

Cost Volume Profit analysis

1 Contribution and profit

Marginal costing (calculating the contribution per item by taking the sales price and deducting all variable production and selling costs) is a useful starting point for a wide variety of calculations used in management decision-making.

We illustrate this with the example of a product selling at a unit price of £15, with variable materials cost of £4 per unit and other variable costs of £2 per unit. Contribution is therefore £9 per unit (£15 – £4 – £2).

We suppose that fixed costs are £40,000 per period and proceed to deal with the following questions.

If 5,000 units are produced and sold what is the total contribution and the net profit?

$$\begin{array}{l} \text{Contribution} \\ \text{Profit} \end{array} \quad \begin{array}{l} = 5,000 \times \pounds 9 \\ = \pounds 45,000 - \pounds 40,000 \end{array} \quad \begin{array}{l} = \\ = \end{array} \quad \begin{array}{l} \pounds 45,000 \\ \pounds 5,000 \end{array}$$

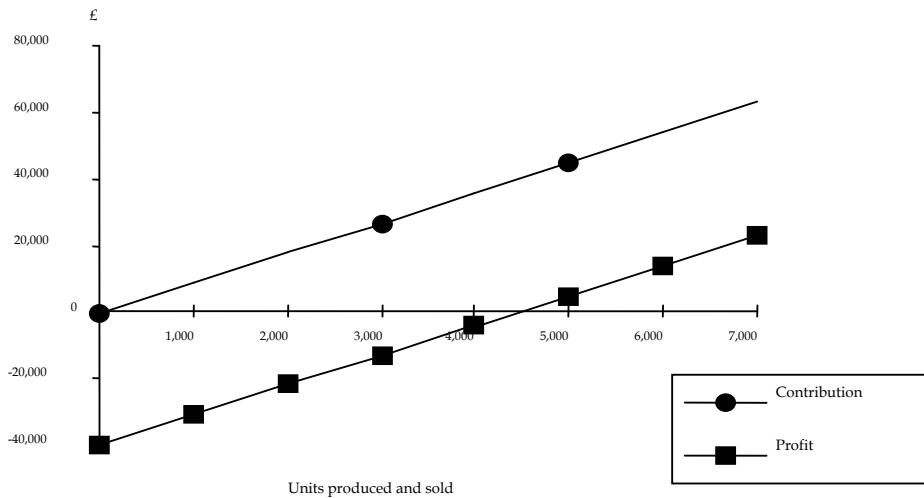
What is the total contribution and profit if 7,000 units are produced and sold?

$$\begin{array}{l} \text{Contribution} \\ \text{Profit} \end{array} \quad \begin{array}{l} = 7,000 \times \pounds 9 \\ = \pounds 63,000 - \pounds 40,000 \end{array} \quad \begin{array}{l} = \\ = \end{array} \quad \begin{array}{l} \pounds 63,000 \\ \pounds 23,000 \end{array}$$

What is total contribution and profit if 3,000 units are sold?

$$\begin{array}{l} \text{Contribution} \\ \text{Profit} \end{array} \quad \begin{array}{l} = 3,000 \times \pounds 9 \\ = \pounds 27,000 - \pounds 40,000 \end{array} \quad \begin{array}{l} = \\ = \end{array} \quad \begin{array}{l} \pounds 27,000 \\ \pounds (13,000), \text{ ie a loss of } \pounds 13,000 \end{array}$$

These results can be plotted on a chart as follows.



Notice that the two lines are parallel to one another. The steepness of the line represents the contribution per item; the vertical distance between the two lines represents the fixed costs. In other words if you know the total contribution, subtract £40,000 to arrive at the net profit. If zero units are made then no contribution is earned, but all the fixed costs must still be paid, resulting in a loss of £40,000.

2 Breakeven analysis

The breakeven point (sometimes abbreviated to BEP) is the amount of sales (in units or in revenue) that a business must achieve in order to break even, to make £0 profit or loss.

From the graph on the previous page, if we look at the point at which the profit line crosses zero we could read this as approximately 4,500 units. Therefore if the company can sell more than about 4,500 units, they will make a profit.

In addition to graphing the contribution and profit, the breakeven point can also be calculated as follows.

$$\text{Breakeven point} = \text{fixed costs} / \text{contribution per unit}$$

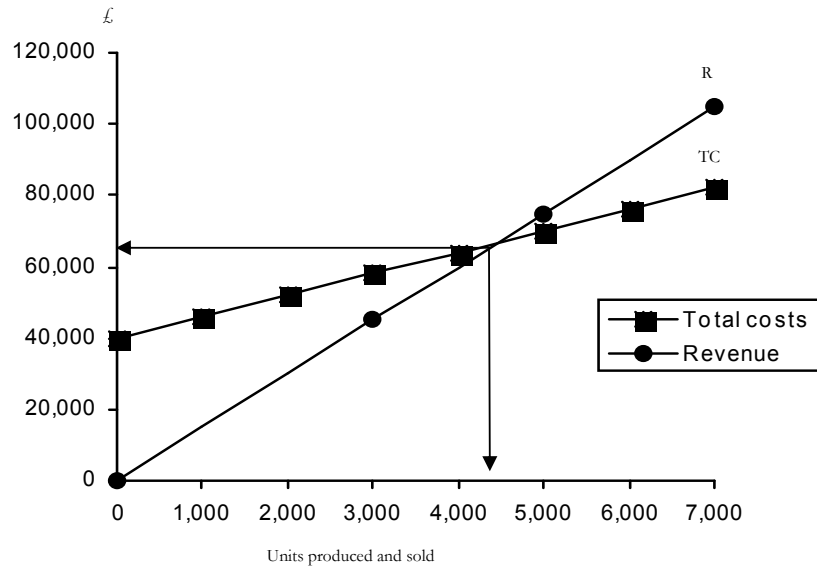
In our example remember that contribution is £9 per item and fixed costs were £40,000. The breakeven point can then be calculated as follows. $\text{£}40,000 / \text{£}9 = 4,444$ units

This calculation confirms our earlier approximation derived from inspection of the graph.

The following table shows the level of revenue, variable costs, fixed costs and total costs for various levels of output.

Units	Revenue £	Variable costs £	Fixed costs £	Total costs £	Profit £
0	0	0	40,000	40,000	-40,000
3,000	45,000	18,000	40,000	58,000	-13,000
5,000	75,000	30,000	40,000	70,000	5,000
7,000	105,000	42,000	40,000	82,000	23,000

Breakeven chart (indicating breakeven point)



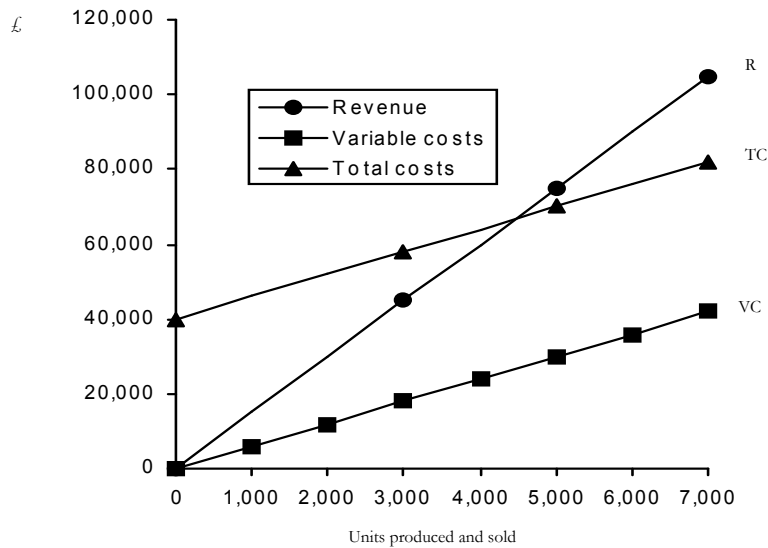
From this chart we can see that the breakeven point is about 4,500 units or £66,000.

We can also read off the amount of profit or loss at any point by looking at the difference between the total revenue and total cost lines.

A similar graph is called a contribution chart and shows sales revenue, total costs and variable costs (ie variable instead of fixed costs).

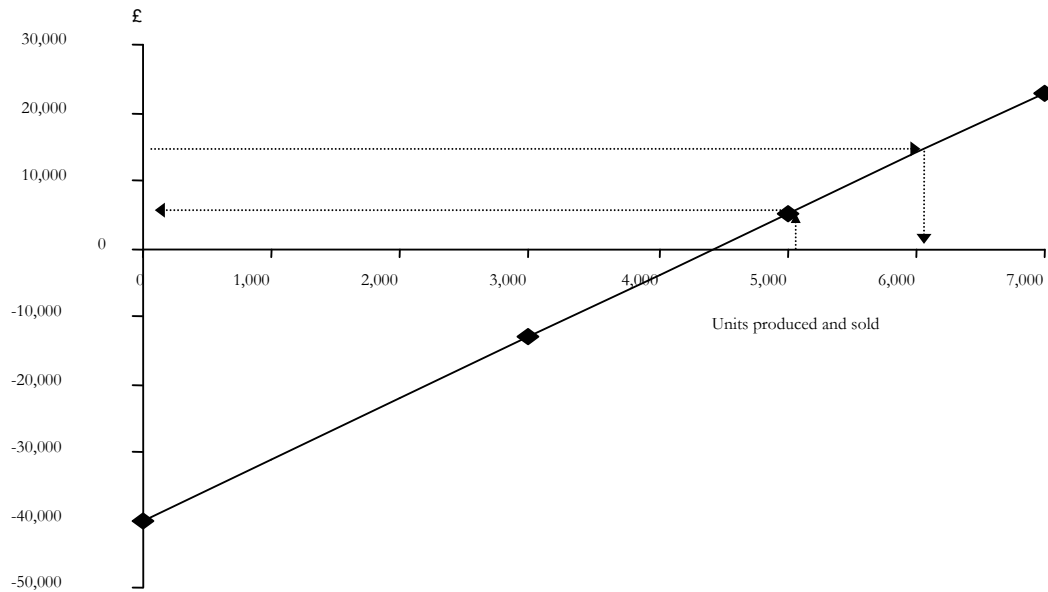
To plot this graph, draw in total variable costs and then move the line up by the amount of fixed costs (in this case £40,000).

Contribution chart



Again, breakeven units and revenue can be found directly from the graph as well as profit or loss at any point, using the same method as above. Perhaps the most useful graph is called the profit/volume chart. This simply shows the profit at each level of production and sales. The best way to draw it is to calculate total contribution at various production levels and then subtract fixed costs to get total profit at each point.

Profit/volume chart



To find the profit at any particular production level, go up from the units produced to the profit line (upward arrow) and along to read off the profit (arrow pointing left). For example we could read off how much profit will be made if we produce 5,000 units. Start at 5,000 units, go up to the profit line and then draw a horizontal line along to read off the profit (about £5,000).

3 Contribution/sales ratio (C/S ratio)

This ratio is also used to calculate the breakeven point but gives the answer in terms of sales revenue rather than units.

The calculation can be done as either contribution per unit divided by sales per unit or total contribution divided by total sales revenue (used when more than one product is being sold).

Breakeven revenue = fixed costs ÷ C/S ratio.

In the previous example, sales price = £29, contribution = £15, and fixed costs = £60,000.

$$\text{C/S ratio} = \frac{£15}{£29} = 0.517$$

$$\text{Breakeven revenue} = \frac{£60,000}{0.517} = £116,000$$