

Management Accounting IV

Cost Volume Profit Analysis

This is the term given to the study of the relationship between costs and volume (level of output) and their effect on profit at various levels of activity. It is a decision making tool used by managers to answer the following questions:

- How many units do we need to sell in order to break even?
- How many units need to be sold in order to achieve a targeted profit?
- What would profit be at different levels of sales?
- What the selling price of a product should be
- Which alternative course of action should be taken?

Marginal Costing

This is an alternative method of costing to absorption costing. We use both in CVP Analysis. The principles of marginal costing are as follows:

- The total cost of a product can be divided into fixed cost plus variable cost
- Fixed or period costs are not affected by the volume of output
- If production is increased by one unit, costs will increase only by the variable cost of that one unit

When we produce and sell one extra unit the following is the outcome:

- Income (revenue) will increase by the amount of the sales value of the unit sold
- Costs will increase by the variable costs producing and selling the extra unit
- Profit will increase by the sales value of one unit minus the variable costs of one unit. In marginal costing this is referred to as **contribution**
- Variable cost in this context refers to the total variable cost of sales, not just the variable cost of production

Contribution

This is the amount each unit of sales contributes towards converting fixed costs and profit. It is the sales less the variable costs

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

Fixed costs as well as variable costs must be accounted for. When variable costs are deducted from sales revenue, the remainder contributes towards the fixed costs and the making of profit - hence the term "contribution".

Let's take a look at an example

James Ltd sells their product at €100. The variable cost of the product is €60 and the fixed cost per unit is €30.

Marginal Costing Statement for One Unit of a Product		
Sales	€	100.00
Less variable/ marginal cost of sales	€	60.00
Contribution	€	40.00
Less Fixed costs	€	30.00
Profit	€	10.00

The concept of contribution is central to marginal costing theory. From the marginal costing statement previous, it's clear each unit of product produced and sold provide a "contribution" towards (1) covering fixed costs and (2) making a profit.

The contribution earned goes initially to cover fixed costs, and when fixed costs have been recovered, all further contributions are profit.

Break Even Point (BEP)

This is the number of units that must be sold so that the sales revenue is equal to the total cost. Hence neither a profit nor loss is made. This is the point at which the profit is zero or the point at which the contribution equals the fixed costs.

Break-even point = Firm is making neither a profit or loss

The break-even point can be shown as either units or in sales revenue.

In our example above, each unit of product sold is earning a contribution of €40. Let us assume that the fixed costs for the year are €6,000.

How many units must we make and sell to recover the €6,000? I.e. how many units do we need to make and sell in order to break even?

$$\text{Break-even point} = \frac{\text{Fixed costs}}{\text{Contribution per unit}} = \frac{\text{€6,000}}{\text{€40}} = 150 \text{ units}$$

This means that if we make and sell 150 units we will neither make a profit or a loss, our total revenue will equal out total costs.

Level of sales required to reach profit target

Break-even analysis can be used to find out what level of production and sales is required in order to reach a predetermined profit target. This information can be very useful to the management of a company for future planning and decision making.

Level of sales required to reach profit target = $\frac{\text{Fixed costs} + \text{Profit target}}{\text{Contribution per unit}}$

Contribution per unit

Contribution/sales ratio

This is another formula we use to calculate the break-even point. It is used to find the BEP in sales revenue. It is a measure of the rate at which profit is being earned. We use it in marginal costing where the variable cost per unit and sales price per unit are not available.

The contribution/sales (C/S) ratio is also called the profit/volume (or P/V) ratio. It shows the contribution per €1 of sales. If the selling price per unit and the marginal cost per unit remain unchanged, then the C/S ratio is a constant.

This ratio can be used for many calculations in marginal costing e.g.

- Calculating break-even point
- Calculating level of sales required to reach target profit

Let's take a look at an example

Justin Ltd manufactures a component for the motor industry. Selling price per unit €10 variable cost per unit, €6 fixed costs are expected to be €24,000.

Using C/S ratio, calculate:

- a) The break-even point
- b) The sales volume required to produce a profit of €56,000

Contribution per unit is €10 - €6 = €4 per unit

Contribution/Sales ratio is $\frac{€4}{€10} = 40\%$

- a) Break-even point

Fixed costs = $\frac{€24,000}{40\%} = €60,000$ (or 6,000 units at €10 per unit)

- b) Sales volume required

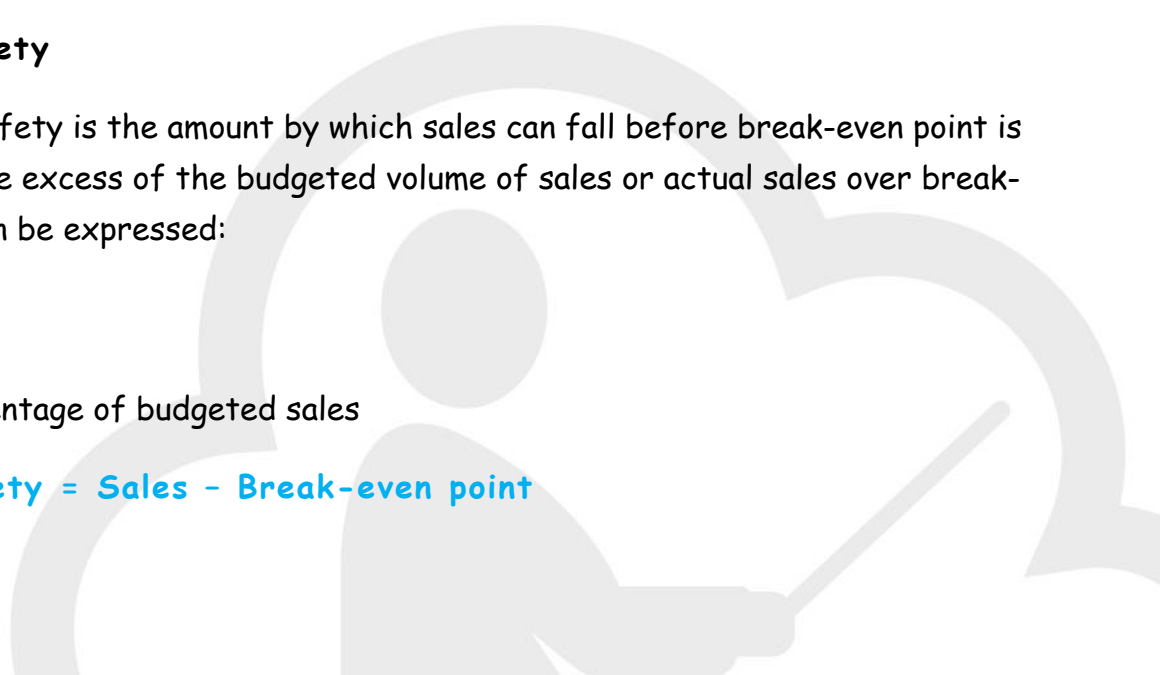
Fixed costs + Profit target = $\frac{€24,000 + €56,000}{40\%} = €200,000$ (or 20k units @ €10)

Margin of Safety

The margin of safety is the amount by which sales can fall before break-even point is reached. It is the excess of the budgeted volume of sales or actual sales over break-even point. It can be expressed:

- In units
- In euros
- As a percentage of budgeted sales

Margin of safety = Sales - Break-even point



It can be described as the buffer between sales and the break-even point. When expressed as a percentage it is more meaningful than when expressed in units.

Let's take a look at a question

Q21.1

Walker Ltd manufactures a single product. The following is the proposed budget for the year ended 31/12/2008:

Sales (20,000 units)		€300,000
Variable costs	€200,000	
Fixed costs	<u>€60,000</u>	<u>€260,000</u>
Profit		<u>€40,000</u>

You are required to:

- a) Prepare a marginal costing statement
- b) Calculate the sales price per unit
- c) Calculate the variable cost per unit
- d) Calculate the contribution per unit
- e) Calculate the break-even point in units
- f) Calculate the break-even point in sales revenue
- g) Calculate the margin of safety in units
- h) Calculate the level of sales in units and sales revenue that will give a profit of €55,000

Marginal Costing Statement	
Sales (20,000)	€ 300,000.00
Less variable costs	€ 200,000.00
Contribution	€ 100,000.00
Less Fixed Costs	€ 60,000.00
Profit	€ 40,000.00

Sale price per unit		
Sales	= $\frac{300,000}{20,000}$	= €15
Number of units sold	20,000	
Variable cost per unit		
Variable costs	= $\frac{200,000}{20,000}$	= €10
Number of units sold	20,000	
Contribution per unit (CPU)		
Contribution	= $\frac{100,000}{20,000}$	= €5
Number of units sold	20,000	
Break-even point in units (BEP)		
Fixed costs	= $\frac{€60,000}{5}$	= 12,000 units
CPU	5	
Break-even point in sales revenue		
BEP x Selling price = 12,000 units x € 15 = €180,000		
The margin of safety in units		
Sales Units - BEP Units = 20,000 - 12,000 = 8,000 units		

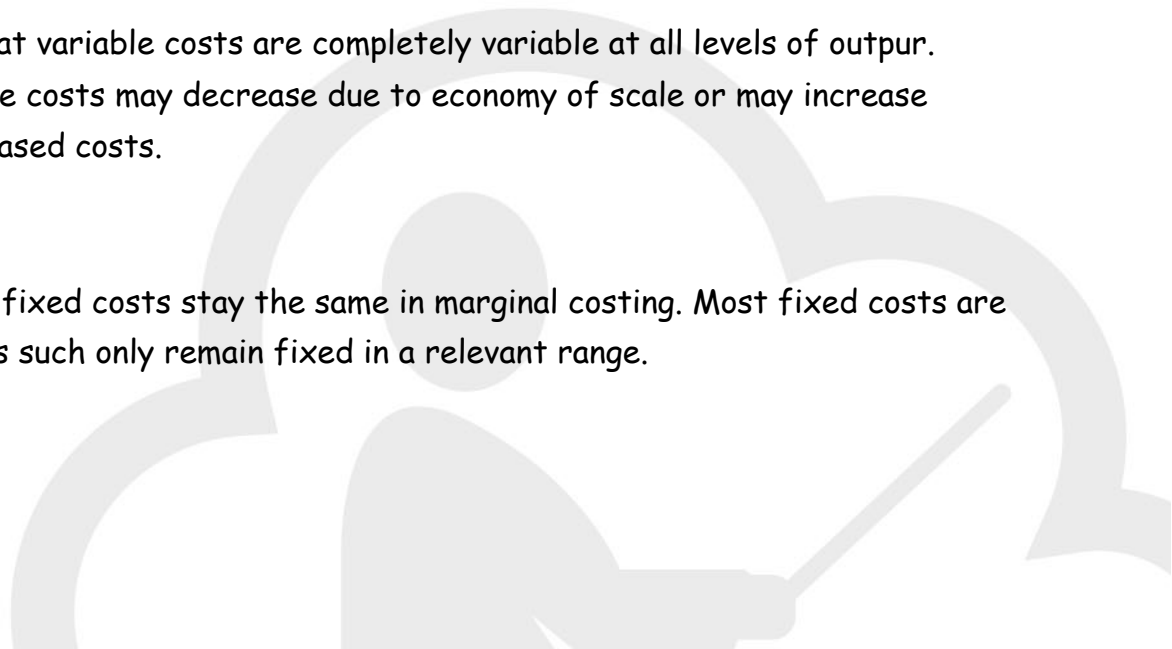
Limitations of Marginal Costing

Variable costs:

It is assumed that variable costs are completely variable at all levels of output. However, variable costs may decrease due to economy of scale or may increase because of increased costs.

Fixed costs:

We assume that fixed costs stay the same in marginal costing. Most fixed costs are step fixed and as such only remain fixed in a relevant range.



Mixed costs:

Mixed costs are assumed to be easily separated into fixed or variable. The high/low method can be used for this purpose but it is not always possible to do so.

Selling price:

It is assumed that the selling price per unit is constant. It does not allow for sales price variations due to discounts given for bulk sales etc.

Sales volume:

It assumes that production in a period usually equals sales and that there is no closing stock. Fixed costs are charged in total to a period and are not carried forward to the next period when valuing closing stock.

Marginal Vs Absorption Costing

- In marginal costing, fixed costs are charged in full to the period in which they have arisen, whereas in absorption costing, a share of fixed costs is carried forward into the next accounting period (i.e. closing stock)
- Closing stocks are valued higher in absorption because of the element of fixed costs and so accounts show higher profits as a result.
- Absorption costing must be used for financial accounting to comply with regulation
- Marginal costing is a very useful technique for decision-making purposes. This is because the contribution concept is a great aid to profit planning

Let's take a look at a question

Q21.2

Green Ltd intends to sell its product at €40 per unit. The variable cost of the product is €25 and fixed costs are €100,000.

You are required to:

- a) Calculate the C/S ratio
- b) Calculate the break-even point in units

- c) Calculate the break-even point in sales revenue
 d) Calculate the level of sales required to produce a profit of €55,000

Contribution/ Sales ratio	
Contribution = Sales - Variable costs = €40 - €25 = €15	
$\frac{\text{Contribution} \times 100}{\text{Sales}} = \frac{15 \times 100}{40} = 37.50\% \text{ or } 0.375$	

The BEP in units	
$\frac{\text{Fixed costs}}{\text{C/S ratio}} = \frac{100,000}{0.375} = €266,66.67 / 40 = 6,667 \text{ units}$	

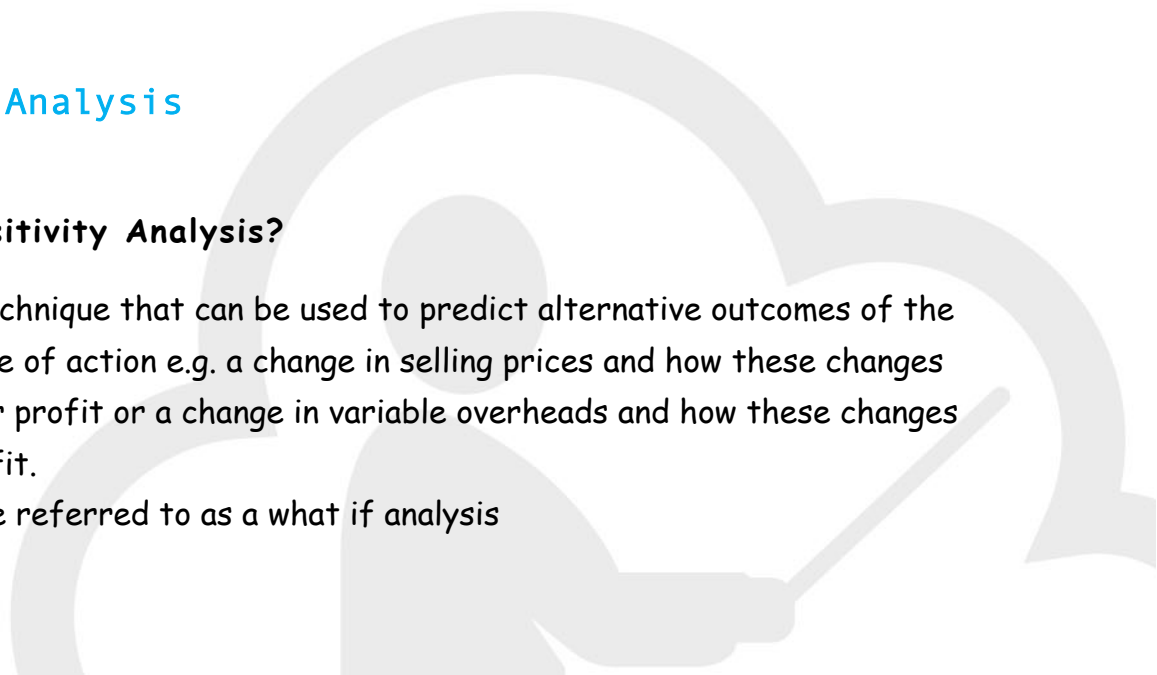
Break-even point in sales revenue	
BEP X Selling price = 6,667 x 40 = €266,680	

The level of sales revenue and units that will give a profit of €55,000	
$\frac{\text{Fixed costs} + \text{Profit target}}{\text{C/S ratio}} = \frac{100,000 + 55,000}{0.375} = €413,333.33$	
$€413,333.33 / €40 = 10,333.33 \text{ units} = 10,334 \text{ units}$	

Sensitivity Analysis

What is a Sensitivity Analysis?

- This is a technique that can be used to predict alternative outcomes of the same course of action e.g. a change in selling prices and how these changes affect your profit or a change in variable overheads and how these changes affect profit.
- May also be referred to as a what if analysis



Recap of Marginal Costing Formulae

Contribution Per Unit (CPU) = Sales - Variable Costs

Break-Even Point (BEP) = $\frac{\text{Fixed Costs}}{\text{CPU}}$

Contribution/Sales Ratio = $\frac{\text{Contribution}}{\text{Sales}}$

Margin of Safety = Sales - Break/Even Point (in units or €)

Margin of Safety percentage = $\frac{\text{Sales} - \text{Break-Even Point} \times 100}{\text{Sales}}$

Level of sales required to reach a profit target = $\frac{\text{Fixed Costs} + \text{Profit Target}}{\text{CPU}}$

Homework Ordinary
Q21.3

8. Marginal Costing



8. **Marginal Costing**

[80]

(a) **Selling Price per unit** = $\frac{770,000}{55,000 \text{ units}}$ = €14 per unit

[12]

Homework Higher

Q21.4

8. Marginal Costing

Ivor Ltd produces a single product. The company's profit and loss account for the year ended 31/12/2010, during which 90,000 units were produced and sold, was as follows:

€

€



80

Question 8

	€	€	€
Sales (90,000 units)		1,170,000	per unit 13.00
Less Variable Costs			
Direct materials	390,000		
Direct wages	236,000		
Factory overhead (40%)	[1] 32,800		
Selling expenses (5% of sales)	[1] 58,500	(717,300)	(7.93)

(e) Let the number of units = N
 Sales Revenue = $16N$
 Profit = $1.6N$

Sales	=	Variable Costs	+	Fixed Costs	+	Profit
$16N$ [2]	=	$8.12N$ [4]	+	$225,700$ [2]	+	$1.6N$ [4]
$6.28N$	=	$225,700$				
N	=	$35,939.49$				[2] 35,940 units

12

(f)

Limitations/assumptions: [7]

Variable costs are assumed to be completely variable at all levels of output. However variable costs may decrease due to economies of scale or may increase because of increased costs.

It is assumed that in marginal costing fixed costs remain the same although most fixed costs are step-fixed and are only fixed within a relevant range.

It is assumed that all mixed costs are easily separated into fixed or variable. The High Lo method can be used for this purpose but it is not always possible to do this.

It is assumed that the selling price per unit is constant and does not allow for discounts.

Production in a period usually equals sales. Fixed costs are charged in total to a period and are not carried forward to next period.

Step Fixed Cost

Step fixed costs are costs that are fixed within a certain range of activity but change outside of that range. E.g. Rent could be fixed up to a certain level of production. However, if production increases and results in the rental of more factory space, then the rent would increase to a new level. Thus the fixed costs would increase in steps.

Graph [5]

