

# Short-Term Decisions

The most likely tasks in this area fall into the following groups:

- ☞ Break-even analysis
- ☞ Limiting factor analysis

## **Break-Even Analysis**

The break-even point is the level of output or sales which must be achieved for the business to make neither a profit nor a loss. In other words, the revenue earned from sales is just enough to cover the total costs.

To calculate break-even point, it is assumed that all costs are either fixed or variable (mixed costs are broken down into fixed and variable components as described above). Contribution is then defined as follows:

$$\text{Contribution} = \text{sales revenue} - \text{variable costs}$$

*(per unit OR in total)*

The idea is straightforward – if an extra item is made and sold, it will generate extra revenue (the selling price). This revenue will first be used to pay off the extra costs caused by this unit (the variable cost per unit), and any remaining revenue *contributes* towards paying off the fixed costs, and hopefully making a profit.

Break-even point can then be re-defined as the level of output where contribution is just enough to cover fixed costs, and may be calculated as follows:

$$\text{Break-even point (in units)} = \frac{\text{Fixed Costs}}{\text{Contribution per unit}}$$

## **Example**

The single product manufactured by a business sells for £50 per unit. Materials cost £20 per unit, and labour costs £10 per unit. Fixed costs for the forthcoming period are estimated at £40,000.

Calculate the number of units which must be made and sold in order to break even.

## **Solution**

The fixed costs are given as £40,000.

Contribution per unit = selling price – variable costs = £50 – (£20 + £10) = £20 per unit

Break-even point is therefore  $\text{£}40,000 / \text{£}20 = 2,000$  units

Whilst not required, this can be checked by preparation of a simple profit and loss account:

Sales	2,000 @ £50		100,000
Material costs	2,000 @ £20	40,000	
Labour costs	2,000 @ £10	20,000	
Fixed costs		40,000	
		-----	
			100,000
			-----
Profit/Loss			NIL
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Break-even is a useful short-term decision making tool. The expected level of output/sales will be compared to the break even point – if the business expects to sell more than break-even, it is worthwhile to go ahead.

However, the business may be concerned about its estimates of demand. In the above example, break-even point was 2,000 units. If the business expects to sell 30,000 units, it will almost certainly be safe to proceed. If it only expects to sell 2,500 units, it may be a little concerned – a relatively small downturn in demand may give rise to losses.

The **margin of safety** considers this aspect of the decision, and is defined as the difference between the break-even point and expected output.

If expected sales are 2,500 units, the margin of safety is  $2,500 - 2,000 = 500$  units.

Expressed as a percentage of expected results this is  $500 / 2,500 \times 100 = 20\%$

Both measures say the same thing, but in a slightly different way – expected demand can fall by up to 500 units, or up to 20%, before losses are made.

The higher the margin of safety, the safer the decision.

A further extension of break-even analysis recognises that businesses exist to make profits. Selling enough to just break even is not enough – a more realistic question asks how many must be made and sold to earn a certain **target profit**.

The solution is based on a small adaptation to the basic break-even calculation. Rather than earning enough contribution to simply cover fixed costs, extra contribution is now required:

$$\text{Required output/sales (units)} = \frac{\text{Fixed costs} + \text{target profit}}{\text{Contribution per unit}}$$

In the above example, suppose the business wants to make a profit of £20,000.

$$\text{Required output/sales} = (\text{£}40,000 + \text{£}20,000) / \text{£}20 = 3,000 \text{ units}$$

As a check, realise that this is 1,000 units higher than break-even. Each of those 1,000 units generates a positive contribution of £20, and the higher output will not affect fixed costs.

So, starting from a position of no profit or loss, an extra 1,000 units will generate

$$1,000 \times £20 = £20,000$$

Finally, break-even may be considered from a different viewpoint. The **profit-volume ratio** (or **contribution-sales ratio**) is defined as follows:

$$\text{PV or CS ratio} = \frac{\text{Contribution per unit}}{\text{Selling price per unit}}$$

This may then be used to work out break-even point as follows:

$$\text{Break-even sales revenue} = \frac{\text{Fixed costs}}{\text{PV or CS ratio}}$$

In the above example, the PV or CS ratio is £20 / £50 = 0.4 (or 40%)

Break-even sales revenue is therefore £40,000 / 0.4 = £100,000

To check this, recall that break-even was previously calculated as 2,000 units, each of which will sell for £50, and 2,000 x £50 = £100,000.