales.
10. Show the angel of incidence.

Specimen of break-even-chart is as given below:



Production (Volume)

Use and Limitations of Break-even point

Advantages of Break-Even Chart:

1. It is simple to construct and understand. Facts are represented graphically are understood well.
2. It helps management in studying the relationship between cost, volume and profits. This enables the management in taking decisions on sales.
3. It helps management in understanding the strength and profit earning capacity of a business concern. Many important decisions can be taken on the basis of margin of safety, break-even point etc.

4. It indicates the impact of different product mixes on profits. This helps management in selecting the most profitable product-mix.

Limitations of Break-Even-Chart

1. Break-even chart indicates a static picture. It becomes out of date if there is a change in the assumptions or conditions.
2. A company manufacturing variety of products cannot represent the fact of each product in the chart.
3. Break-even chart does not consider the amount of capital employed which is very vital in many decisions.

Self-Assessment Questions - 3

5. Profit/Volume ratio is popularly known as _____ .
6. P/V ratio heavily depends on contribution is considered as one of the benefit aspects. True/False.
7. B.E. Analysis is based on the assumption that costs can be classified into _____ and _____ .
8. The break-even chart is a graphical representation of_____ .

6. SUMMARY

Increase/decrease in one unit of output increases/reduces the total cost from the existing level to the new level. This increase/decrease in variable cost from existing level to the new level. is called as marginal cost. So Marginal costing means "the ascertainment of marginal costs and of the effect on profit of changes in volume or type of output by differentiating between fixed and variable costs".

Contribution is the excess of selling price over variable costs. It is known as contribution because it contributes towards recovery of the fixed costs and profits. Contribution is not profit. It covers fixed cost and the balance left out is profit. Contribution plays a very important role in decision making. It is the criteria of deciding profitability of various alternatives. The alternative which gives maximum contribution is considered as most profitable.

Profit is known as 'Net Margin' calculated after deducting fixed cost from total contribution or gross margin. Profit is an excess of contribution over fixed cost.

P/V Ratio expresses the relationship between contribution and sales. It is expressed in percentage. It is the indicator of the rate at which the organistion is earning profit. A high ratio indicates high profitability and a low ratio indicates low profitability. It is useful for calculating Break Even Point, at a given level of sales, sales required to earn a certain amount of profit etc.

Higher P.V. Ratio is an index of sound financial health of company's product. P/V Ratio can be improved by improving contribution.

Break-even-point is the point at which total revenue is equal to total cost. It is that level of output (or sale) where there is no profit or no loss. At this stage contribution is just sufficient to absorb fixed cost. Break Even Analysis is finding out break even points for different levels of output variable costs and profits required. Break Even analysis can be done through Break Even chart.

7. TERMINAL QUESTIONS

1. State merits and demerits of Marginal Costing.
2. Distinguish between Profit and Contribution.
3. From the following particulars of X Ltd., calculate the break-even point :

	Rs.
Variable cost per unit	12
Fixed Cost	60,000
Selling price per unit	18

4. A company estimates that next year it will earn a profit of Rs. 50,000. The budgeted fixed costs and sales are Rs. 2,50,000 and Rs. 9,93,000 respectively. Find out the break-even point for the company.
5. From the following particulars, find out the selling price per unit if B. E. P. be brought down to 9,000 units.

	Rs.
Variable cost per unit	75
Fixed expenses	2,70,000
Selling price per unit	100

6. Total sales turnover and profits during two periods are as under:

   Period I : Sales Rs. 20 lakhs; Profit Rs. 2 lakhs

   Period II: Sales Rs. 30 lakhs; Profit Rs. 4 lakhs

   Calculate P/V Ratio
7. You are required to calculate the break-even-point in the following case: The fixed cost for the year is Rs. 80,000; variable cost per unit for the single product being made is Rs. 4.

   Estimated sales for the period are valued at Rs. 2,00,000. The number of units involved coincides with the expected volume of output. Each unit sells at Rs. 20.

   Calculate break-even point.

8. What do you mean by Break Even Point? Explain this with the help of graph.

8. ANSWERS

1. True
2. Marginal costing
3. Contribution
4. Break Even Point
5. P/V ratio
6. False
7. fixed and variable categories
8. marginal costing

Terminal Questions

1. Ref. 2.2 and 2.3
2. Ref. 13.3
3. Contribution = Sales – V. Cost

   = 18 – 12

   = 6

   B.E.P. (in units) $= \frac{\text{Fixed cost}}{\text{Contribution per unit}}$

   $= \frac{60,000}{6}$

   = 10,000 Units

   B.E.P. (Rs.) $= \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$

   P/V Ratio $= \frac{C}{S} \times 100$

   $= \frac{6}{18} \times 100$

   = 33.33%

   $= \frac{60,000}{33.33\%}$

= Rs. 180,000

4. B.E.P. = $\frac{\text{Fixed Cost}}{\text{P/V Ratio}}$

Contribution = S – V = F + P

P/V Ratio = $\frac{C}{S} \times 100$

C = F + P

= 2,50,000 + 50,000

= 3,00,000

P/V Ratio = $\frac{3,00,000}{9,93,000}$x 100

= 30.21%

B.E.P. = $\frac{2,50,000}{30.21\%}$

= 8,27,500

5. Let us assume that the contribution per unit at B.E. sales of 9,000 is x.

B.E.P. = $\frac{\text{Fixed cost}}{\text{Contribution per unit}}$

Contribution per unit is not known. Therefore,

9,000 units = $\frac{2,70,000}{X}$

9,000 x = 2,70,000

x = 30

The contribution at present is 100 – 75 = 25

New Contribution is Rs. 30 per unit, in place of Rs. 25. Therefore, the selling price should be Rs. 105, i.e., Rs. 75 + 30 as variable cost per unit will not change.

6. P/V Ratio $= \frac{\text{Change of profit}}{\text{Change in sales}} \times 100$

$= \frac{2,00,000}{10,00,000} \text{x} 100$

$= \quad 20\%$

7.

		Per Unit Rs.	Total Rs.
	Sales (No. of units sold 1,00,00)	20	2,00,000
Less:	Variable cost (100 unit x 4)	4	40,000
	Contribution	16	1,60,000
Less:	Fixed Cost		80,000
	Profit		80,000

Sales of B.E.P.

B.E.P. $= \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$

P/V Ratio $= \frac{C}{S} \times 100$

$= \frac{16}{20} \times 100$

$= \quad 80\%$

(or)

B.E.P. (Rs.) $= \frac{80,000}{80\%}$

$=$ Rs. 1,00,000

8. Ref. 13.4