CHAPTER-2

CONCEPTUAL FRAMEWORK OF DATA ENVELOPMENT ANALYSIS MODEL

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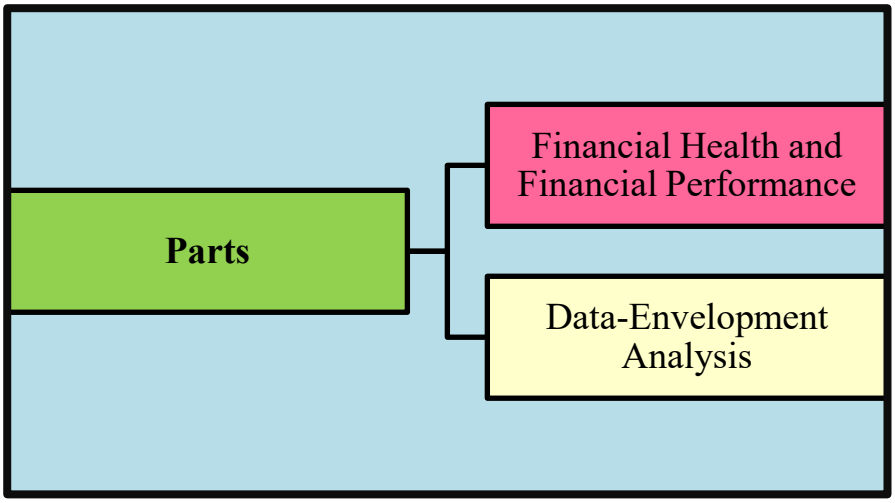
[2.1] INTRODUCTION:

This whole chapter is based on the Financial Health and Data Envelopment Analysis Model. The whole chapter is divided into two parts.

1. **Financial Health and Financial Performance**
2. **Data-Envelopment Analysis**

Figure: 2.1 Division of Chapted-2



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The first part of this chapter covers the information regarding Financial Health and Financial Performance. The content include in first part is as under…

- **Objectives of Financial Performance Analysis**
- **Essential of Good Financial statement**
- **Techniques of Financial Performance Analysis**
- **Importance of Financial Performance Analysis**
- **Limitations of Financial Performance Analysis**

The second part covers information regarding concept of Data-Envelopment Analysis Model. The content include in second part is as under…

- **History of DEA Model**
- **Concepts of DEA Model**
- **Advantages of DEA Model**
- **Limitation of DEA Model**

[2.2] PART-1: FINANCIAL HEALTH AND FINANCIAL PERFORMANCE

Financial Performance is the act of performing, execution, fulfilment and accomplishment etc. of objectives. "Performance" is emerged from the word "Parfourmen" which means 'to do', 'to carry out' or 'to render'. In broader meaning, performance refers to the fulfilment of given piece of work which is to be measured against pre-determined standards of…….

- **Accuracy,**
- **Cost,**
- **Completeness,**
- **Speed and**
- **Cost**

In other words, it also refers to the degree to which attainment of objectives is been or has been fulfilled.

To accurately evaluate the financial health and long-term sustainability of a company, a number of financial metrics must be considered. Four main areas of financial health that should be examined are

- **Liquidity,**
- **Solvency,**
- **Profitability, and**
- **Operating efficiency.**

However, of the four, likely the best measurement of a company's health is the level of its profitability.

There are a number of financial ratios that can be reviewed to gauge a company's overall financial health and to make a determination of the likelihood of the company continuing as a viable business. Standalone numbers such as total debt or net profit are less meaningful than financial ratios that connect and compare the various numbers on a company's balance sheet or income statement. The general trend of financial ratios, whether they are improving over time, is also an important consideration.

Performance can be used to learn about a company's circumstances, achievements, and compliances. The act of carrying out financial activity is referred to as financial performance. Calculating important financial ratios over the previous five to seven years is one method of determining the financial performance. Performance ratios can be compared from year to year to gauge progress. Financial ratios can be used to compare two or more financial data pieces. Therefore, a company's overall financial health over a specified time period is measured by its financial performance. It can also be used to compare similar companies within the same industry or to compare industries or sectors generally. It is, in essence, the act of quantifying the financial outcomes of a company's operations and policies. Rearranging, comparing, and determining the importance of financial and operational data are all steps in the financial statement analysis process. Based on analysis, the financial statement interpretation aids in drawing logical conclusions about the state and development of the company. Financial statement interpretation and analysis are therefore seen as complementary to one another. 'Financial Statements' often refers to two fundamental statements:

- **The Balance Sheet and**
- **The Income Statement**

Balance Sheet

One of the three basic financial statements, the balance sheet is essential to accounting and financial modeling. The company's total assets and their financing method—debt or equity—are displayed on the balance sheet. It is also known as net worth or a statement of financial situation. The following is the name of the basic balance sheet equation:

Assets = Liabilities + Equity

The Income Statement

One of the company's key financial documents, the income statement displays profit and loss over a specified time period. All revenues from operating and nonoperating operations are subtracted from all expenses to determine the profit and loss. The statement displays the company's

- **Income,**
- **Expense,**
- **Gross profit,**
- **Selling & admin expense**
- **Income,**
- **Net profit and**
- **Taxes paid.**

[2.2.1] MEANING:

1. Financial performance is the achievement of the company's financial performance for a certain period covering the collection and allocation of finance measured by capital adequacy, liquidity, solvency, efficiency, leverage and profitability.
2. The process of reviewing and analyzing a company's financial statements to make better economic decisions is called analysis of financial statements. In other words, the process of determining financial strengths and weaknesses of the entity by establishing the strategic relationship between the items of the balance sheet, profit and loss account, and other financial statements.
3. The term 'financial analysis', also known as analysis and interpretation of financial statements', refers to the process of determining financial strengths and weaknesses of the firm by establishing strategic relationship between the items of the balance sheet, profit and loss account and other operative data.
4. "Analyzing financial statements," according to Metcalf and Titard, "is a process of evaluating the relationship between component parts of a financial statement to obtain a better understanding of a firm's position and performance."

[2.2.2] OBJECTIVES OF FINANCIAL PERFORMANCE ANALYSIS

The following are various objectives of Financial Performance Analysis**.**

- True & Fair view of financial position
- True & fair view of financial performance
- To provide information about resources
- To form basis for decisions of the stakeholders
- To report on the effectiveness and efficiency of the management
- To increase the understandability of the end users
- Other Objectives
    - ✓ To help settle disputes arising between various parties.
    - ✓ To provide information about the credibility of the entity in the finance world.
    - ✓ To decide on whether it is right time to replace the assets of the firm with new assets having increased capacities
    - ✓ To decide whether to invest in other entities so to expand the empire.
    - ✓ To help government with information about payment of taxes, etc.

[2.2.3] ESSENTIALS OF GOOD FINANCIAL STATEMENTS

An adequate analysis and interpretation of the financial statements allows interested parties to judge the profitability and financial soundness of the business. Essential of Good Financial Statements are briefly explained below.

1. Easy to Prepare

The content of the financial statements should be easily available in the company's account books. If so, the calculation is very easy and also irrelevant information can be avoided from being recorded in the financial statements. In addition, the size of the form of the financial statements should not be abnormally large.

2. Depict True Financial Position

The information contained in the financial statements must be clear and correct so that the true financial position is disclosed in the financial statements. In addition, all material information must be included in the financial statements.

3. Understand by Common Man

A common man or layman does not know the rules, the principles and the accounting conventions. These are necessary to understand the content of the financial statements. However, the financial statements should be prepared in a simple and common non-technical language to understand the financial statements without any specialized training or education.

4. Effective Presentation

The usefulness of the financial statements is improved only through an effective presentation. A simple format is used to understand the affirmations without much difficulty.

5. Easy Comparison

Columns and quantities should be organized so that the figures for the current year are easily compared with the previous year.

6. Relevance

The prepared financial statements must achieve the objectives of the company. This is possible if only relevant information is included in the financial statements.

7. Attractive

The financial statements should be prepared in such a way that the important information is underlined in a way that attracts all the interested parties of the financial statements.

8. Focus on Significant Items

Each reader of the financial statements wants to identify the significant elements. Therefore, it is necessary that said facts or elements are written in bold letters or with different ink.

9. Analytical Representation

The content of the financial statements can be analyzed in different directions so that the new facts of the accounting data can be highlighted. A relationship can be established in a similar type of information.

10. Brief

There is no need for detailed information in the financial statements. Only a brief information is enough. The reason is that detailed information entails difficulties in judging the financial position and performance of the company.

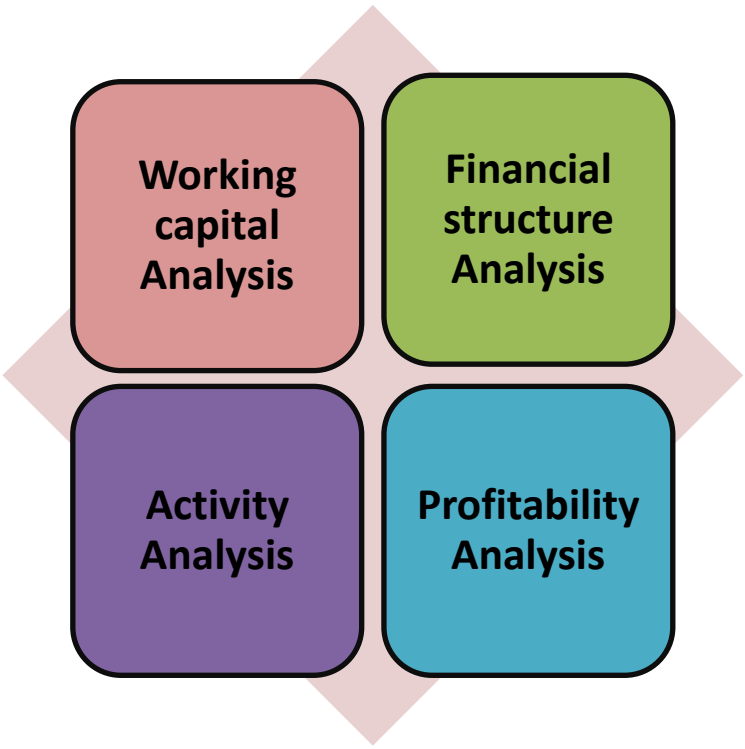
11.Easy Calculation of Accounting Ratios

The financial statements must be presented in such a way that the required items and figures are easily obtained to calculate various accounting indices. These relationships are used by the interested parties for an adequate analysis and interpretation.

[2.2.4] AREAS OF FINANCIAL PERFORMANCE ANALYSIS:

The success of the company in terms of output and productivity (total business performance), profitability, liquidity, working capital, fixed assets, money flow, and social performance are all frequently evaluated by financial analysts. Analysis of several financial ratios includes

Figure: 2.2 Area of Financial Performance Analysis



[Source: self-constructed]

[2.2.5] TECHNIQUES OF FINANCIAL PERFORMANCE:

Financial analysis is the process of determining a company's financial strengths and weaknesses by developing a relationship between the income statement and balance sheet components. The data related to the financial accounts is crucial since it is used to make interpretations and analyses. A business's short- and long-term prospects can be assessed through the process of financial analysis, which also allows for the determination of important performance metrics including liquidity solvency, profitability, and operational efficiency.

There are various types of Financial analysis. They are briefly mentioned herein:

External analysis:

The external analysis is done on the basis of published financial statements by those who do not have access to the accounting information, such as, stock holders, banks, creditors, and the general public.

Internal Analysis:

This type of analysis is done by finance and accounting department. The objective of such analysis is to provide the information to the top management, while assisting in the decision making process.

Short term Analysis:

It is concerned with the working capital analysis. It involves the analysis of both current assets and current liabilities, so that the cash position (liquidity) may be determined.

Horizontal Analysis:

The comparative financial statements are an example of horizontal analysis, as it involves analysis of financial statements for a number of years. Horizontal analysis is also regarded as Dynamic Analysis.

Vertical Analysis:

It is performed when financial ratios are to be calculated for one year only. It is also called as static analysis.

An assortment of techniques is employed in analyzing financial statements. They are: Comparative Financial Statements, statement of changes in working capital, common size balance sheets and income statements, trend analysis and ratio analysis.

Comparative Financial Statements:

When comparing two financial statements, this crucial analysis technique is employed. When compared to comparable data from previous periods, this horizontal analysis technique, which may be used for both financial statements, income statements, and balance sheets, yields insightful information. While the balance sheets, which reflect a change in the financial position throughout the period, demonstrate the effects of operations on the assets and liabilities, the comparative statement of income statements allows for an assessment of the operational performance and the drawing of conclusions. As a result, it is possible to ascertain the absolute change from one time to another.

Statement of Changes in Working Capital:

The objective of this analysis is to extract the information relating to working capital. Subtracting the total of current liabilities from the total of current assets yields the amount of net working capital. Information about working capital between two financial periods is provided in the statement of changes in working capital.

Common Size Statements:

Financial statement numbers are transformed into percentages. To do this, the entire balance sheet is taken as 100. The ratios of each asset to total assets and each liability to total liabilities are used to express the items on the balance sheet. Thus, it illustrates how each part relates to the whole, hence the term "common size."

Trend Analysis:

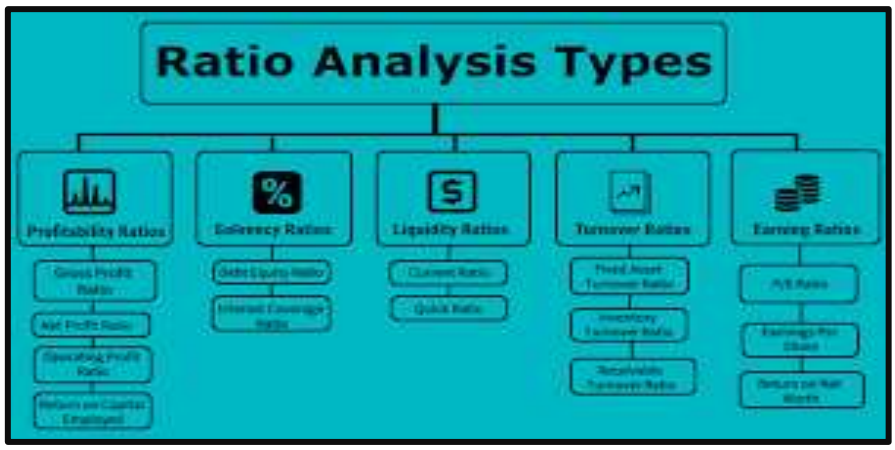
It is a crucial horizontal analytical tool. Ratios of various financial statement items for different periods are computed as part of this study, and the comparison is made appropriately. The trend or direction is shown by the examination of previous years. Trend analysis is a helpful technique for determining if a company's financial situation is getting better or getting worse over time.

Ratio Analysis:

The most popular way to analyze the financial statements is computing ratios. It is an important and widely used tool of analysis of financial statements. While developing a meaningful relationship between the individual items or group of items of balance sheets and income statements, it highlights the key performance indicators, such as, liquidity, solvency and profitability of a business entity. The tool of ratio analysis performs in a way that it makes the process of comprehension of financial statements simpler, at the same time, it reveals a lot about the changes in the financial condition of a business entity.

A ratio is the mathematical relationship between two quantities in the form of a fraction or percentage. Ratios can be classified on the basis of statement or on the basis of their function:

Figure: 2.3 Ratio Analysis Types

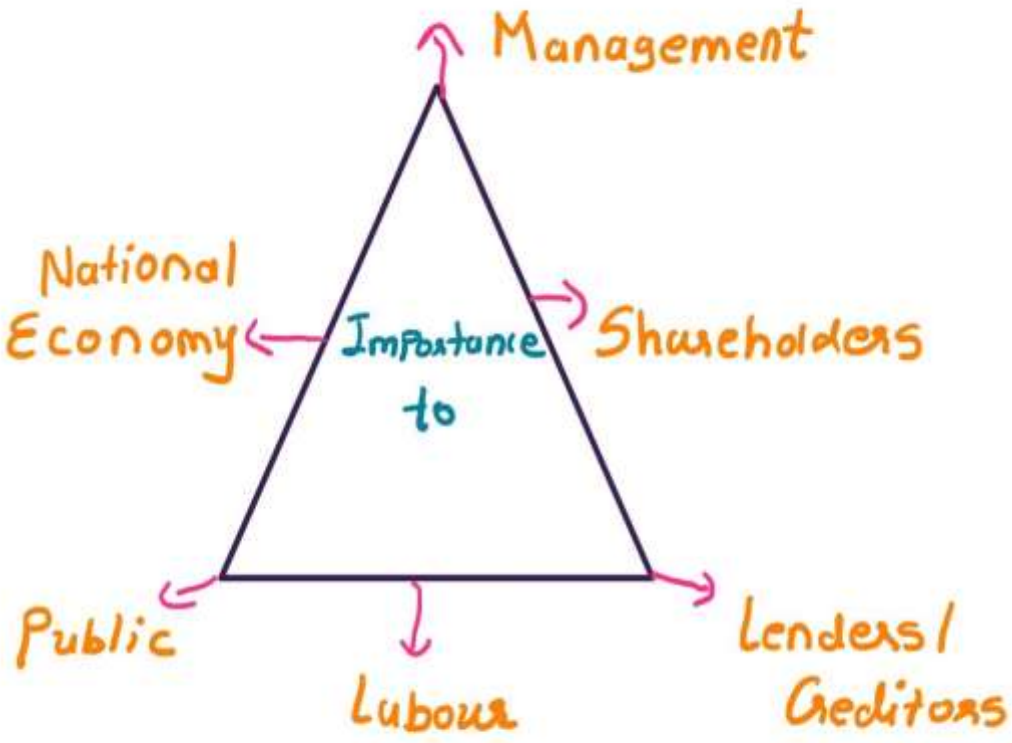


[Source: www.yourarticlelibrary.com]

[2.2.6] IMPORTANCE OF FINANCIAL PERFORMANCE ANALYSIS:

The importance of financial statements lies in their utility to satisfy the varied interest of different categories of parties such as management, creditors, public, etc.

Figure: 2.4 Importance of Financial Performance Analysis



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1. Importance to Management:

Modern company companies must be managed using a scientific and analytical approach due to the growing size and complexity of the factors influencing their operations. For its functions, the management team needs current, precise, and organized financial data. Financial statements assist management in comprehending the state, development, and future prospects of the company in relation to the industry. Through a comparative review of financial accounts, management can identify trends in the enterprise's progress and position and adjust policies accordingly to prevent undesirable outcomes.

2. Importance to the Shareholders:

When it comes to enterprises, management and ownership are two different things. Shareholders do not have easy access to the company's day-to-day operations. However, shareholders should get financial statements detailing the results of these activities at the annual general body meeting.

These statements give the shareholders information about the company's earning potential, financial stability, and management's efficacy and efficiency.

By looking at the financial accounts, potential shareholders can ascertain the company's profitability, present situation, and possibilities for the future. They could then decide what to invest in based on this information.

3. Importance to Lenders/Creditors:

Both present and prospective suppliers as well as possible lenders might benefit from a company's financial records. By rigorously examining a company's financial accounts, these organizations can discover information regarding its liquidity, profitability, and long-term solvency position. This would help them decide what to do next.

4. Importance to Labour:

Employees can receive incentives based on the profit margin shown in the audited profit and loss statement. P&L accounting so becomes essential to the staff. When negotiating salary, the amount earned and the profitability achieved are both crucial considerations.

5. Importance to the Public:

Companies are social entities. Even if they are not directly related to business, many societal groups are curious about the state, development, and future of a company.

6. Importance to National Economy:

The development of the corporate sector has a significant impact on a nation's economic advancement. Corporate managers who are dishonest and deceptive undermine public trust in joint stock businesses, which is crucial for economic advancement and slows the nation's economic expansion. The public's trust in

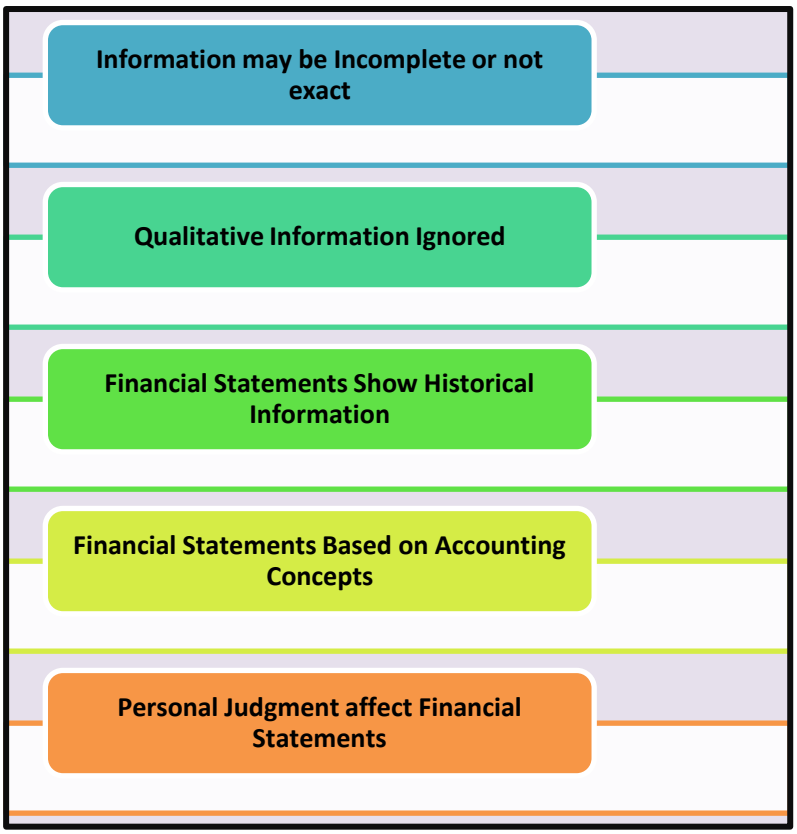
businesses has grown as a result. The different regulatory agencies, including tax authorities and company registrars, also require financial statements. By analyzing the financial statements, they may determine whether the rules are being properly followed and whether they are having the intended impact.

[2.2.7] LIMITATIONS OF FINANCIAL PERFORMANCE ANALYSIS:

The cumulative impact of recorded facts, accounting practices, and individual judgment on financial statements is mostly to blame for the majority of the constraints. They don't accurately represent the state of company economics unless they are specifically prepared. Financial statements are therefore subject to several restrictions.

The important limitations are as follows:

Figure: 2.5 Limitations of Financial Performance Analysis



[Source:self-constructed]

1. Information may be Incomplete or not exact:

Typically created for an accounting period, the financial statements are interim reports. As a result, the financial data they disclosed is neither accurate nor comprehensive. Only after the company has been shut down can the actual financial situation or final profit or loss be determined.

2. Qualitative Information Ignored:

Only quantitative data that is expressed in monetary terms is shown in financial statements. The financial statements do not, however, represent a number of qualitative factors that cannot be quantified, such as the management's standing and reputation with the public, friendly labor relations and employee productivity, customer satisfaction, competitive strength, etc.

3. Financial Statements Show Historical Information:

Since the financial accounts are based on past expenses, they do not account for things like changes in the price level or a decline in the worth of money.

These assertions are not very useful for making decisions because they solely address historical data.

4. Financial Statements Based on Accounting Concepts:

Financial statements are unrealistic due to the accounting ideas and standards used in their preparation.

For instance, because it includes likely losses and ignores likely profits, the income statement created using the convention of conservatism does not reveal the genuine income. In a similar manner, the balance sheet's "going concern concept" displays the fixed asset value.

This indicates that the quantity of cash that would be realized upon liquidation is rarely represented by the asset's valuation.

5. Personal Judgment affect Financial Statements:

The accountant's personal judgment is used to determine many of the elements in the financial accounts. For instance, the accountant's personal judgment determines how to value inventory, depreciate assets, handle deferred revenue expenditures, and more.

[2.3] PART-2 DATA ENVELOPMENT ANALYSIS MODEL

[2.3.1] INTRODUCTION:

Data Envelopment Analysis (DEA) is a technique based on linear programming to measure the relative performance of organizational units where the presence of multiple inputs and outputs makes comparisons difficult. There is a growing concern to measure and compare the efficiency of the organizational units, such as departments of local authorities, schools, hospitals, bank branches and other similar instances in which there is a set of relatively homogeneous units. Data Envelopment Analysis (DEA) is a powerful service and evaluation technique originally developed by Chames, Cooper and Rhodes (1978) to evaluate nonprofit and public sector organizations. Both production and cost figures have been sourced from the DEA. It has been demonstrated that the DEA finds methods to enhance the service that are not apparent with other approaches by using the chosen factors, such as unit cost and performance. Efficiency and performance are successfully determined in many domains using the DEA, a performance evaluation technique, and the efficient use of resources. A mathematical programming technique called Data Envelope Analysis (DEA) is used to assess the relative effectiveness of the Decision-Making Units (DMU). "The ratio between the sum of the weighted outputs and the sum of the weighted inputs" is the definition of efficiency in the traditional DEA. The inputs and outputs of the DMU are given varying weights in order to determine the maximum efficiency score for each DMU that is being evaluated. The DEA's traditional models permit weight flexibility. As a result, certain significant DMU inputs and outputs can be given zero weights. In this scenario, the evaluation will overlook such inputs and outputs, leading to irrational findings. Restrictions on weight are employed to solve the issue. The degree of correlation between the input and output variables in the production process is related to these variables. The relationship between inputs and outputs was not taken into account in the earlier papers.

[2.3.2] DEFINITION OF DEA:

“Data Envelopment Analysis (DEA) is a method in operations research and economics for the estimation of production frontiers. It is used to empirically measure productive efficiency of Decision Making Units (or DMUs).”

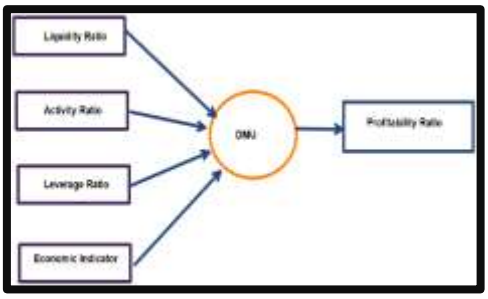
[2.3.3] HISTORY OF DEA:

A production function is used in the theory of microeconomic production to depict the combinations of a company's entry and exit. A production technology limit can be created by using such a function to demonstrate the greatest output that can be obtained with any feasible combination of inputs (Sieford and Thrall, 1990). About 30 years ago, the DEA began working to address the issue of how to apply this theory in empirical applications while resolving the fact that it is impossible to view all potential combination of inputs and outputs for actual businesses (or other DMUs). The groundbreaking study "Measuring the efficiency of decision-making units" by Charnes, Cooper, and Rhodes (1978) uses linear programming to estimate a frontier of empirical production technology for the first time, drawing on the theories of Farrell (1957). The process was previously applied in Germany to calculate the marginal productivity of R&D and other industrial factors (Brockhoff 1970). Since then, numerous books and journal papers have been written about DEA or its application to 65 different kinds of issues.The DEA has been used not just to compare DMU efficiency within an organization but also to compare company efficiency. Some DEAs address variable returns to scale, such as CRS (constant returns to scale), RSV (variable), non-increasing returns at scale, or non-decreasing returns at the scale by Ylvinger (2000). The most fundamental DEA is the CCR, which was developed by Charnes, Cooper, and Rhodes. The primary DEA developments during the 1970s and 1980s are documented by Seiford & Thrall (1990).

[2.3.4] Concept of DEA:

Charans, Cooper, and Rhodes conducted the first data analysis (DEA), also known as border analysis. It is a performance measuring approach for determining the relative efficiency of decision making. Units (DMU) in the organization A DMU is an independent unit within an organization having decision-making flexibility but not complete freedom. DEA has been used in a variety of settings, including banks, police stations, hospitals, tax offices, jails, defense bases (army, navy, and air force), schools, and university departments. \It is worth noting that DEA has the advantage of being applicable to non-profit organizations. Since the technique's inception, extensive empirical and theoretical research has been conducted, and numerous articles have been published on the DEA's applicability in real-world scenarios. Obviously, many more unpublished studies exist, such as those conducted internally by firms or by external consultants. Data Envelope Analysis (DEA) is a method for determining the efficiency of DMUs with many inputs and outputs. Calculate the weights of the inputs and outputs to determine the maximum efficiency score for a DMU being evaluated. As a result, it enables for weight flexibility. As a result, zero pesos and illogical results are not uncommon. To circumvent this problem, weight limitations are imposed by the DEA. The nonparametric DEA approach is recommended because it evaluates the set of inputs and outputs simultaneously.

Formula of DEA:



Data-Envelopment Analysis Model

Table- 2.1 Data-Envelopment Analysis Model

Ratio		Weight	Input/ Output
Liquidity Ratio	Current Ratio	0.50	**Input-1**
	Quick Ratio	0.30	
	Working Capital Turnover Ratio	0.20	
	Total	**1**	
Activity Ratio	Account Receivable Turnover Ratio	0.20	**Input-2**
	Inventory Turnover Ratio	0.25	
	Assets Turnover Ratio	0.35	
	Collection Period Ratio	0.20	
	Total	**1**	
Leverage Ratio	Debt Assets Ratio	0.50	**Input-3**
	Interest Coverage Ratio	0.30	
	Equity Ratio	0.20	
	Total	**1**	
Economic Indicator	**EVA**	**1**	**Input-4**
Profitability Ratio	Return on Assets (ROA)	0.35	**Output**
	Return on Capital Employed (ROCE)	0.22	
	Return on Current Assets	0.10	
	Return on Equity	0.18	
	Operating Profit to Sales	0.15	
	Total	**1**	

[Source: Reza Tehrani, M. R. (2012). A Model for Evaluating Financial Performance of Companies by Data Envelopment Analysis. *International Business Research Vol.5*, 8-16.]

Liquidity Ratio:

Liquidity ratios are an important part of financial metrics used to govern a debtor's ability to pay off current debt compulsions without raising external capital. Liquidity ratios are very useful when they are used in comparative form. This analysis may be

- **Internal or**
- **External**

Liquidity ratios measure a company's ability to pay debt obligations as well as its margin of safety through the calculation of ratios Like,……

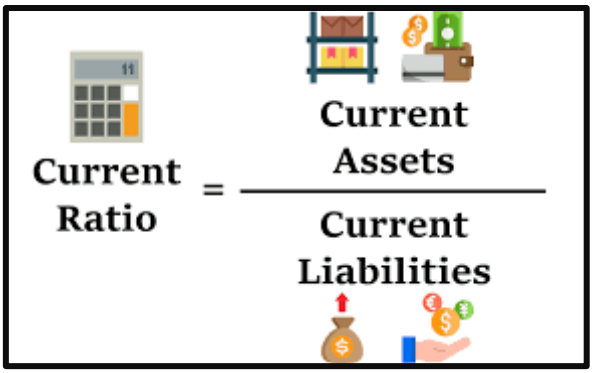
- **Current Ratio**
- **Quick Ratio**
- **Working Capital Ratio**

Current Ratio:

The current ratio shows company's ability to pay off its current liabilities (payable within one year) with its current assets like, cash, accounts receivable and inventories. The higher the current ratio, the better the company's liquidity position of company and vice a versa:

Current Ratio	Company's Liquidity Position
Higher	Better
Lower	Worst

Formula:



Current Assets = Cash + bank balance + Stock + Debtors + Bills Receivable + Prepaid Expense + Investment + Loans & Advances.

Current Liabilities = Creditors + Bills Payable + Bank Overdraft + Unclaimed Dividend + Provision for Taxation + Proposed Dividend.

Quick Ratio:

The quick ratio is another way to gauge a company's capacity to pay down its existing debt. While the quick ratio solely takes into account liquid or quick assets for calculation purposes, the current ratio takes into account all current assets. Pre-paid expenses and inventory are not included in the quick ratio.

This is an example of a business where the quick ratio is significantly lower than the working capital ratio, indicating that the business capital asset inventory is heavily reliant on retail outlets. This ratio illustrates the firm's level of liquidity. This is the only reliable and significant indicator of liquidity. This ratio evaluates the firm's level of liquidity and is the most accurate and significant indicator of liquidity.

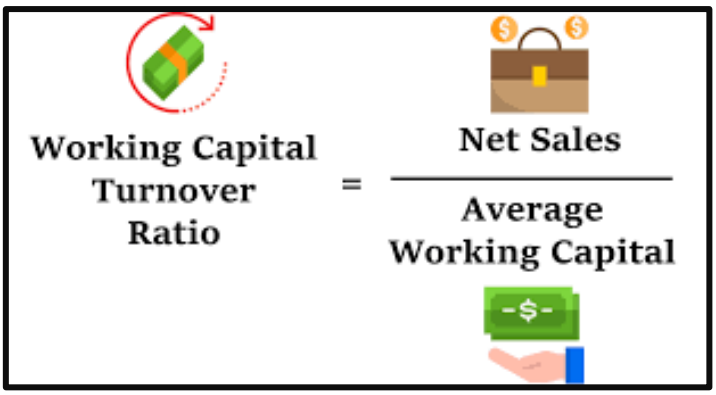
Formula:

Where, Quick Assets = Current Assets - Inventory

Current Liabilities = Creditors + Bills Payable + Bank Overdraft + Unclaimed Dividend + Provision for Taxation + Proposed Dividend.

Working Capital Turnover Ratio:

The working capital turnover ratio is calculated by dividing net annual sales by the average amount of working capital. A high turnover ratio shows that management is being very efficient in using a company’s short-term assets and liabilities for supporting sales.



Working Capital = Current Assets – Current Liabilities

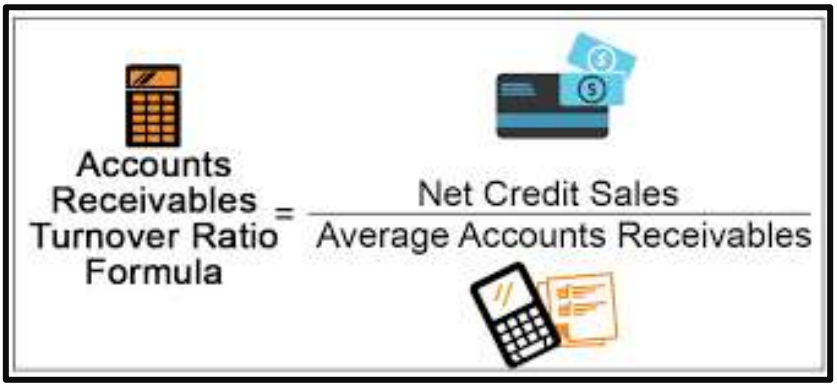
Activity Ratio:

An activity ratio is a type of financial metric that indicates how efficiently a company is leveraging the assets on its balance sheet, to generate revenues and cash. DEA Model includes following ratios as a activity ratio.

- **Account Receivable Turnover Ratio**
- **Inventory Turnover Ratio**
- **Assets Turnover Ratio**
- **Collection Period Ratio**

Account Receivable Turnover Ratio:

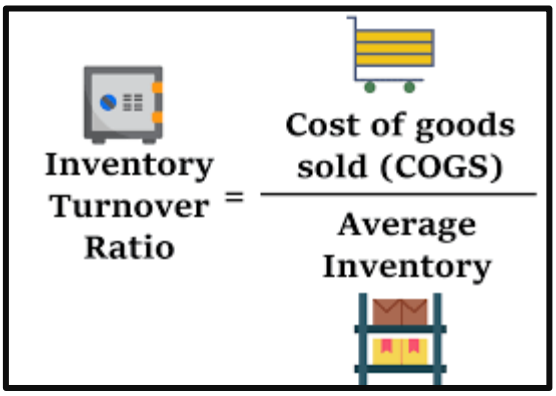
Receivable Turnover Ratio or Debtor's Turnover Ratio is an accounting measure used to measure how effective a company is in extending credit as well as collecting debts. The receivables turnover ratio is an activity ratio, measuring how efficiently a firm uses its assets.



Inventory Turnover Ratio:

A relationship known as inventory turnover illustrates how frequently a business sells and replaces its stock over a specific time frame. The number of days required to sell the available inventory can then be determined by dividing the period's days using the inventory rotation formula. Sales are divided by average inventories to arrive at this figure. Businesses may make better decisions about 115 prices, manufacturing executions, how to use promotions to sell surplus inventory, and how and when to purchase new inventory by using inventory turnover calculations. Another way to calculate inventory turnover is to divide the average inventory by the cost of items sold.

Formula:

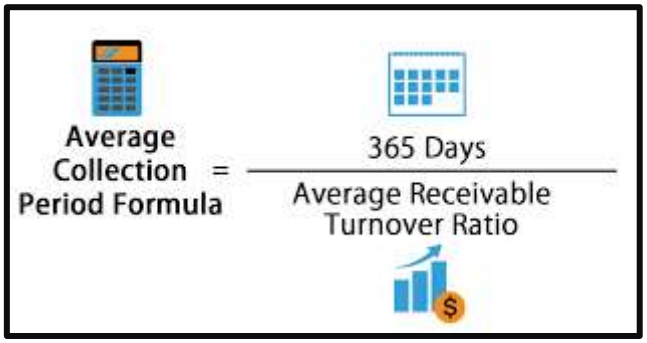


Assets Turnover Ratio:

The asset turnover index is an efficiency index that measures a company's ability to generate sales from its assets by comparing net sales with average total assets. In other words this relationship demonstrates how well a business can use its resources to produce revenue. Net sales are divided by the average total assets to determine the asset turnover ratio.

Collection Period Ratio:

With the help of following formula collection period ratio can be found out.



Leverage Ratio:

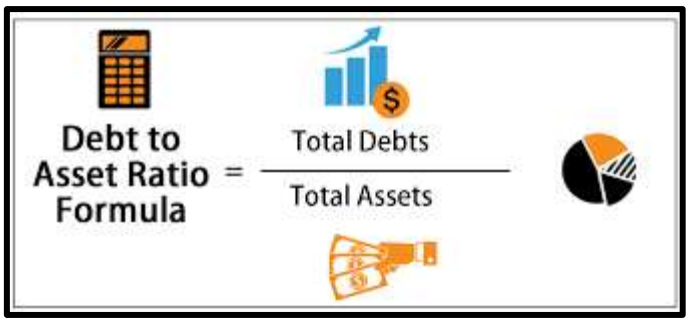
The following ratios are selected in DEA Model as a Leverage Ratio:

A leverage ratio is any one of several financial measurements that look at how much capital comes in the form of debt (loans) or assesses the ability of a company to meet its financial obligations. The leverage ratio category is important because companies rely on a mixture of equity and debt to finance their operations, and knowing the amount of debt held by a company is useful in evaluating whether it can pay off its debts as they come due.

- **Debt-Assets Ratio**
- **Interest Coverage Ratio**
- **Equity Ratio**

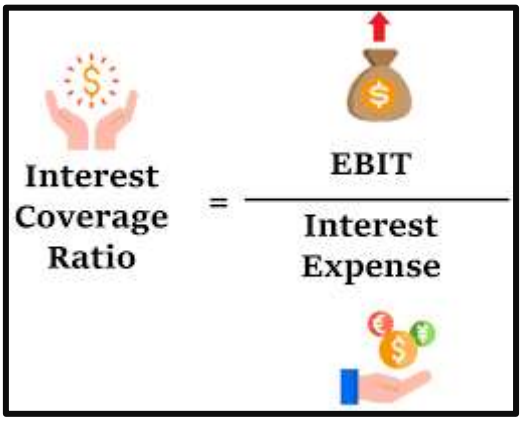
Debt-Assets Ratio:

Analysts, investors, and creditors use this measurement to evaluate the overall risk of a company. Companies with a higher figure are considered more risky to invest in and loan to because they are more leveraged. This means that a company with a higher measurement will have to pay out a greater percentage of its profits in principle and interest payments than a company of the same size with a lower ratio. Thus, lower is always better.



Interest Coverage Ratio:

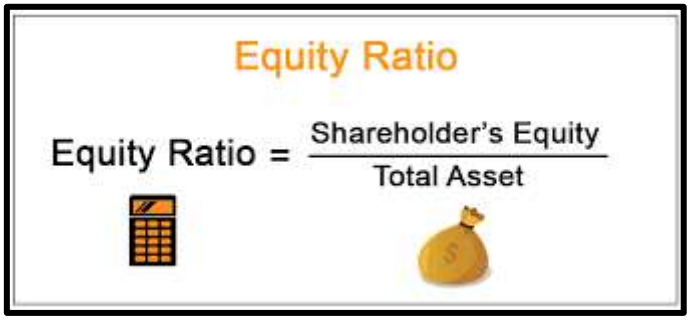
The analysis of Interest Coverage Ratio is tricky because on a large portion it depends on how much risk the creditors or investors are ready to take. The bank might be more comfortable based on the desired risk limit the investor is willing to take. The basics of this measurement does not change, If the result is less than 1, it means the company is not making enough money to pay off its interest payments. So, the question of paying back of principle amount does not arise. A company with a calculation less than 1will not be able to pay interest on debt. If the coverage ratio equals 1, it means the company has enough money to pay its interest. This situation is not much better than the last one because the company still cannot afford to make the principle payments. If the coverage measurement is above 1, it means that the company is making more than enough money to pay its interest obligations with some extra earnings left over to make the principle payments. Most creditors look for coverage ratio to be at least 1.5 before they will make any loans.



Equity Ratio:

The equity ratio is an investment leverage that measures the amount of assets that are financed by owners' investments by comparing the total equity in the company to the total assets. The equity ratio highlights two important financial concepts of a solvent

and sustainable business. In other words, after all of the liabilities are paid off, the investors will end up with the remaining assets. The second component inversely shows how leveraged the company is with debt. The equity ratio measures how much of a firm's assets were financed by investors. In other words, this is the investors' stake in the company. This is what they are on the hook for. Companies with higher equity ratios show new investors and creditors that investors believe in the company and are willing to finance it with their investments. Higher equity ratios are typically favorable for companies. Higher investment levels by shareholders shows potential shareholders that the company is worth investing in since so many investors are willing to finance the company. A higher ratio also shows potential creditors that the company is more sustainable and less risky to lend future loans. Equity financing in general is much cheaper than debt financing because of the interest expenses related to debt financing.



Economic Indictor:

Under Economic Indicator Economic as a DEA Model Value Added i.e. EVA is taken into consideration**.**

Economic Value Added:

EVA as a tool of financial measurement enlightens us whether the operating profit is

enough to cover the cost of capital. Economic value added (EVA) is a measure of a company's financial performance based on the residual wealth calculated by deducting its cost of capital from its operating profit, adjusted for taxes on a cash basis. EVA can also be referred to as economic profit, as it attempts to capture the true economic profit of a company.

The formula for calculating EVA is as under:

EVA = NOPAT - (Invested Capital * WACC)

Where:

NOPAT = Net operating profit after taxes

Invested capital = Debt + capital leases + Shareholders equity

WACC = Weighted average cost of capital

Profitability Ratio:

Profitability ratios are financial metrics used by analysts and investors to measure and evaluate the ability of a company to generate income (profit) relative to revenue, balance sheet assets, operating costs, and shareholders' equity during a specific period of time. They show how well a company utilizes its assets to produce profit and value to shareholders.

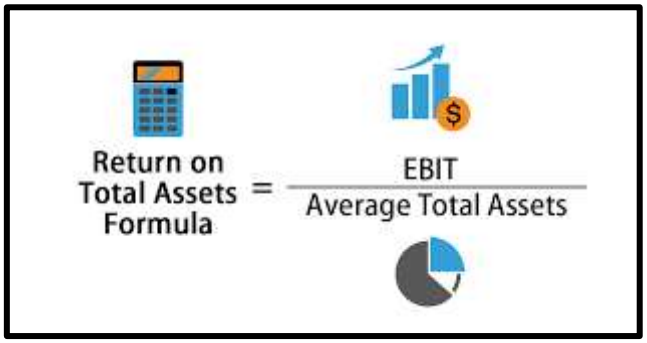
A higher ratio or value is commonly sought-after by most companies, as this usually means the business is performing well by generating revenues, profits, and cash flow. The ratios are most useful when they are analyzed in comparison to similar companies or compared to previous periods. The most commonly used profitability ratios are examined below which are used in Data-Envelopment Analysis Model:

- **Return on Assets**
- **Return on Capital Employed**
- **Return on Current Assets**
- **Return on Equity**
- **Operating Profit to Sales Ratio**

Return on Assets:

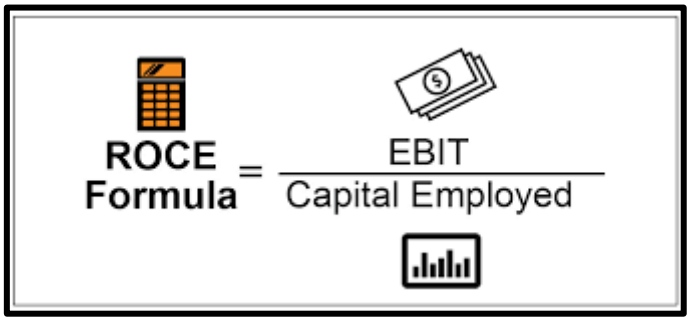
The return on assets ratio, often called the return on total assets, is a profitability ratio that measures the net income produced by total assets during a period by comparing net income to the average total assets. In other words, the return on assets ratio or 140 ROA measures how efficiently a company can manage its assets to produce profits during a period. Since company assets' sole purpose is to generate revenues and produce profits, this ratio helps both management and investors see how well the

company can convert its investments in assets into profits. In short, this ratio measures how profitable a company's assets are. This ratio can also be represented as a product of the profit margin and the total asset turnover. It only makes sense that a higher ratio is more favorable to investors because it shows that the company is more effectively managing its assets to produce greater amounts of net income. A positive ROA ratio usually indicates an upward profit trend as well.



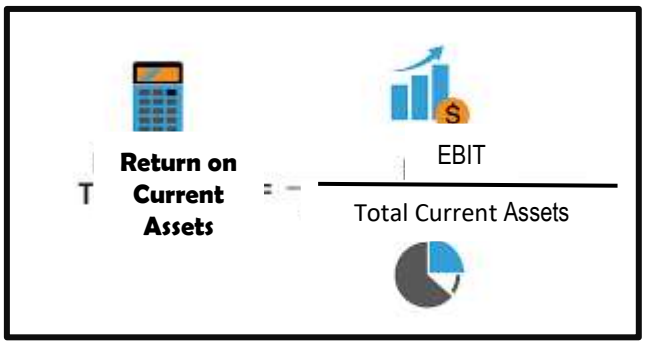
Return on Capital Employed:

Return on capital employed or ROCE is a profitability ratio that measures how efficiently a company can generate profits from its capital employed by comparing net operating profit to capital employed. ROCE is a long-term profitability ratio because it shows how effectively assets are performing while taking into consideration long-term financing. This is why ROCE is a more useful ratio than return on equity to evaluate the longevity of a company. Capital employed is a fairly convoluted term because it can be used to refer to many different financial ratios. Most often capital employed refers to the total assets of a company less all current liabilities. This could also be looked at as stockholders' equity less long-term liabilities.



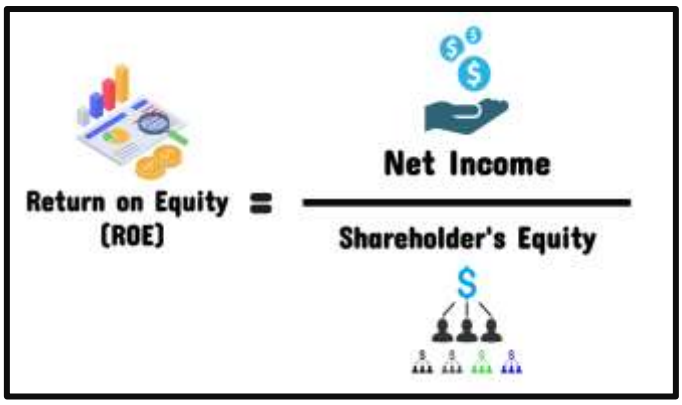
Return on Current Assets:

The return on current assets ratio is a profitability ratio that measures the net income produced by total current assets during a period by comparing net income to the average current total assets. In other words, the return on assets ratio measures how efficiently a company can manage its current assets to produce profits during a period. In short, this ratio measures how profitable a company's current assets are.The return on current assets ratio measures how effectively a company can earn a return on its investment in current assets. In other words, ROCA shows how efficiently a company can convert the money used to purchase current assets into net income or profits.



Return on Equity:

Equity shareholders are the true owners of a company. They bear more risk. They are entitled to get their share of dividend only after the payment of fixed dividend to preference shareholders. Therefore the dividend payable to equity share holders various depending upon the quantum of profits available to them. High return on equity capital attracts more investment it is calculated to established relationship between net profit available to equity share holders and equity share capital.



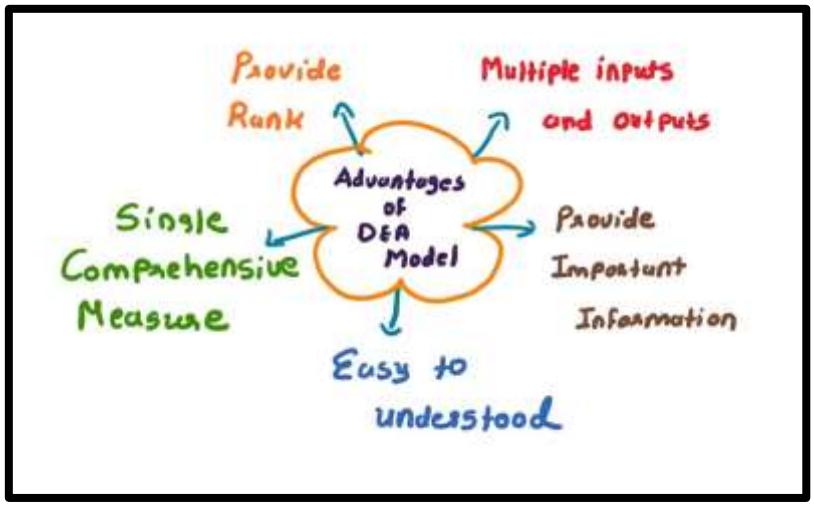
Operating Profit to Sales Ratio:

The operating margin ratio, also known as the operating profit margin, is a profitability ratio that measures what percentage of total revenues is made up by operating income. In other words, the operating margin ratio demonstrates how much revenues are left over after all the variable or operating costs have been paid. This ratio is important to both creditors and investors because it helps show how strong and profitable a company's operations The operating profit margin ratio is a key indicator for investors and creditors to see how businesses are supporting their operations.

[2.3.5] ADVANTAGES OF DATA – ENVELOPMENT ANALYSIS MODEL:

The following are various advantages of Data – Envelopment Analysis Model:

Figure: 2.6 Advantages of DEA Model



[Source: self-constructed image]

With the help of DEA multiple inputs and multiple outputs can be handled.

- DEA gives a single comprehensive measure of performance.
- It does not take into consideration any specific functional form that relates to
- inputs and outputs.
- It provides important information about the inefficient units and ways of how
- to improve its performance.
- It helps to give rank.

[2.3.6] DISADVANTAGES OF DATA – ENVELOPMENT ANALYSIS MODEL:

The following are drawbacks of DEA Model

- The results are sensitive to the selection of inputs and outputs (Berg 2010).
- You cannot prove the best specification (Berg 2010).
- The number of efficient companies at the border tends to increase with the
- Number of inputs and output variables (Berg 2010)

[2.4] SUMMARY:

So, this whole chapter cover concept regarding the Financial Health and Data Envelopment Analysis Model. Like,

- **Objectives of Financial Performance Analysis**
- **Essential of Good Financial Statement**
- **Areas of Financial Performance Analysis**
- **Techniques of Financial Performance Analysis**
- **History of DEA**
- **Concept of DEA Model**
- **Advantages of DEA Model**
- **Disadvantages of DEA Model**

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