

# BREAK EVEN ANALYSIS

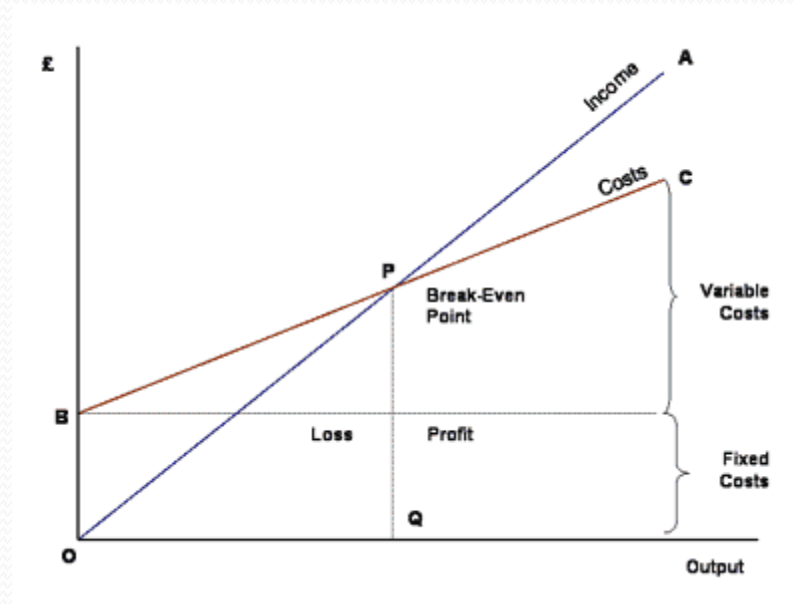
Break-even analysis is a technique widely used by production management and management accountants. It is based on categorising production costs between those which are "variable" (costs that change when the production output changes) and those that are "fixed" (costs not directly related to the volume of production).

Total variable and fixed costs are compared with sales revenue in order to determine the **level of sales volume, sales value or production at which the business makes neither a profit nor a loss (the "break-even point")**.

# BREAK EVEN CHART

- **The Break-Even Chart**
- In its simplest form, the break-even chart is a graphical representation of costs at various levels of activity shown on the same chart as the variation of income (or sales, revenue) with the same variation in activity. The point at which neither profit nor loss is made is known as the "break-even point" and is represented on the chart below by the intersection of the two lines:

# BREAK EVEN CHART



- In the diagram above, the line OA represents the variation of income at varying levels of production activity ("output"). OB represents the total fixed costs in the business. As output increases, variable costs are incurred, meaning that total costs (fixed + variable) also increase. At low levels of output, Costs are greater than Income. At the point of intersection, P, costs are exactly equal to income, and hence neither profit nor loss is made.

# FIXED COSTS

- Fixed costs are those business costs that are not directly related to the level of production or output. In other words, even if the business has a zero output or high output, the level of fixed costs will remain broadly the same. In the long term fixed costs can alter - perhaps as a result of investment in production capacity (e.g. adding a new factory unit) or through the growth in overheads required to support a larger, more complex business.

# *Examples of fixed costs*

- Rent and rates
- Depreciation
- Research and development
- Marketing costs (non- revenue related)
- Administration costs

# VARIABLE COSTS

- Variable costs are those costs which vary directly with the level of output. They represent payment output-related inputs such as raw materials, direct labour, fuel and revenue-related costs such as commission.
- A distinction is often made between "**Direct**" variable costs and "**Indirect**" variable costs.
- **Direct** variable costs are those which can be directly attributable to the production of a particular product or service and allocated to a particular cost centre. Raw materials and the wages those working on the production line are good examples.

# VARIABLE COSTS

- **Indirect** variable costs cannot be directly attributable to production but they do vary with output. These include depreciation (where it is calculated related to output - e.g. machine hours), maintenance and certain labour costs.



# SEMI VARIABLE COSTS

- Whilst the distinction between fixed and variable costs is a convenient way of categorising business costs, in reality there are some costs which are fixed in nature but which increase when output reaches certain levels. These are largely related to the overall "scale" and/or complexity of the business. For example, when a business has relatively low levels of output or sales, it may not require costs associated with functions such as human resource management or a fully-resourced finance department. However, as the scale of the business grows (e.g. output, number people employed, number and complexity of transactions) then more resources are required. If production rises suddenly then some short-term increase in warehousing and/or transport may be required. In these circumstances, we say that part of the cost is variable and part fixed.

# Strengths of breakeven analysis

- Focuses entrepreneur on how long it will take before a start-up reaches profitability – i.e. what output or total sales is required
- Helps entrepreneur understand the viability of a business proposition, and also those who will lend money to, or invest in the business
- Margin of safety calculation shows how much a sales forecast can prove over-optimistic before losses are incurred
- Helps entrepreneur understand the level of risk involved in a start-up
- Illustrates the importance of a start-up keeping fixed costs down to a minimum (higher fixed costs = higher break-even output)

# Limitations of breakeven analysis

- Unrealistic assumptions – products are not sold at the same price at different levels of output; fixed costs do vary when output changes
- Sales are unlikely to be the same as output – there may be some build up of stocks or wasted output too
- Variable costs do not always stay the same. For example, as output rises, the business may benefit from being able to buy inputs at lower prices (buying power), which would reduce variable cost per unit.
- Most businesses sell more than one product, so break-even for the business becomes harder to calculate
- Break-even analysis should be seen as a planning aid rather than a decision-making tool

# BREAK EVEN SIMPLE PROBLEM

- Here is a table showing the sales, variable costs, fixed costs and profits from various levels of output for a one-product business:
- The product is sold for £10 per unit. The variable cost per unit is £4. Fixed costs are £40,000 (the same at each level of output).



# TABLE TO UNDERSTAND THE BREAK EVEN POINT

Output	Sales	Variable Costs	Fixed Costs	Total Costs	Profit
'000	£'000	£'000	£'000	£'000	£'000
0	0	0	40	40	-40
1	10	4	40	44	-34
2	20	8	40	48	-28
3	30	12	40	52	-22
4	40	16	40	56	-16
5	50	20	40	60	-10
6	60	24	40	64	-4
7	70	28	40	68	2
8	80	32	40	72	8
9	90	36	40	76	14
10	100	40	40	80	20

# CALCULATION OF BREAK EVEN IN UNITS

- **Contribution per unit = selling price per unit less variable cost per unit**
- In our example, contribution per unit = **£10 less £4 = £6 per unit**
- Now apply the classic formula for calculating breakeven output:
- **Break-even output (units) = Fixed costs (£) / Contribution per unit (£)**
- So, break-even output = £40,000 divided by £6 = 6,666 units
- Note: break-even output is always expressed in terms of units
- **So break-even output = 6,666 units**

# CONTRIBUTION

- The concept of **contribution** is a crucial one in business. It focuses on the returns (contribution) a business makes from each unit of product sold and whether that return is enough to allow the business to make money overall after taking account of its fixed costs.
- Contribution looks at the profit made on individual products. It is used in calculating how many items need to be sold to cover all the business' costs (variable and fixed).

# CALCULATION OF CONTRIBUTION

- **Total Contribution is the difference between Total Sales and Total Variable Costs**
- ***Formulae:***
- **Contribution = total sales less total variable costs**
- **Contribution per unit = selling price per unit less variable costs per unit**
- **Total contribution can also be calculated as:**
- **Contribution per unit x number of units sold**



# CONTRIBUTION SIMPLE EXAMPLE

- Let's look at a simple worked example of contribution. Here is some information about a business that just sells one product:
- Selling price per unit £30
- Variable cost per unit £18
- Contribution per unit £12 (i.e. £30 less £18)
- Units sold 15,000
- Using the formulae, we can perform the following calculation:
- Contribution = £180,000 (i.e. £12 x 15,000 units)

# APPLICATIONS OF BREAKEVEN OR MARGINAL COSTING

- **.\_Optimum Sales Mix:**
- When a company is engaged in a number of products, there, may arise a problem of selecting most optimum product mix which would maximize the profit of the concern. Under such situation, profitability will improve by economizing the scare resource known as key factor.
- The product giving highest contribution per unit of key factor should be considered and then all products are put in ranks in order of priority. Selection of products will offer optimum product mix or which the profit will be maximum
- **The following guide lines will be helpful in this direction:**
- (i) Calculate contribution per unit of key factor.
- (ii) Assign ranks as per highest contribution per unit of key factor.
- (iii) Available key factor is to be utilized in the manufacture of first rank and so on.

# APPLICATIONS OF BREAK EVEN

- **2. Market Expansion:**
- Sales volume can be increased by taking new territories or by extending its own marketing organisation. It will require an extra expenditure. Marginal costing will be helpful in providing adequate and relevant data for taking a decision in this regard.

# APPLICATIONS OF BREAK EVEN OR MC

- **Make or Buy Decision:**
- **The nature of decision regarding make or buy may be of the following types:**
- (A) Every businessmen has to take a decision whether to manufacture the component in the factory or to buy it from the market. In such cases a comparison of marginal cost with that of buying price is to be made. Here only marginal cost is the relevant factor which is to be considered.
- If the marginal cost is less than buying price, additional requirement of component is to be made by making rather than buying it from the markets. Similarly, if buying price is less than the marginal cost, it will be advantageous to purchase it from the market.
- If the market price is less than the production cost, then the component should be purchased from the market.
- A decision has to be taken whether a component should be purchased from the market or it should be produced in the factory.
- If additional costs are less than the buying price, the component should be manufactured and vice versa.

# APPLICATIONS OF CVP

- **4. *Product Mix:***
- When any company produces a number of products, then a problem may arise of selecting most optimum product mix which would provide the maximum profits.
- **Before taking decision in product mix, the following principles are taken into account:**
  - (i) Available key factor should be utilized.
  - (ii) Calculate contribution per unit of key factor.
  - (iii) Assign ranks on the basis of highest contribution per unit of key factor.

# APPLICATIONS OF MC OR BREAK EVEN

- 5. Sales Mix:
- Problem of sales mix arises when a business concern is producing more than one product. Each product might be yielding different amount of contributions. The management goal is only to get maximum profit. The ratio of quantities to be sold various products in such a manner as to earn maximum profit. It is known as optimum sales mix. It is ascertained with the help of contribution per unit. The product which gives the highest contribution is given the highest priority. Out of the various sales mix, that sales mix is selected which provides the maximum profits.

# APPLICATIONS OF MC

- 6. Increase in Level of Activity:
- If any concern is not making adequate profit, the level of activity may be increased by reducing the price and removing the shortage of materials; shortage of skilled labour or market situations etc. In all these positions, marginal costing is taken into consideration

# APPLICATIONS OF MC

- *7. Dropping a Product:*
- The businessmen want to earn maximum profits out of his limited resources. It requires to fix priorities for various products. The management would like to drop the production of unprofitable product. It will be based on the comparative study of contributions made for each product



# DROPPING A PRODUCT

- **For this purpose, marginal contribution statement is prepared. In this connection the following points are taken into consideration:**
- (i) If any production is dropped, the contribution should be expressed in terms of per unit of key factor.
- (ii) The left unused capacity should be used in the production of other products.
- (iii) Production having highest contribution should be accepted top priority in production.
- (iv) If case of positive contribution, the, product should not be dropped.
- (v) Least contribution product should be dropped.

# APPLICATIONS OF MC

- **8. Suspension of Activities:**
- Sometimes due to competition or other reasons, the business concern may not be in a position to carry out its trading activities. Thus trading activities are suspended.
- **These suspension may be of two types as under:**
- (i) Temporary Suspension – During off season, trading activity is closed temporarily for short period. It is known as temporary suspension.
- (ii) Permanent – But when on account of depression, in case of continuous loss, the trading activity can be suspended permanently.

# APPLICATIONS OF MC

- **9. Sales Channel:**
- Sometimes the trader is faced with the problem of selecting the most profitable channel of distribution. With the help of marginal costing technique, the contribution may be ascertained and correct decision may be taken in time. Under it, that channel of distribution should be selected which may provide maximum contribution. Selling and distribution expenses should be considered as a part of marginal cost for calculating contribution.

# APPLICATIONS OF MC

- **10. Sales Promotion Scheme:**
- The management has to evaluate the profitability of various sales schemes which may cover trade discount free gifts, extra commission and price reduction etc. In all these cases, marginal costing will help in assessing the profit through contribution analysis. If goes to increase the total contribution, the profit in that case will be maximum

# APPLICATIONS OF MC

- **11. Profit Target:**
- **Marginal costing** is used by management in profit planning.
- **A profit target is fixed and management tries to achieve it by making changes in the factors given below:**
  - (i) Quantity sold
  - (ii) Variable cost per unit
  - (iii) Sales mix
  - (iv) Selling price
  - (v) Total fixed costs.
- With the help of marginal costing, the management can easily evaluate the desired profit and can examine the improvement in profit position
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# APPLICATIONS OF MC

- **12. Best Level of Activity:**
- Level of activity of business is expanded or contracted according to the market conditions. Management selects that level of activity which would provide maximum profits. The level of activity is optimum, where marginal cost equals to marginal revenue. The level of activity can be expanded up to the level where sales exceeds marginal costs.
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# APPLICATIONS OF MC

- **13. Introducing New Line of Product:**
- Whenever a new product is to be added the problem may arise that whether a new product is to be added or the new shape or new model is to be added. If there are many model then the management has to decide that which model should be selected.
- In such situation, the marginal cost of new product of all models should be considered. Some additional investment may be required which may increase the fixed cost.
- **The following guiding points are to be taken into consideration in making any decision:**
- (i) Contribution and profit for the new product and of all models should be considered.
- (ii) Return on additional investments regarding new products is to be compared with the old product.
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# APPLICATIONS OF MC

- 14. Discontinue of a Product:
- Marginal cost will help the management in taking a decision regarding continuance of a product from the market. Besides marginal cost, the other expenses are selling expenses, salesman commission, distribution expenses, advertisement etc. The selling price may differ from market to market. Discontinuance of a market will eliminate variable expenses but selling and distribution expenses are to be compared with the fixed expenses. Till any market yields contribution, it should not be discontinued.



# APPLICATIONS OF MC

- **15. Price Change:**
- It is contended that price in short term should cover total cost and profit. But in a competitive market, price is determined by the market forces. In this connection, marginal costing is helpful in price determination in short run.
- Price in long run should be as much as to cover total cost and normal profit. But in the competitive world, minimum price has to be determined. If any item of cost seems to be irrelevant, it should be ignored and should not be taken into account in determining the price.
- Under certain special circumstances price may be fixed as below cost. But this price should cover all variable costs and some part of fixed cost.
- In fixing the price, marginal cost, fixed cost and price are more important points. Price changes may hike in price or reduction in price. In both the cases, the quantity sold will be affected and it may affect the profit position. Management may be forced to take a decision, that how much quantity to be produced and sold, if price is reduced by certain amount. Similarly, it is to be decided that what production technique should be applied to reduce the burden of fixed costs.
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