Chapter - 2
RESEARCH DESIGN

2.1 Review of Literature:
It is most desirable to review the relevant literature before going through the present research study. It provides indispensable conceptual clarity and limitations to improve the quality for present work. This Chapter, therefore, deals with the existing studies available on the related topic and to explore the existing research gap. The main consideration in reviewing the research work already done in the concerned field is to evaluate such studies, in order to formulate the present study and to avoid duplication of the work. Further, this also provide invaluable information regarding the methodologies, analytical tools etc. already employed along with the methodological weaknesses, if any. This will not only help in tailoring the present study, but in consonance of the objectives of the study.

Rosendale (1908), emphasised that the credit is usually extended on the strength of quick assets and many good judges feel that the ratio of quick assets to liabilities should be about 2.5:1. It is thus evident that by 1908 quantitative measures by the means of ratio had been adopted by credit men.

Lawrence (1911), used wood lock ratio of operating expenses to gross earning in the name of 'operating ratio'. He developed a system of analysis of financial statements by the means of ratio. Later on this technique got known as "common size" as 100 per cent statement.

Snyder (1913), revolted against the supremacy of current ratio as basic criterion, and raised questions regarding the reasonable proprietors of cash to liabilities, goods in hand to the annual sales and receivable to credit sales.
Bliss (1923)*, states that in every branch of industry there are certain financial and operating characteristics depending upon the nature of its activities. He added that such ratio might be determined by averaging the ratio of concerns in the industry and to enjoy the average measures of success, a concern must approximate these ratios.

Kennedy and McMuller (1952)^, describe the analysis and interpretation of financial statements as an attempt to determine the meaning and significance of financial statement data so that forecast may be made of the prospects of future earning, ability to pay interest and debt maturities and probability of sound dividend policy.

Beaver (1966)^, examined the Predictive Power of 30 different financial ratios. Its main findings turned out to be that the cash flow ratio to total debt was the best ratio for predicting failure five years in advance, since it showed the least percentage of error in predicting for sample firms.

Altman, (1968)^ tried to improve upon conventional ratio analysis by showing a way of combining several financial ratios into a single index viz. The ‘Z Score’ on the basis of statistical technique known as ‘multiple discriminant analysis’. His analytical technique was directly concerned with the problem of distinguishing between bankrupt and non-bankrupt firms. The ‘Z Value’ is calculated for each company on the basis of its financial ratios and the particular company is accordingly classified as bankrupt or non-bankrupt.

Wilcox (1976)^, suggested that at any moment, the firm’s financial state can be defined by its ‘Adjusted Cash Position’ or ‘Net Liquidation Value’. According to Wilcox’s
view the financial strength of firm consist of 'Net Liquidation Value' and is related to the strength of equity base.

Harry and Walton (1976), conducted the financial analysis of employed stock ownership trust in 1976. They concluded that effective analysis require financial planning without which it cannot be assessed whether an ESOT is basically workable or not.

Chakravarty (1976), describe the analysis of financial statement as most important tool to pin-point the area of sickness at its early stage. He stated that standard ratios of the major item of expense to cost of sales are to be established of an enterprise and those of similar units. He concluded that the degree of efficiency and deficiency can be measured from the comparative study of standard operating ratios with the ratios of the periodical actual performance and remedial steps can be taken accordingly to improve the operating results.

Higgson and Jackson (1977), conducted essential criteria for valid inter-firm comparison. They stated that business organisations have regarded comparison with similar business, vital for planning activity at strategic level. They considered financial ratio analysis as a main factor for inter-firm comparison.

Shastry (1978), stated that in financial analysis the usual criterion applied to test the liquidity of an unit is the ratio analysis. The ratios are (i) current ratio and (ii) quick ratio or acid-test ratio. He said that there are some methods of measuring liquidity of a company but they do not consider one important variable "Credit Borrowing Capacity".
He concluded that credit can be taken as a substitute of cash and thus form a part of liquidity. The credit availability capacity of an enterprise can be calculated from the balance sheet.

Maheshwari (1978), used the ratio analysis for the analysis of nationalised bank's financial statements. He considered that ratio analysis is a modern devise to judge the financial performance in financial statements. He said that there is no single ratio, which gives sufficient information by which performance of commercial banks and their financial soundness could be measured, rather a group of ratios are taken into account. He found that ratio analysis will score two purpose (i) establishment of judicious balance sheet resource mobilisation and bank profitability and; (ii) the real criteria for evaluation of the performance of individual bank with reference to the fulfilment of socio-economic objectives of nation wide importance.

Desai (1978), in his paper used financial ratios and stated that cash flow ratio, capital assets ratio and return on net worth and net worth to liabilities are useful for making the analysis of decisions of the bank.

Daminia (1979), stated that financial statement analysis is largely a study of variations in the statement items and a measurement of proportions between various items. When any of them are out of proportion, the measuring devices call attention to the analyst seeks to find the reason for it.

Murthy (1979), reported that performance of public enterprises may be measured through six indicators i.e. profitability, employment, utilisation of capital, foreign exchange earned, market standing and innovation. He assigned
arbitrary weights to these six factors and constituted composite performance index of the enterprise by applying Laspeyer's formula. He added that there is no finality either about the ingredients or weights or even the formula and he concluded that a step in this direction is likely to add more pragmatism to the performance evaluation of an enterprise.

Banerjee (1979)\textsuperscript{17}, attempted to apply Z-model, using statistical technique to the data of certain companies in India to test their efficiency. He developed new technique of application of accounting ratios through statistical techniques for predicting sickness of an enterprise. He considered the Z-scores on the basis of cut-off point and classified the companies into financial solvent and sick companies. He concluded that this model can sound the bell of warning for dangerous situations which may not otherwise be apparent.

Porwal and Kumar (1980)\textsuperscript{18}, have conducted a case study of Engineering Industries. They made a comparative assessment of the anticipated and actual relationship between the different financial ratios and future rate of return. They found that only four out of ten financial ratios investigated possess the relationship with future rate of return. On the basis of their findings they concluded that for the industry under study financial ratios may not be useful in order to rank the firms in terms of future rate of return.

Bhattacharya and Ahuja (1981)\textsuperscript{19}, highlighted the inadequacy of financial data disclosed in the annual reports for arriving at any sound judgement about company's performance on the basis of ratio analysis. They added that financial
analyst should be aware of these inadequacies and make his own calculations of current assets, current liabilities, and net profits etc. Also, he should in addition to what he can get from the annual reports, try to get more information from the company directly and from other sources.

Zahir (1981)⁰, developed an earning power chart with a view to emphasising the relations among various operating and financial variables that are likely to have a bearing on the earning power of business enterprise. He analysed the earning power of 101 large companies as related to different operating and financial ratios. He computed the composite scores of all the companies under study on the basis of asset turn over and net worth ratios. He discovered a higher degree of correlation between composite score and earning power. His study revealed that asset turn over and net worth ratios have an important bearing on earning power and whenever these ratios were fairly high, the earning power was also invariably good and vice-versa.

Lal (1981)¹, conducted a case study of 51 cotton spinning mills. He selected 16 ratios of these companies and arranged them in a descending order. The median and quartile range of different ratios has been worked out and the results thus obtained were considered by him for interpretation. He concluded that in order to interpret the results, the analyst is required to make situational analysis and use his judgement because standard ratios are not substitutes for judgement.

Bhatt (1981)², suggested that because of inherent limitations in the price-earning ratio, it is not advisable to use the P/E ratio in isolation for security selection decisions. The analyst can use the number of accounting
ratios to obtain more information about the firm and about
the security.

Batra (1981), stated that the debt-equity norm of 2:1 - a
broad indicator of an upper limit of debt in relation to
equity is far and away from the prevalent debt equity ratios
in the corporate sector. She added that there is much scope
for companies to increase the volume of debt in their
financial structure, because the debt-equity ratio of
companies in various industries is well below 1:1. On the
basis of her analysis, she suggested that improvement in the
operational efficiency of financial institutions can also
play important role in this context.

Vijayasaradhi and Gangadhar (1981), commented upon the
liquidity position in Indian Private Corporate Sector in
1971-76 with the help of the current and the acid-test
ratios. They also attempted to prove the superiority of
turnover ratios in reflecting the liquidity and short-term
solvency position. Their study of liquidity in the corporate
sector highlighted that, medium and large private Ltd.
Companies as compared to their public limited counterparts
accounted for larger inventory turnovers and longer average
collection periods. Small companies - public as well as
private - in view of their relatively higher inventory
turnovers coinciding with longer average collection periods
appeared to have followed liberal credit policies. The study
has also revealed that the turnover ratios when studied in
combination with profitability proved superior to current
and acid-test ratios as measures of short-term solvency.

Pandey (1981), analysed the working capital trends in India
during 1970-71 to 1975-76. He classified all processing and
manufacturing industries into three groups i.e. consumer
goods, capital goods and others. To ascertain which ratio reflect the state of corporate financial health more faithfully, he identified the relationship of various components of current assets with other variables of financial statements. His analysis highlighted certain important trends in working capital of manufacturing industries. It is revealed that current assets as a percentage of total assets is increasing and that inventories constitute the major part of current assets. He suggested that business executives should manage inventories and debtors skilfully in order to bring down their levels without adversely affecting production and sales.

Gupta (1983)\textsuperscript{26}, tried to refine the analytical techniques for real world conditions by identifying the following five best ratios which he claimed, show fairly good agreement among themselves in the classification.

- Ratio of EBDIT to sales
- Ratio of OCF to sales
- Ratio of EBDIT to total assets plus accumulated depreciation
- Ratio of OCF to total assets plus accumulated depreciation
- Ratio of OCF to interest plus 0.25 of debt.

Watts (1983)\textsuperscript{27}, suggests that cash flow is very important to a business, therefore, a critical examination of this area is vital in assessing the performance and position of a business enterprise. His assessment based upon historic-cost cash flow analysis revealed that cash flow analysis is more useful than battery of ratios based on balance sheet.
Johan (1983)\textsuperscript{28}, in his article says that by analysing the balance sheet, trading and profit and loss account of industrial unit and by calculating various financial ratios and interpretation thereof, a banker can inter-alia assess the following:-

- The present financial position of the firm.
- Whether the unit will be able to meet its short term commitment without stress and strain.
- Profit records.
- Whether the unit is likely to use its short term funds for long term investment.
- And whether the business is carried on economic lines.

Robertson (1983)\textsuperscript{29}, presented a critical examination of the performance of the traditional ratios by testing a model which measures changes in the financial health of companies. He developed a model consisting of five ratios and calculated weighted adjusted score on the basis of factoring of these ratios. He suggested that a drop of 40 per cent or more in weighted score in a single year should be investigated without delay and that a further drop of 40 per cent for a second year running would indicate that a company was unlikely to survive.

Sharma (1984)\textsuperscript{30}, examined the usefulness of price-earning ratio analysis in the context of equity investment decision making. He analysed the P/E ratio in efficient market set-up and found that the analysis helps investors to obtain a rate of return that is commensurate with their desired level. He has also presented the theoretical derivation of the relative values of P/E ratio from equity valuation model. His empirical study has served a very useful purpose in identifying and studying the statistical significance of the
important determinants of P/E ratios. It helped in providing to investors an insight into the working of market mechanism in valuing equity shares in terms of their earnings.

Chew Ng. (1985), conducted a case study of Trustees Executors and Agency Company Ltd. He believes that corporate failure does not strike like a bolt of lighting, an early warning signs do exists in the business world. He added that empirical relations/models statistically derived in terms of appropriately weighted finance and accounting ratios, are available to investors and financial institutions for predicting the financial standing of corporate bodies. His analysis revealed that failure of Trustees Executors and Agency Company Ltd. is the culmination of bad decisions, e.g. its involvement in high risk property development, borrowing short and landing long etc. He concluded that the failure of Trustees Executors and Agency Company Ltd. could have been predicted as far back in 1978 using the Castanga and Matolesy Model and Altaman Model.

Aggrawal (1985), said that analysis of finances of a business unit is usually done to know about its under or over capitalisation, financial leverage, financial liquidity and cost of capital together with its impact on profitability and potential source of finance. The financial analysis of public enterprises assumed significance for the reason that financial leverage and financial liquidity influence their profitability and potential sources of funds to a great extent. His findings established that financial memoeuvrability has little role in improving the profitability of public enterprises in state of Gujrat.
Yadav (1986), developed a multivariate model to establish the determinants of effective working capital management. He applied statistical techniques such as T-test, Factor analysis, Discriminant analysis and F-test, using financial ratios as variables. His analysis brings out that four variables namely cash flow to total tangible assets, net sales to total tangible assets, defensive assets to total operating expenditure and current assets to current liabilities are to be given more weightage in appraising the effectiveness of working capital management. He concluded that a company’s performance measured in terms of these four variables can be effectively used by banks and other credit granting institutions for monitoring the performances of working capital management.

Srinivasan (1987), suggests the need for industry association to take up inter-firm comparisons to improve productivity. The author employed the pyramid of ratio’s technique in which ratios of five cement manufacturing units were developed on year to year basis. In his findings of comparative study, he observed that inter-unit comparison based on real data can go a long way in improving the productivity of industry.

Kajipet and Hussain (1987), conducted the essential criteria for valid inter-firm comparison. They reviewed the financial performance of two major Airline Corporations i.e. Air-India and Indian Airlines in terms of profitability, turnover, cost control and capacity utilisation. Financial ratios have been used for last ten years and technique of Inter-firm comparison was employed. On the basis of their analysis, they observed that in some areas one is doing better and in some other areas the other. The Indian Airlines has performed comparatively better as far as
profitability is concerned on account of better cost control and food factor. The Air India has not shown better profitability because of poor control of costs and poor factor load. They suggested that merger of these two undertakings may result in correction of weak points of one undertaking by the strong points of other undertaking and the overall profitability can be improved from the point of view of financial performance.

Katyal and Dhiman (1988), while presenting their view about analysis of financial statement define it as a technique of x-raying financial position and performance of enterprise. They define interpretation as drawing inferences and stating what figures in financial statement really mean.

Sharma and Gupta (1990), describe the importance of financial statement analysis by stating that it is necessary to bring mystery behind financial statement. They state that analysis means division among similar group and arranged in desired form. The interpretation involves explanation of financial facts in simplified manner.

Roger (1990), explains shareholder value analysis, using the annual reports of the Quaker Oats Company. He observed that shareholder value analysis does bear some comparison with strategic financial management. His findings reveal that shareholder value analysis overcomes the criticisms associated with accounting approaches for managing the long-term financial future of the business.

Agrawal and Joshi (1992), used multiple discriminant analysis to predict corporate sickness. They opined that the ensuing bankrupting of an industry can be predicted five years prior to its occurrence. The authors view is that the
economic conditions and several internal and external factors of an industry drag it to the catastrophe. They used a set of financial ratios for prediction of corporate sickness by adopting multiple discriminant analysis. On the basis of their findings they observed that periodic determinations of discriminant score for each company may prevent that company from becoming bankrupt and provide an opportunity for a timely action to control the situation.

Vashisht and Thilakerathne (1994), emphasised that understanding the relationship between the returns and the risks involved in an investment is the key to a secure and rational investment. They identified the nature of relationship between risk and return by using both accounting and financial ratios and applied statistical tools in their study. Their findings reveal that a discerning investor and portfolio manager can identify companies in which higher return is accompanied by lower risk and can rank the identified companies in terms of risk and return. The process can help the investor in making sound investment decisions.

Panigrahy and Misra (1994), focused on cash flow information which would facilitate prediction of the health of the companies in the Indian corporate sector and monitor the key variables to bring back the sick units to their normal condition. The study undertaken with selected sample of public limited companies in private sector revealed that the cash flow ratio do possesses both the discriminating as well as predictive power. It can discriminate between sick and non-sick companies and can predict the potential corporate sickness at high degree of accuracy when ratios are used on individual basis.
Dutta (1994), stated that the liquidity estimate derived from the dependency ratio along with the relevant flow estimates of productivity and profitability furnish us with a comprehensive model for delineating the boundary conditions within which an appropriate balance between the operating dimensions of liquidity and profitability may be sought.

Gardiner (1995), reviewed the definitions of some of the most important financial ratios. He classified the financial ratios into five categories and observed that ratio analysis continues to represent one of the financial world’s most powerful and versatile tools. His findings revealed that accounting consideration and ratio definitions can dramatically affect the quality of analysis.

Vijaya Kumar and Venkatachalam (1995), have examined the impact of working capital on profitability. They computed co-efficient of correlation and regression between profitability ratios and working capital ratios and used linear multiple regression model. The analysis revealed that liquid ratio, inventory turnover ratio, receivable turnover ratio and cash turnover ratio influenced the profitability of industries.

Gupta (1995), stated that the integrated process will show the casual links which exist between the activities of company at the one end and earning of an individual investor in the company at the other end. He further stated that the integrated sub-set of ratios can be used to evaluate the competing proposals. On the basis of his analysis, he concluded that the integrated approach of financial ratios can be gainfully used for planning the future of an organisation.
Stead (1955), stated that ordinary shareholder views return on equity as the ultimate performance of the company but profitable reward for the shareholders depends upon some measure of capital growth of the shares and this generally depends on the earnings per share. Therefore, he suggested that in the financial planning process it is essential to assess the earnings per share of the company over the next five years.

Banerjee (1996), states that the credit rating agencies in India are consistently analysing performance of an enterprise on the basis of three parameters viz. industry risk, financial risk and management risk. Therefore, commercial banks are now in a better position in the sense that they can have access to vital corporate information without much difficulty.

Sehgal (1997), has tested the model in the Indian context using The Bombay Stock Exchange Data. He observed that the capital assets pricing model provides an intuitive linear relationship between return and risk for an asset. His empirical findings further reveals that CAPM is not suitable descriptor of asset pricing in the Indian capital market.

Allen (1988), points out that a sound credit-control procedure gives a good cash flow in a profitable business. On the other hand a weak credit-control procedure results into a potential problem in the short-term which become worse as time goes on. He concluded that most firms have one or more leakage points in their credit control system. If these can be sealed, the bottom line must improve.

Banerjee and Jain (1999), conducted a statistical analysis of the drugs and pharmaceuticals industries. They studied
the relationship between shareholder wealth and certain financial variables such as earning per share, adjusted return on net worth, capital productivity, labour productivity, economic value added and market value added. They concluded that EVA was the most significant variable. Therefore, the companies must disclose a direct link between stock prices and EVA.

2.2 Need of the Study:
In summing up the review of literature, it is noted that most of studies already undertaken on financial appraisal concerns either to ratio analysis, cash flow analysis or fund flow analysis. No conclusion can be drawn about the overall financial affairs of the company from these studies. Keeping in view of the fact that different ratios have been interpreted in different manner, for instance, rising trend of certain ratios like profitability ratios depicts favourable indications while falling trend of certain other ratios like debt collection ratios depicts favourable indications. While interpreting these ratios of a particular company sometimes a subset of ratios reveal favourable trend and other subset of ratios reveal unfavourable trend. Hence, these ratios can not be added to compute the overall financial affairs of the company. Under these circumstances, it is not feasible to compare the overall financial performance of one concern with others or with its own performance over the past years or with industry norms and standards. To avoid this, an attempt has been made in the present study to develop a weighted composite index model to evaluate the overall financial performance of a concern. It will give us a better insight into the short-term and long-term solvency, efficiency and effectiveness of the selected commercial undertakings.
2.3 **Scope of the Study:**

Public sector undertakings are growing since the beginning years of plans in India. It is regarded as core sector in India. All units are not subjected to an intensive search by a single researcher. So the present study is confined to 100 companies i.e. 25 companies each from the four selected industries i.e. General Engineering and Electronics, Chemical and pharmaceuticals, Textiles and Mining Metallurgical and Cement Industries. The secondary data relating to these companies has been collected for the period of five years i.e. 1991-92 to 1995-96.

Further the scope of the study is limited to:-

(i) Financial appraisal of selected commercial undertakings.

(ii) Determination of significance of various ratios.

(iii) Development of weighted composite index model of various ratios.

(iv) Development of norms and standards of various ratios.

(v) Interpretation and comparison of financial performance of selected companies with others or with its own performance over the past years on the basis of developed norms and standards.

2.4 **Objectives of the Study:**

The present study is aimed at evaluating the financial performance of selected commercial undertakings with the help of various tools and techniques of financial analysis and with the help of weighted composite index model. The main objectives of the present study are:-

(i) To get a reliable picture of financial health, strength and stability of companies and to ensure its
capacity to meet its short-term and long-term obligations.

(ii) To get an insight into operational efficiency and profitability.

(iii) To get an idea of relative worth and performance of the companies.

(iv) To study the capacity utilisation of the companies.

(v) To develop norms and standards of different ratios within industry and interpret results to evaluate the overall financial performance of the companies.

(vi) To conclude and suggest thereof, to get a view of future progress and prospective of companies.

2.5 Research Methodology:
The present study is entirely based on the secondary data. The relevant latest available data has been collected mainly from The Bombay Stock Exchange Official Directory. The use of a single source of data is intended to minimise the disparities arising due to use of different accounting practices definition of terms and basis of calculations. Relevant ratios where ever available are used, certain ratios like GPR, NPR, DTOR, ATOR and WCTR are calculated on the basis of financial data available in The Bombay Stock Exchange Official Directory. The financial statement data analysed in this study is for a period of five years i.e. 1991-92 to 1995-96.

2.5.1 Sample Selection:
The relevant data has been taken from four industries as given below:-

1. General Engineering and Electronics Industries.
2. Chemical and Pharmaceuticals Industries.
3. Textiles Industries.
2.5.2 Research Setting and Selection of Indicators:
The subset of universe is consisted of 100 companies i.e. 25 companies in each industry. Different aspects of financial ratios have been considered by concentrating upon four separate industrial sectors, primarily to alleviate the industry effect on the results and to penetrate deeper into the problem by confirming to single industry only.

For the convenience of exposition, the ratios to be used in the present study have been grouped under five broad categories viz. liquidity ratios, profitability ratios, efficiency ratios, capitalisation ratios and turnover ratios. Each of these categories is further divided into several sub-categories. Data relating to 19 different ratios are depicted in the present study. The explanatory variables i.e. indicators chosen for the study are listed below:-

\[
\begin{align*}
V_1 & \quad \text{Current ratio (CR)} \\
V_2 & \quad \text{Acid-test ratio (ATR)} \\
V_3 & \quad \text{Gross Profit ratio (GPR)} \\
V_4 & \quad \text{Net profit ratio (NPR)} \\
V_5 & \quad \text{Return on Capital Employed (ROCE)} \\
V_6 & \quad \text{Net profit to total assets (NP/TA)} \\
V_7 & \quad \text{Net sales to total assets (NS/TA)} \\
V_8 & \quad \text{Net sales to net worth plus debentures (NS/ND)} \\
V_9 & \quad \text{Net sales to plant and machinery at cost (NS/P&M)} \\
V_{10} & \quad \text{Cash flow ratio (CFR)} \\
V_{11} & \quad \text{Earning to equity (ETOE)} \\
V_{12} & \quad \text{Dividend to equity (DTOE)} \\
V_{13} & \quad \text{Earning per share (EPS)} \\
V_{14} & \quad \text{Price-earning ratio (PER)} \\
V_{15} & \quad \text{Dividend per share (DPS)} \\
V_{16} & \quad \text{Dividend yield ratio (DYR)}
\end{align*}
\]
2.5.3 Rational for Selection of Indicators:

With a view to select companies of repute in the present study, only those companies have been considered whose shares were quoted in The Bombay Stock Exchange and whose earning per share and dividend yield ratios were positive. While selecting variables, every care has been taken to represent each sphere like liquidity, profitability, efficiency, capitalisation rate and turnover of the company so that realistic indices of financial structure can be constructed. The first two indicators $V_1$ and $V_2$ represent liquidity position of the company. Four indicators $V_3$, $V_4$, $V_5$ and $V_6$ have been selected to indicate the overall profitability of the company. Indicators $V_7$, $V_8$ and $V_9$ are indicative of efficiency of the company in terms of sales turnover. Capitalisation rate is considered as one of the most important aspect in the financial structure of the company. Indicators $V_{10}$ to $V_{16}$ have been selected to exhibit the cash flow ratio, earning to equity, dividend to equity, earning per share, price earning ratio, dividend per share and dividend yield ratio of the company. Efficiency of the company in terms of debtor turnover, asset turnover and working capital turnover is represented by indicators $V_{17}$ to $V_{19}$.

2.5.4 Tools and Techniques used:

The indicators selected for working out composite indices were measured in different units and as such they were not directly additive. It was felt necessary to convert the variables into standard units so that the initial scale selected for measuring the variables did not bias the
To standardise the indicators, 'Z-sum techniques' is used having mean value zero and standard deviation unity. The Z-score is calculated as follows:

\[ Z = \frac{X_{ij} - \bar{X}_{ij}}{\sigma_{ij}} \]

Where,

- \( i \) refers to the company
- \( j \) refers to the ratio
- \( \bar{X}_{ij} \) refers to the arithmetic mean of \( i \text{-th} \) company's \( J \text{-th} \) ratio
- \( \sigma_{ij} \) refers to the standard deviation of the \( J \text{-th} \) ratios

The standardised scores depicted in Appendix Z.1-Z.20, having distribution pattern has an additive property, which can be added to compute composite scores. But the significance of different ratios in different industries varies since the nature of each industry is different, some deals in seasonable articles and other deals in capital equipment etc. Hence, industry-wise weights are required to be assigned to each ratio. Some objective method of assigning suitable weights has to be employed for construction of composite indices.\(^5\) \(^2\) Weights to each ratio are assigned with the help of principal component analysis or factor analysis. This method provides a better system of composite classification of indices. Factor loading of values of factor 1 is used as weights which depicts the relative significance of each ratio. To evaluate the overall performance of each concern a weighted composite index model is developed.

The weighted composite index of financial performance has been constructed for 19 indicators of four industrial sectors for five years period of time i.e. 1991-92 to 1995-
The present study therefore, makes use of first Principal Component Analysis for constructing composite indices of financial performance of selected companies. Further, the method of factor analysis has also been used for construction of composite indices of various dimensions of financial performance.

The first principal component is the linear combination of weighted variables which explains the maximum of total variance. The formula used is as follows:

\[ P_1 = \sum_{i=1}^{n} a_{ji} X_i \]

Where \( P_1 \) = the first principal component.

\( a_{ji} \) = Factor loading of the first principal component vector relating to \( j \)th indicator of \( i \)th company.

\( Z_i \) = Standardised value of the observed variable.

Thus the first principal component which gives maximum correlation with variables and explains maximum of the total variance is considered as composite index of performance of a company.

The data of five benchmark years, i.e. the correlation matrices for the years 1991-92 to 1995-96 were analysed separately from the derivation of factor matrix.

The sum of the squares of the factor loading of the first principal component is the largest eigen value, which measures the proportion of variance explained by the first principal component. On the other hand, the sum of squares of the factor loading of all the principal components retained corresponding to the variables in communality (\( h^2 \))
which explains the percentage of variance explained by the factor model.

Although the Selection of technique depends on the availability of computer programme, yet the results are not likely to be affected much irrespective of whether principal component analysis was used or factor analysis, because both the techniques give almost similar results after rotation\(^5^3\). Further results are not likely to be affected after two decimal figures. Therefore, financial results depicted in various tables are restricted to two or three figures after decimal in the present study.

In order to identify different dimensions of financial performance of selected companies, rotated factor matrices were derived from correlation matrix using principal component analysis, i.e. with unity along the diagonal of the correlation matrix. For the extraction and rotation of the number of factors, Kaiser’s latent root criterion or eigen value greater than one criterion was used which is suitable particularly for principal component analysis.\(^5^4\) Further, for rotation, the widely used method namely varimax method was used. This method aims at simplification of columns i.e. factor loading tends towards unity or zero, thus facilitating interpretation of factors.\(^5^5\) Various aspects of the financial performances and associations of each selected variables have been identified on the basis of rotated factor matrix by taking into account the factor loading greater than 0.488 (or nearer to this value)\(^5^6\) as significant for the purpose of construction of composite indices of financial performances with a view to interpret each variable with at least one factor. Statistical technique of normal distribution is applied to the weighted composite index to develop industry norms and standards.
The following equation has been used

\[ \bar{X} \pm \alpha_{0.25} \sigma / \sqrt{n} \]

\( \bar{X} = \) computed value of Industry norms and standards

\( \alpha_{0.25} = \) Area under standard normal curve i.e. 0.675 (Table Value)

\( \sigma = \) Standard deviation of the weighted composite scores of the Industry.

\( n = \) Number of selected companies in the industry.

On the basis of financial performance, selected companies have been categorised into four quartiles i.e. excellent, above average, below average and very poor companies. Excellent companies are those, which achieved financial results more than the calculated value of Industry norms and standards, above average companies depict financial results between 0 to plus value of industry norms, below average companies depict financial results between 0 to minus value of industry norms, whereas very poor companies are those, which yielded financial results below the calculated value of industry norms and standards. Thereupon, weighted composite index of each concern is compared with other concerns in the each industrial sector or with its own performance over the past years or with industry norms and standards.

2.6 Limitation of the Study:
The main limitations of the present study are:-

i) One serious difficulty associated with the secondary data is to draw inferences because the secondary data are vitiated by different procedures adopted by various firms. The different may be due to various reasons viz different depreciation methods, differences in the
basis of inventory valuation and estimated working life of assets particularly plant and machinery and so on.

ii) Another major limitation of secondary data is associated with price level changes. Assets acquired at different periods are, in effect, shown at different prices in the balance sheet, as they are not adjusted for changes in the price level. As a result, study based on secondary data will not yield strictly comparable and therefore, dependable results.

iii) The study take into consideration the quantitative aspects of the financial performance of the companies and not the qualitative aspects, such as impact of industrial assistance in the economic development of the country, on additional employment opportunities contribution to net domestic product and development of industrial estate.

iv) For an extensive study of financial appraisal of commercial undertakings, a lot of time is needed. Due to the time constraint, present stud is kept within manageable limit only.

v) Further the study is subject to limitations of the nature of financial statements.
REFERENCES


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