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# Break-Even Analysis for Management Decision-Making

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Break-even analysis can help management decide among many financial alternatives. Several decisions are aided by break-even analysis, such as those relative to pricing and machinery or equipment purchasing.

Break-even analysis can help management make a decision, but it should never be used alone. Break-even analysis does not necessarily consider cash flow or alternative uses for unused capacity, labor or cash. Break-even analysis is valuable as a preliminary decision-making tool.

## Basic concepts

The principle idea behind break-even analysis is that all costs are variable (which means they vary with output), fixed (which means they are relatively constant over time) or a combination of both.

Theoretically, after fixed costs are covered, each dollar of sales will have to cover only variable costs. The break-even point at which a firm makes no profit or sustains no loss can be computed or it can be determined from a graphic presentation of the relationship between revenue, cost and volume of productive capacity (see Figure 1). In either case, the information required is:

- Total estimated fixed costs and expenses for a future period, such as a year, and
- The total estimated variable costs and expenses for the same period, stated as a percent of net sales.

Break-even Point (in \$) = Fixed Costs (in \$) + Variable Costs (as % of Break-even Sales)

Because most firms desire to make a profit and not just break even, a profit should be added to the variable costs. This reduces the gross profit, which in turn raises the break-even volume. The resulting break-even volume thus becomes the target volume necessary to achieve the firm's profit objective. If the firm is able to sell the higher volume, profit will be made if costs remain linear.

# Concept of linearity

Linearity assumes variable costs per unit remain the same over some relevant range. Linearity also assumes fixed costs are constant throughout the same relevant range. This means the firm has sufficient capacity to produce without adding significant amounts of plant or equipment.

Labor is considered a variable cost, so additional labor does not affect linearity. But, if higher production requires another shift with additional supervision, linearity may be violated. If higher production requires new or additional pieces of equipment, fixed costs will increase and the break-even analysis will have to be recalculated. Break-even analysis is valid only through a relevant range of normal activity.

## An example:

If a firm has total sales of \$75,000, fixed costs (FC) of \$20,000 and variable costs (VC) of \$45,000, the break-even point (BE) is:

$$\begin{aligned} \text{BE} &= \text{FC} \div (1 - (\text{VC} \div \text{corresponding sales})) \\ &= 20,000 \div (1 - (45 \div 75)) \\ &= 20,000 \div 0.4 \\ &= 50,000 \end{aligned}$$

If management considers a major change in equipment that will add \$10,000 to fixed costs, fixed costs will be raised to \$30,000. This will reduce direct labor costs an estimated 37.5 percent. With a current sales level of \$75,000, this would be a \$7,500 reduction in labor costs or a \$37,500 decrease in variable costs. The break-even point for the new cost relationship would be:

$$\begin{aligned} \text{BE} &= 30,000 \div (1 - (37,500 \div 75,000)) \\ &= 30,000 \div 0.5 \\ &= 60,000 \end{aligned}$$

If management feels sales will not increase, and if no other benefits will accrue, it might decide to postpone the investment.

Higher fixed costs due to new equipment may be offset by increased production. The equipment may allow production of more products, lower the price and allow more profit.

Break-even analysis can help a firm answer questions like these and more. Remember, however, break-even analysis is only a tool to be used with care; it is not intended to be used alone.

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