**Chapter: CVP Analysis**

**What is a Variable Cost?**

A variable cost is a corporate expense that changes in proportion to production output. Variable costs increase or decrease depending on a company's production volume; they rise as production increases and fall as production decreases.

Examples of variable costs include the costs of [raw materials](https://www.investopedia.com/terms/r/rawmaterials.asp) and packaging. A variable cost can be contrasted with a [fixed cost](https://www.investopedia.com/terms/f/fixedcost.asp).

## What is a Fixed Cost?

A fixed cost is a cost that does not change with an increase or decrease in the amount of goods or services produced or sold. Fixed costs are expenses that have to be paid by a company, independent of any specific business activities.

Examples of fixed costs include the rents, salary of staff.

### Differences between fixed cost and variable cost

| **BASIS FOR COMPARISON** | **FIXED COST** | **VARIABLE COST** |
| --- | --- | --- |
| Meaning | The cost which remains same, regardless of the volume produced, is known as fixed cost. | The cost which changes with the change in output is considered as a variable cost. |
| Nature | Time Related | Volume Related |
| Incurred when | Fixed costs are definite, they are incurred whether the units are produced or not. | Variable costs are incurred only when the units are produced. |
| Unit Cost | Fixed cost changes in unit, i.e. as the units produced increases, fixed cost per unit decreases and vice versa, so the fixed cost per unit is inversely proportional to the number of output produced. | Variable cost remains same, per unit. |
| Behavior | It remains constant for a given period of time. | It changes with the change in the output level. |
| Combination of | Fixed Production Overhead, Fixed Administration Overhead and Fixed Selling and Distribution Overhead. | Direct Material, Direct Labor, Direct Expenses, Variable Production Overhead, Variable Selling and Distribution Overhead. |
| Examples | Depreciation, Rent, Salary, Insurance, Tax etc. | Material Consumed, Wages, Commission on Sales, Packing Expenses, etc. |

**Contribution margin** (CM) is the selling price per unit minus the variable cost per unit. "Contribution" represents the portion of sales revenue that is not consumed by variable costs and so contributes to the coverage of fixed costs. The contribution margin is computed as the selling price per unit, minus the [variable cost](https://www.investopedia.com/terms/v/variablecost.asp) per unit. Also known as dollar contribution per unit, the measure indicates how a particular product contributes to the overall profit of the company. It provides one way to show the profit potential of a particular product offered by a company and shows the portion of sales that helps to cover the company's fixed costs. Any remaining revenue left after covering fixed costs is the profit generated.

## The Formula for Contribution Margin is

The contribution margin is computed as the difference between the sale price of a product and the variable costs associated with its production and sales process.

Contribution Margin=Sales Revenue − Variable Costs

The above formula is also used as a ratio, to arrive at an answer in percentage terms, as follows:

Contribution Margin Ratio = (Sales Revenue − Variable Costs)/Sales Revenue​

## Objectives of CVP analysis

Earning of profit depends on the efficient management of cost because each unit sold has its specific cost controlling of cost through efficient management; on the other hand, it depends on the quantum of output. The main objective of the cost-volume-profit analysis is to help management make important decisions revealing the interrelationship among the volume of output and sales, cost, and profit. In other words, cost-volume-profit analysis is an important tool through which the management can have an insight into the effects on profit due to variations in cost and volume of sales for taking appropriate decisions.

The objectives achieved by such analysis may also be identified as its benefits. These objectives or advantages of cost-volume-profit analysis are as follows:

1. Profit planning;
2. Help in preparation of flexible budgets;
3. Ascertainment of no profit and no loss level;
4. Ascertainment of optimum product mix;
5. Taking pricing decisions;
6. Production planning;
7. Taking other managerial decisions;
8. Help in controlling cost;
9. Achieving efficiency;

## Assumptions of CVP

### Basic Assumptions of CVP Analysis

Several assumptions commonly underlie CVP analysis:

1. The selling price is constant. The price of a product or service will not change as volume changes.
2. [Costs are linear and can be accurately divided into variable and fixed elements](https://www.iedunote.com/cost). The variable element is constant per unit, and the fixed element is constant in total over the entire relevant range.
3. In multiproduct companies, the sales mix is constant.
4. In manufacturing companies, inventories do not change. The number of units produced equals the number of units sold.

**Limitations of CVP**

Despite being considered as an important tool for decision making and planning the cost-volume-profit analysis, the technique has the following limitations:

1. Problems in identifying fixed and variable costs.
2. [Fixed costs not always fixed](https://www.iedunote.com/cost-behavior).
3. Proportionate relation between variable cost and volume of output not always effective.
4. Unit selling price not always constant.
5. Not suitable for a multiproduct firm.
6. Ignoring the influence of other factors on cost and profit.
7. Presence of inventory.
8. Not effective in the long run.
9. More emphasis on sales.
10. A statistic tool.

**Equation:**

1. Contribution Margin = Sales – Variable Expenses
2. CM ratio = Unit CM / Unit Sales Price
3. Variable expenses ratio = Unit Variable Expenses / Unit Sales Price
4. Breakeven point =

Profit = Unit CM \*Q – Fixed Cost

OR

Profit = CM Ratio \*Q – Fixed Cost

1. Margin of Safety = Total Sales – Breakeven Sales
2. Degree of Operating Leverage = Contribution Margin/ Net Operating Income

Problem 01

Following is the contribution format income statement of Paradise Company Ltd. for the month July, 2021.

|  |  |  |
| --- | --- | --- |
| Particulars | Tk. | Tk. (per unit) |
| Sales (80,000 units) | 64,00,000 | Tk. 80 per unit. |
| Variable expenses | 40,00,000 | Tk. 50 per unit. |
| Contribution margin | 24,00,000 | 30 |
| Fixed costs | 18,00,000 |  |
| Net operating income | 6,00,000 |  |

You are required to:

1. Compute the company’s CM ratio, variable expenses ratio, monthly break-even point in units and in Taka sales, company’s margin of safety in both taka and percentage form and company’s degree of operating leverage at the present level of sales.
2. If you want to earn a target profit of Tk. 7,50,000, how many units would have to be sold in each month to do that?

**Solution:**

i.

Calculation of CM ratio = 30/80 =0.375 = 37.5%

Calculation of variable expenses ratio = 50/80 =0. 625 = 62.5%

Breakeven point =

Profit = Unit CM \*Q – Fixed Cost

=) 0 = 30 Q – 18,00,000

=) Q = 18,00,000/30

=) Q = 60,000 Units.

Or.

Profit = Unit CM Ratio \*Q – Fixed Cost

=) 0 = 37.5 % Q – 18,00,000

=) Q = 18,00,000/37.5%

=) Q = 48,00,000 Tk.

Margin of Safety = Total Sales – Breakeven Sales

= 64,00,000 – 48,00,000

= 16,00,000 Tk.

In % :

(16,00,000/64,00,000)\*100

= 25%

Degree of operating leverage = Contribution Margin/ Net operating income

= 24,00,000 / 6,00,000 = 4 Times

ii.

Profit = Unit CM \*Q – Fixed Cost

=) 7,50,000 = 30 Q – 18,00,000

=) Q = 22,50,000/30

=) Q = 85,000 Units

Or.

Profit = Unit CM Ratio \*Q – Fixed Cost

=) 7,50,000 = 37.5 % Q – 18,00,000

=) Q = 22,50,000/37.5%

=) Q = 60,00,000 Tk.

Problem 02

Following is the particulars of Paradise Company Ltd. for the month July, 2021.

|  |  |
| --- | --- |
| Particulars | Tk. |
| Sales (80,000 units) | 80 per unit |
| Variable expenses | 50 per unit |
| Fixed costs | 18,00,000 |

You are required to:

1. Prepare the contribution format income statement of Paradise Company Ltd.
2. Compute the company’s CM ratio, variable expenses ratio, monthly break-even point in units and in Taka sales, company’s margin of safety in both taka and percentage form and company’s degree of operating leverage at the present level of sales.
3. If you want to earn a target profit of Tk. 7,50,000, how many units would have to be sold in each month to do that?

**Solution:**

Calculation contribution format income statement:

|  |  |  |
| --- | --- | --- |
| Particulars | Tk. | Tk. (per unit) |
| Sales (80,000\* 80 units) | 64,00,000 | Tk. 80 per unit. |
| (-) Variable expenses (80,000\* 50) | 40,00,000 | Tk. 50 per unit. |
| Contribution Margin | 24,00,000 | 30 |
| (-) Fixed costs | 18,00,000 |  |
| Net Operating Income | 6,00,000 |  |

Calculation of CM ratio = 30/80 =.375 = 37.5%

Calculation of variable expenses ratio = 50/80 =. 625 = 62.5%

Breakeven point =

Profit = Unit CM \*Q – Fixed Cost

=) 0 = 30 Q – 18,00,000

=) Q = 18,00,000/30

=) Q = 60,000 Units.

Or.

Profit = Unit CM Ratio \*Q – Fixed Cost

=) 0 = 37.5 % Q – 18,00,000

=) Q = 18,00,000/37.5%

=) Q = 48,00,000 Tk.

Margin of Safety = Total Sales – Breakeven Sales

= 64,00,000 – 48,00,000

= 16,00,000 Tk.

In % :

(16,00,000/64,00,000)\*100

= 25%

Degree of operating leverage = Contribution Margin/ Net operating income

= 24,00,000 / 6,00,000 = 4 Times.

ii.

Profit = Unit CM \*Q – Fixed Cost

=) 7,50,000 = 30 Q – 18,00,000

=) Q = 22,50,000/30

=) Q = 85,000. Units

Or.

Profit = Unit CM ratio \*Q – Fixed Cost

=) 7,50,000 = 37.5 % Q – 18,00,000

=) Q = 22,50,000/37.5%

=) Q = 60,00,000 Tk.

Problem 03.

Following is the contribution format income statement of Alpha Industries Ltd. for the month January, 2021.

|  |  |  |
| --- | --- | --- |
| Particulars | Tk. | Tk. (Per unit) |
| Sales (30,000 units) | 37,50,000 | 125 |
| Variable expenses | 27,00,000 | 90 |
| Contribution margin | 10,50,000 |  |
| Fixed expenses | 5,25,000 |  |
| Net operating income | 5,25,000 |  |

1. Compute the CM ratio, variable expense ratio, the breakeven point in units and taka, degree of operating leverage and margin of safety in both taka and percentage form.
2. If sales price increased by Tk. 75, variable expenses increased by Tk. 60 and fixed cost reaming constant. what will be the new contribution format income statement of Alpha Developers Ltd.?
3. If you want to earn a target profit of Tk. 15,00,000, how many units would have to be sold in each month to do that? (for both cases)

**Solution**

Calculation of CM ratio = 35/125 =.28 = 28%

Calculation of variable expenses ratio = 90/125 =. 72 = 72%

Breakeven point =

Profit = Unit CM \*Q – Fixed Cost

=) 0 = 35 Q – 5,25,000

=) Q = 5,25,000/35

=) Q = 15,000 Units.

Or.

Profit = CM ratio \*Q – Fixed Cost

=) 0 = 28 % Q – 5,25,000

=) Q = 5,25,000/28%

=) Q = 18,75,000 Tk.

Margin of Safety = Total Sales – Breakeven Sales

= 37,50,000 – 18,75,000

= 18,75,000 Tk.

In % :

(18,75,000/37,50,000)\*100

= 50%

Degree of operating leverage = Contribution Margin/ Net operating income

= 10,50,000/ 5,25,000 = 2 Times.

ii.

Profit = Unit CM \*Q – Fixed Cost

=) 15,00,000 = 35 Q – 5,25,000

=) Q = 20,25,000/35

=) Q = 57,857 Units = 57856

Or.

Profit = CM ratio \*Q – Fixed Cost

=) 15,00,000 = 28 % Q – 5,25,000

=) Q = 20,25,000/28%

=) Q = 72,32,143 Tk.

II)

|  |  |  |
| --- | --- | --- |
| Particulars | Tk. | Tk. (Per unit) |
| Sales (30,000 units) | 60,00,000 | 125+75=200 |
| Variable expenses | 45,00,000 | 90+60= 150 |
| Contribution margin | 15,00,000 | 50 |
| Fixed expenses | 5,25,000 |  |
| Net operating income | 9,75,000 |  |

Problem 04.

The contribution format income statement for the last month of the BRB Cables Ltd. is given below:

|  |  |  |
| --- | --- | --- |
| Sales (45,000 units) Tk. | 36,00,000 | Tk. 80 per unit |
| Variable expenses | 22,50,000 | Tk. 50 per unit |
| Contribution margin | 13,50,000 |  |
| Fixed costs | 9,00,000 |  |
| Net operating income | 4,50,000 |  |

You are required to:

1. Compute the company’s CM ratio and monthly break-even point in unit and in Taka sales.
2. If you want to earn a target profit of Tk. 9,00,000, how many units would have to be sold in each month to do that?
3. Compute the company’s margin of safety in both taka and percentage form and company’s degree of operating leverage at the present level of sales.

Problem 05.

Following is the particulars of Alpha Developers Ltd. for the month July, 2019.

|  |  |
| --- | --- |
| Particulars | Tk. |
| Sales (30,000 units) | 125 per unit |
| Variable expenses | 90 per unit |
| Fixed costs | 5,25,000 |

1. Prepare the contribution format income statement of Alpha Developers Ltd.
2. Compute the company’s CM ratio, variable expenses ratio, monthly break-even point in units and in Taka sales, company’s margin of safety in both taka and percentage form and company’s degree of operating leverage at the present level of sales.
3. If you want to earn a target profit of Tk. 10,00,000, how many units would have to be sold in each month to do that?

Problem 06.

The contribution format income statement for the last month of the Araf Developers Co. Ltd. showed the following information. From following information

|  |  |
| --- | --- |
| Particulars | Tk. |
| Sales (50,000 units) | 150 (per unit) |
| Variable expenses | 90 (per unit) |
| Fixed costs | 15,00,000 |

You are required to calculate:

1. Variable expense ratio and the company’s CM ratio.
2. Monthly break-even point in unit and in Taka sales.
3. Margin of safety in both taka and percentage form.
4. Company’s degree of operating leverage at the present level of sales and
5. How many unit will have to sold next year to earn net operating income Tk. 27,00,000?

Problem 7.

From the contribution format income statement of Shapnil Co. Ltd for the last month is given below:

|  |  |  |
| --- | --- | --- |
| Sales (50,000 units) Tk. | 62,50,000 | Tk. 125 per unit |
| Variable expenses | 37,50,000 | Tk. 75 per unit |
| Contribution margin | 25,00,000 |  |
| Fixed costs | 15,00,000 |  |
| Net operating income | 10,00,000 |  |

Requirement: Compute:

1. Variable expense ratio and the company’s CM.
2. Monthly break-even point in unit and in taka sales.
3. Margin of safety in both taka and percentage form.
4. Company’s degree of operating leverage at the present level of sales and
5. How many units will have to sold next year to earn net operating income Tk. 12,00,000?