

Unit 4 – Ratio Analysis and Cost-Volume-Profit (CVP) Analysis

Types of Ratio

Several ratios, calculated from the accounting data, can be grouped into various classes according to financial activity or function to be evaluated. The parties interested in financial analysis are short and long term creditors, owners and management. Short term creditor's main interest is the liquidity position or short term solvency of the firm. Long term creditors on the other hand are more interested in the long term solvency and profitability of the firm. Similarly, owners concentrate on the firm's profitability and financial condition. Management is interested in evaluating every aspect of the firm's performance. They are classified into 4 categories:

- Liquidity ratios
- Leverage ratios
- Activity ratios
- Profitability ratios

Liquidity ratios

Liquidity ratios measure the firm's ability to meet current obligations. It is extremely essential for a firm to be able to meet its obligations as they become due liquidity ratio's measure. The ability of the firm to meet its current obligations. In fact analysis is of liquidity needs in the preparation of cash budgets and cash and funds flow statements, but liquidity ratios by establishing a relationship between cash and other current assets to current obligations provide a quick measure of liquidity.

A firm should ensure that it does not suffer from lack of liquidity and also that it does not have excess liquidity. The failure of the company to meet its obligations due to the lack of sufficient liquidity will result in poor credit worthiness, loss of creditor's confidence or even in legal tangles resulting in the closure of company. A very high degree of liquidity is also bad, idle assets earn nothing. The firm's funds will be unnecessarily tied up to current assets. Therefore, it is necessary to strike a proper balance between high liquidity and lack of liquidity. The most common ratios which indicate the extent of liquidity or lack of it are: (i) current ratio and (ii) quick ratio.

Current Ratio

Current ratio is calculated by dividing current assets by current liabilities: Current assets include cash and those assets which can be converted into cash within a year, such as marketable securities, debtors and inventories. Current liabilities include creditors, bills payable, accrued expenses, short term back loan, income tax liability and long term debt maturing in current year. The current ratio is a measure of firm's short term solvency. As a conventional rule a current ratio of 2:1 or more is considered satisfactory. The current ratio represents margin of safety for creditors.

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current liabilities}}$$

Quick Ratio

Quick ratio establishes a relationship between quick or liquid, assets and current liabilities. Cash is the most liquid asset, other assets which are considered to be relatively liquid and included in quick assets are debtors and bills receivables and marketable securities. Inventories are considered to be less liquid. Generally a quick ratio of 1:1 is considered to represent a satisfactory current financial condition.

$$\text{Quick Ratio} = \frac{\text{Current Assets} - \text{Inventories}}{\text{Current Liabilities}}$$

Leverage Ratios

The short term creditors, like bankers and suppliers of raw material are more concerned with the firm's current debt paying ability. On the other hand, long term creditors like debenture holders, financial institutions etc. are more concerned with firms long term financial strength. In fact a firm should have short as well as long term financial position. To judge the long term financial position of the firm, financial leverage or capital structure, ratios are calculated. These ratios indicate mix of funds provided by owners and lenders. As a general rule, there should be an appropriate mix of debt and owners' equity in financing the firm's assets. There is two main ratio (i) Debt Ratio and (ii) Debt equity Ratio.

Debt Ratio

Several debt ratios may be used to analyze the long term solvency of the firm. It may therefore compute debt ratio by dividing total debt by capital employed or net assets. Net assets consist of net fixed assets and net current assets.

$$\text{Debt ratio} = \frac{\text{Total debt (TD)}}{\text{Net assets (NA)}}$$

Debt Equity Ratio

It is computed by dividing long term borrowed capital or total debt by Shareholders fund or net worth.

$$\text{Debt Equity ratio} = \frac{\text{Total Debt (TD)}}{\text{Net Worth (NW)}}$$

Activity Ratios

Funds of creditors and owners are invested in various assets to generate sales and profits. The better the management of assets, the larger is an amount of sales. Activity ratios are employed to evaluate the efficiency with which the firm manages and utilizes its assets these ratios are also called turnover ratios because they indicate the speed with which assets are being converted or turned over into sales. Activity ratios, thus, involve a relationship between sales and assets. A proper balance between sales and assets generally reflects that assets are managed well. There is two main ratio (i) Debtors Turnover Ratio and (ii) Total Asset Turnover Ratio.

Debtors Turnover Ratio

Debtor's turnover ratio is found out by dividing credit sales by average debtors. Debtors turnover indicates the number of times debtors turnover each year. Generally the higher the value of debtor's turnover, the more efficient is the management of credit.

$$\text{Debtors turnover Ratio} = \frac{\text{Credit Sales}}{\text{Average Debtors}}$$

Total Assets Turnover Ratio

An effective use of total assets held by a company ensures greater revenue to the firm. In order to measure how effectively a company has used its total assets to generate revenues, we compute the total assets turnover ratios, dividing the sales by total assets. This ratio shows the firm's ability in generating sales from all financial resources committed to total assets.

$$\text{Total assets Turnover} = \frac{\text{Sales}}{\text{Total Assets}}$$

Profitability Ratios

A company should earn profits to survive and grow over a long period of time. Profits are essential but it would be wrong to assume that every action initiated by management of a company should be aimed at maximizing profits, irrespective of social consequences.

Profit is the difference between revenues and expenses over a period of time. Profit is the ultimate output of a company and it will have no future if it fails to make sufficient profits. Therefore, the financial manager should continuously evaluate the efficiency of the company in terms of profits. The profitability ratios are calculated to measure the operating efficiency of the company. Generally, there are two types of profitability ratios. (i) Gross Profit Margin Ratio and (ii) Net Profit Margin Ratio

Gross Profit Margin Ratio

It is calculated by dividing gross profit by sales. The gross profit margin reflects the efficiency with which management produces each unit of product. This ratio indicates the average spread between the cost of goods sold and the sales revenue.

$$\text{Gross profit margin} = \frac{\text{Sales} - \text{Cost of goods sold}}{\text{Sales}} = \frac{\text{Gross profit}}{\text{Sales}}$$

Net Profit Margin Ratio

Net profit is obtained when operating expenses, interest and taxes are subtracted from the gross profit. The net profit margin is measured by dividing profit after tax or net profit by sales.

$$\text{Net profit margin} = \frac{\text{Profit after tax}}{\text{Sales}}$$

Cost Volume Profit (CVP)

Introduction

The Analytical technique used to study the behavior of profit in response to the changes in volume, cost and prices is called the cost volume profit (cvp) analysis. it is a devise used to determine the usefulness of the profit planning process of the firm. Here it should be noted that the formula profit planning and control also involves the use of budgets and other forecast. As a starting point in profit planning, cvp analysis helps to determine the minimum sales volume to avoid losses and the sales volume at which the profit goal of the firm will be achieved. As an ultimate objective, it helps managements in seeking the most profitable combination of costs and volume.

Break Even Analysis

The break even analysis is the most widely known form of CVP analysis. Break even analysis is a specific way of presenting and studying the inter relationship between costs, volume and profits. It provides information to management in a most precise manner. It is an effective and efficient financial reporting system.

The Break Even Analysis is establishes a relationship between revenues and costs with respect to volume. It indicates the level of sales at which costs and revenue are in equilibrium. The equilibrium point is commonly known as the Break Even Point. The break-even point is that point of sales volume at which total revenue is equal to total costs. It is a no-profit, no-loss point. It should be noted, however, that the break-even point is just incidental in CVP studies. The more significant aspect of the CVP analysis is to examine the effect of changes in costs, volume and prices on profits.

Fixed and Variable costs

A basic Assumption in CVP analysis is that costs can be separated as fixed and variable costs. When a cost changes in direct proportion to changes in volume, it is called a variable cost. Variable costs vary in a proportionate and parallel manner with volume. Mathematically, a linear relationship exists between a variable cost and volume. If volume increases by 10 percent, variable cost would also increase by 10 percent. Example of variable cost is Raw Material. It should be noted that the unit variable cost remains uniform; it is the total variable cost which changes proportionately to volume.

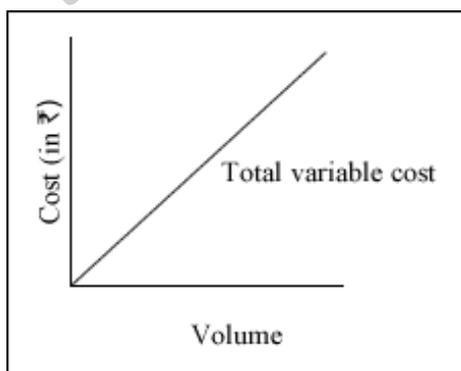


Figure (1) - Total variable Cost

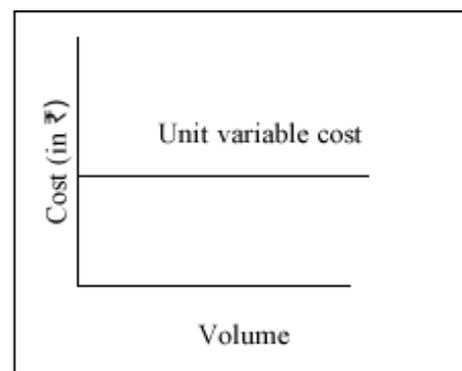


Figure (2) - Unit variable Cost

Figure (1) and (2) show the behavior of variable cost. Figure (1) shows the relationship between total variable cost and units of volume and figure (2) depicts per unit behavior of variable cost. It may be noted from figure (1) that the total variable cost is zero when volume is zero, and it increases proportionately as volume increases.

When a cost does not change with change in volume it is called fixed cost. Fixed cost remains at the same level irrespective of the changes in volume. Examples of Fixed cost are factory rent, insurance, salary, depreciation, maintenance and repairs. It may be noted that it is the total fixed cost which remains constant. The unit fixed cost decreases as the volume increases. Thus the unit fixed cost and volumes are inversely related.

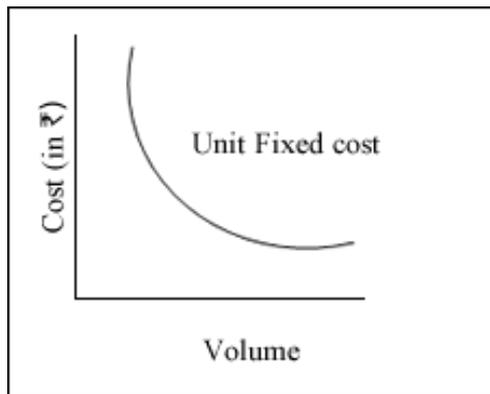


Figure (3) - Unit fixed Cost

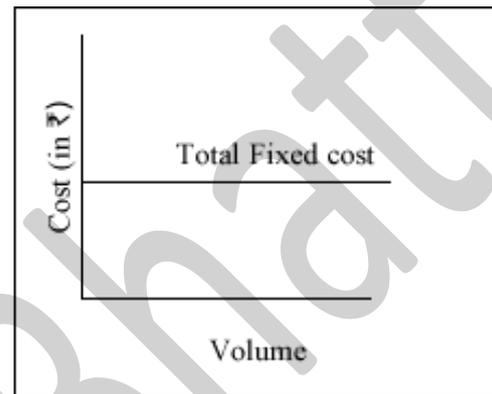


Figure (4) - Total fixed Cost

Figure (3) and (4) show the behavior of unit and total fixed costs. Since unit fixed cost decreases with unit and total increase in volume, the per unit cost of production will also decrease.

Break-even Point

The Break Even Point can be computed in terms of units or in terms of money value of sales volume or as a percentage of estimated capacity.

The Break Even Point may be calculated for a single product firm in terms of units of product. The Break Even Point in terms of units will be reached when units sold create sufficient revenue to cover their total cost- fixed and variable. Each unit of the product sold will cover its own variable cost and leave a remainder called contribution, to cover fixed cost. The Break-even point will occur when enough units have been sold so that total contribution is just equal to total fixed cost.

Formula:

$$\begin{aligned} \text{Unit selling price} - \text{Unit variable cost} &= \text{Unit contribution} \\ \text{unit contribution} \times \text{unit sold} &= \text{total contribution} \\ \text{Total contribution} &= \text{Total fixed cost} + \text{Profit} \end{aligned}$$

At break-even point, profit will be zero, and therefore, total contribution will just cover the total fixed cost. The break-even point in terms of units can be computed by dividing fixed costs by contribution per unit. The formula for break-even point (BEP) is as follows:

$$\text{BEP (units)} = \frac{\text{Total fixed cost}}{\text{Selling price} - \text{Variable cost per unit}}$$

Cash Break-even Point

The concept of cash flow is of utmost significance in financial decision making. It may be therefore important to find the break-even point on a cash basis. If we eliminate the non-cash items from revenues and costs, the break-even analysis on cash basis can easily be computed. In most cases, depreciation would be the non-cash expense included in fixed costs.

$$\text{Cash BEP} = \frac{\text{Cash fixed cost}}{\text{contribution ratio}}$$

Operating Leverage and Risk

Leverage may be defined as relative change in profits due to a change in sales. A high degree of leverage implies that a large change in profits occur due to a relatively small change in sales. Leverage is used in two senses (i) Financial Leverage (ii) Operating Leverage. Financial Leverage occurs when Firm Borrows Funds. Operating leverage refers to the uses of fixed costs in the operating of a firm. A firm will not have operating leverage if its ratio of fixed cost to total cost is Nil. For such a firm a given change in sales would produce the same percentage change in the operating profit or earnings before interest and taxes (EBIT). If the firm has fixed cost, it would have operating leverage and the percentage change in the operating profit would be more for a given change in sales. A firm will have higher operating leverage if the total costs have higher percentage of fixed cost. Operating leverage increases with fixed cost. Operating profit of a highly leveraged firm would increase at a faster rate for any given increase in sales. Operating leverage is a double edged sword.

Profit Analysis: Impact of changing factors

Profit is the function of a variety of factors. It is affected by changes in volume, cost and prices. The break even chart indicates the effect changes in volume on profits, other factors remaining constant. The dynamic cost volume profit analysis is used to reflect the effect of changes in one or more factors on profits.

Although a break-even chart can be used to show the effect of changes in various factors on profit, yet the drawing of the chart will become very complicated. The result of the changing factors can best be presented in tabular forms and by the use of profit-volume (p/v) charts or graphs.

Profit-volume Graphs

The profit-volume graph related profit to volume. The following steps are involved to construct the P/V graph:

- The graph has two parts, separated by sales line.
- The upper part of the graph indicates profits. Fixed costs are marked on the lower part. The amount of fixed costs unrecovered is loss incurred.
- Profit line is drawn by joining fixed cost point and sales line at the break-even point.
- One can read the amount of profit or loss by drawing a vertical line on the profit line from the assumed level of sales.

Effect of Price Changes

An increase in the selling price will increase the profit volume ratio and as a result will lower the break-even point. And reverse a decrease in selling price will reduce the profit volume ratio and therefore result in a higher Break Even Point.

Effect of Volume changes

A change in volume not accompanied with a change in the selling price and cost will not affect Profit Volume ratio. As a result the Break Even Point remains unchanged. Profit will increase with an increase in volume and will be reduced with a decrease in volume.

Effect of Price and Volume Changes

A change in price invariably affects volume. A price reduction may increase demand of the product and consequently may result in increased volume. On the other hand increase in price may adversely affect the demand and thus reduce volume. The impact on profits under these circumstances is not obvious. Profit may increase with a price reduction if volume increases substantially. Similarly a price may reduce profits if there is material fall in volume.

Changes in Price Changes in Volume	Decrease 20% Increase 25%	Budget	Increase 10% Decrease 15%
Units	125,000	100,000	85,000
Selling price (`)	16	20	22
Variable cost (per unit) (`)	10	10	10
Contribution per unit (`)	6	10	12
	Rs	Rs	Rs
Sales	20,00,000	20,00,000	18,70,000
Variable costs	12,50,000	10,00,000	8,50,000
Contribution	7,50,000	10,00,000	10,20,000
Fixed costs	4,00,000	4,00,000	4,00,000
Net profit	3,50,000	6,00,000	6,20,000
Per cent change in profit	-41.67%	-	+3.33%
P/V ratio	37.50%	50%	54.55%
B/E point	10,66,667	8,00,000	7,33,333

Cost Volume profit analysis for a multi-product firm

The firm is producing only one product or if a number of products are manufactured by the firm, the sales mix is constant. The relative proportion of sales of products is called the sales mix or the product mix. In the case of a multi-product firm, the contribution for each product can be found out by deducting its variable cost from sales revenue. The Break Even Point for each product can be calculated only if the total fixed cost of the firm are distributed and fixed cost for each product is known. The firms overall Break Even Point can be calculated by dividing the total fixed cost by the contribution ratio for the firm.

The multi-product firms profit volume ratio will be the weighted average of the profit volume ratios for all the products, the weights being the relative proportion of each products sale. The profit volume ratio for the multi-product firm can also be calculated by dividing the total contribution from all products by total sales.

Utility of CVP Analysis

Break Even Analysis is the most useful technique of profit planning and control. It is a device to explain the relationship between cost, volume and profit. The utility of the break even analysis is the following:

Understanding Accounting Data: The Break Even Analysis is a simple concept and interprets the accounting data. Many business executives and other are unable to understand accounting data contained in financial statements and reports. When the data is presented through break even chart it becomes very easy to grasp and interpret them.

Useful Diagnostic Tool: It indicates to the management the causes of increasing break-even point and falling profits. The analysis of these causes will reveal to the management as to what actions should be taken. The important information to be analyzed is break even as a percentage of capacity. If the break-even point as a percentage of capacity is increasing, it indicates unfavorable conditions. It is this kind of situation which needs immediate action. It is possible that due to plant expansion absolute break-even point may increase but overall capacity may also increase. This situation where the break-even point as a percentage of capacity does not increase is not unfavorable.

Profit improvement: In the break even analysis we compute break-even point and profit volume ratio prepare break even charts and profit volume graph and analyze and report the effect of changing factors on profits. This whole set of information is important to evaluate the reasonableness and usefulness of profits plans and other budgets and forecasts prepared by the management.

Risk Evaluation: The desirability of an action should be considered on the basis of its profits as well as risk. If profits alone is considered a firm may commit to a risky action. The break even analysis to some extent is a useful method for considering the risk implication of alternative actions. The problem of risk evaluation can be approached by considering the effects of the alternative actions on the break-even point.

Limitations of CVP Analysis

- It is difficult to separate cost into fixed and variable components.
- It is not correct to assume that total fixed cost would remain unchanged over the entire range of volume.
- The assumption of constant selling price and unit variable cost is not valid.
- It is difficult to use the break-even analysis for a multi-product firm.
- The Break Even Analysis is a short run concept and has a limited use in long range planning.
- The Break Even Analysis is a static tool.

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Class: BCA SEM III
Subject: US03FBCA01 – Financial and Accounting Management

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