Cost-Volume-Profit Analysis

(Contribution Margin)

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What Is Cost-Volume-Profit (CVP) Analysis?

Cost-volume-profit (CVP) analysis is a method of evaluating the impact that varying levels of costs and volume have on a company's operating profit.

A widely used technique to study CVP relationship is break-even analysis (BE). The break-even analysis shows the relationship between costs and profits with sales volume. The sales volume that equates the total revenues with the total related costs and results in neither profit nor loss is called the BE sales point. If costs are assumed to be at zero sales point. BEP would be at zero at zero sales. If all costs are fixed, profit would vary disproportionately with sales and BEP would be at a point where total sales revenues equal fixed costs.

What Is Cost-Volume-Profit (CVP) Analysis?

Key Takeaways

- Cost-volume-profit (CVP) analysis is used to find out how changes in variable and fixed costs impact a firm's profit.
- Companies can use CVP analysis to see how many units they need to sell to break even (cover all costs) or, alternatively, how many units they need to sell to reach a certain minimum profit margin.
- CVP analysis can also be used to calculate the contribution margin of a firm's products; the contribution margin is the difference between total sales and total variable costs.
- For a business to be profitable, its contribution margin must exceed its total fixed costs of production.
- BEP may, thus, be defined as a point at which total revenues are exactly equal to total costs.

Understanding Cost-Volume-Profit (CVP) Analysis

Cost-volume-profit (CVP) analysis, also referred to as breakeven analysis, can be used to determine the breakeven point for different sales volumes and cost structures. The breakeven point is the number of units that need to be sold—or the amount of sales revenue that has to be generated—to cover the costs required to make the product.

CVP analysis can be useful for companies when making short-term business decisions. Running a CVP analysis involves using several equations for price, cost, and other variables; these equations are plotted on a graph.

Objectives of CVP analysis

- Assist the managers to forecast profits accurately
- The analysis is also helpful in setting up flexible budget which indicates cost at various levels of activities.
- It can assist in evaluating performance for the purpose of control measures put in place by the management
- The analysis may also assist the management in formulating pricing policies by projecting the effect of different price structures on cost and profit.

Assumptions of CVP analysis

- Volume is the only factor affects sales and variable costs
- Total costs can be divided into fixed and variable components
- There is linear relationship between revenue and cost.
- The unit selling price, unit variable costs and fixed costs are constant
- There is a single product, that is being produced
- Revenues and costs can be compared without the need for determination of their present values.
- Technology remains constant during the period of evaluation

CVP approaches

- There are 3 approaches to the CVP analysis:
  - Cost and revenue equations
  - Contribution margin
  - Profit graph

Cost and revenue equations

- Contribution = Sales – marginal costs
- Profit = Contribution – Fixed costs
- Contribution = Profit + Fixed costs
- :Sales – Marginal costs = Profit + Fixed costs
- Profit = Sales – Marginal costs – Fixed costs
- Profit = (selling price –variable cost) *No. of units – Fixed costs

BREAK EVEN ANALYSIS FORMULA

$$\text{Break Even (Quantity)} = \frac{\text{Total Fixed Expense}}{\text{Sales Price Per Unit} - \text{Variable Cost Per Unit}}$$

$$\text{Break Even (Dollar)} = \frac{\text{Total Fixed Expense}}{\text{Contribution Margin Ratio}}$$

$$\text{Contribution Margin Ratio (CM Ratio)} = \frac{\text{Total Contribution Margin}}{\text{Total Sales}}$$

Contribution Margin Per Unit = Sales Price Per Unit – Variable Cost Per Unit

Total Contribution Margin = Total Value of Sales – Total Variable Cost

Cost-Volume-Profit (CVP) Analysis Formula

One key CVP formula is the formula used to calculate a company's breakeven point. The breakeven sales volume formula is:

Breakeven Sales Volume=FC/CM

where:

CM=Contribution margin=Sales−Variable Costs

FC=Fixed costs

For example, a company with $100,000 of fixed costs and a contribution margin of 40% must earn revenue of $250,000 to break even.

In addition to calculating the breakeven point, the formula above can also be tweaked to determine a company's target sales volume (in order to achieve its target profit): Add a target profit amount per unit to the fixed-cost variable of the formula.

For example, if the previous company desired a profit of $50,000, the necessary total sales revenue is found by dividing $150,000 (the sum of fixed costs and desired profit) by the contribution margin of 40%. This example yields a required sales revenue of $375,000.

Contribution margin approach

- Recall:
  - Sales – marginal cost = Fixed costs + profit
  - :Selling price – variable cost per unit = contribution margin
- Number of units that needs to be sold to achieve a profit target:

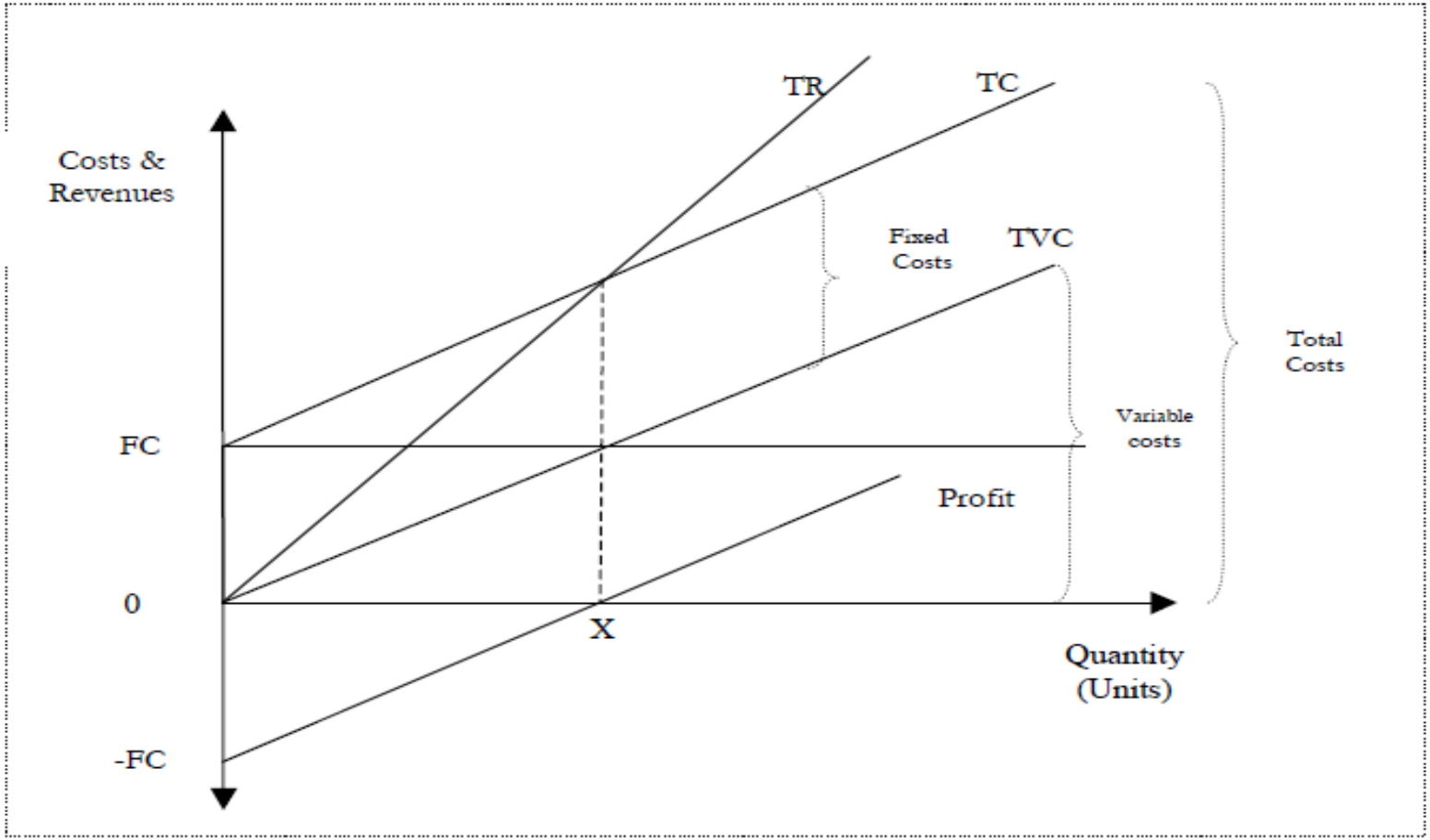
$$= \frac{fixed\ costs + profit}{contribution\ margin}$$

- Contribution margin ratio =:

$$= \frac{contribution\ per\ unit}{Selling\ price} * 100\%$$

- Profit = contribution margin ratio*Units of sales – fixed costs

Profit graph



Margin of safety

- Margin of safety is the excess of budgeted sales over the break-even sales. It is the extent by which sales can decrease/drop before losses begin.
  - Margin of safety = Total budgeted sales – Break-even sales
- It can be expressed as a percentage:

$$\text{Margin of safety} = \frac{Margin\ of\ safety, in\ shillings}{Total\ sales} * 100\%$$

Problem and Solution:

- Problem – 1

The following information is given for the calculation of break-even point:

Sales price per unit	Tk 5.00
Variable cost per unit	Tk 3.00
Contribution margin per unit	Tk 2.00
Fixed costs	Tk 24,000

You are required to:

(i) Calculate the break-even point and desired sales volume;

(ii) The desired profit is Tk 30,000 and;

(iii) The desired profit after income-tax is Tk 20,000 and income-tax is 50%.

Problem and Solution:

Solution – 1

$$\text{BEP (on Tk)} = \frac{\text{Tk. } 24000}{40\%\left(\frac{Tk.2}{Tk5}\text{X}100\right)} = \text{Tk. } 60{,}000$$

(i) Desired sales volume to earn profit of

$$\text{(a)Tk. } 30000 = \frac{Tk.2400 + Tk.30{,}000}{40\%} = \text{Tk. } 1{,}35{,}000$$

$$\text{(ii)} \quad \text{Tk. } 20{,}000 = \frac{Tk.24000 + \frac{Tk\ 20000}{1 - Tax\ Rate}}{40\%} = Tk = \text{Rs. } 1{,}60{,}000$$

Problem and Solution:

- Problem – 1

The following information is given for the calculation:

(i) Break-even point expressed in amount of sales in Taka.

(ii) Number of units that must be sold to earn a profit of Tk 60,000 per year.

,Sales price per unit	Tk 20.00
Variable cost per unit	Tk 11.00
Contribution margin per unit	Tk 3.00
Fixed factory overhead	Tk 5,40,000 per year
Fixed selling costs	Tk 2,52,000 per year

Problem and Solution:

i) BEP (amount) $= \frac{Fixed\ factory\ overhead + fixed\ selling\ costs}{\frac{P}{V}\ ratio\ [\frac{Sales\ price - Variable\ manufacturing\ cost - Variable\ selling\ cost}{Sale\ Price}}$

$= \frac{Tk.5{,}40{,}000 + Tk.2{,}52{,}000}{30\%[\frac{Tk.6}{Tk.20}]}$ = Tk. 26,40,000

I. Desired sales volume (in units) to earn profit of Rs. 60,000

$= \frac{Tk.7{,}92{,}000 + Tk.60{,}000}{TK.6\ (MC\ per\ unit)}$ =Tk. 8,52,000/Tk.6 = 1,42,000 units

Problem and Solution:

- Problem –2

A firm manufactures and sells a standard size of steel trunks. The raw material and direct labour costs are Tk 50 per trunk. The fixed expenses, consisting of rent, depreciation and salaries, etc come to Tk 20,000. The trunks are sold at Tk 90 a piece. How many trunks must be sold by the firm to break-even?

If the firm is working at full capacity (1,000 trunks) what will be its margin of safety?

Problem and Solution:

- Problem – 3

Markwell Ltd. Manufactures filing cabinets. For the current year, the company expects to sell 4,000 cabinets involving a loss of Tk 2,00,000. Only 40% of the plant normal capacity is being utilised during the current year. The fixed costs for the year are Tk 10,00,000 and fully variable costs are 60% of sales value.

You are required to:

(i) Calculate the break-even point;

(ii) Calculate the profit if the company operates at 70% of its normal capacity

(iii) Calculate the sales required to achieve a profit of Tk 60,00,000;

(iv) Calculate the revised break-even point if the existing selling prices are decreased by 10%, the total fixed and variable expenses remaining the same.

Problem and Solution:

- Problem – 4

The Taylor Company products two products, A and B. Expected data for the first year of operation are:

Data	A	B
Expected sales (units)	8,000	12,000
Selling price	Tk 45	Tk 55
Variable costs	Tk 30	Tk 35
Total fixed casts are expected to be Tk 3,60,000 for the year		

You are required to:

(i) If sales, prices and costs are as expected, what will be the operating income and break-even volume in sales revenue?

(ii) Assume that prices and costs were as expected but Taylor sold 12,000 units of A and 8,000 units of B . Recalculate the operating income and break-even volume in sales revenue.

Thank you