CHAPTER II

DATA AND METHODOLOGY
Plethora of studies have been conducted in the area of performance evaluation. The researchers and analysts have devoted their attention to evaluate firms for variety of decision making purposes. These include, prediction of corporate failure, credit lending, investment analysis, inter-firm comparison, and internal control.

2.1 CORPORATE PERFORMANCE MEASUREMENT TECHNIQUES

The analytical techniques relating to the predictive power of financial ratios, can be discussed in four heads:

1) Univariate analysis,
2) Multi-ratio analysis
3) Multivariate analysis, and
4) Computer techniques.

2.1.1 Univariate Analysis

The basic objective of the univariate analysis is to compare the financial ratios of sick companies with those of non-sick companies in order to detect systematic differences which might assist in predicting the chances of survival or sickness of a company. Under univariate approach, each ratio is considered individually for sick companies and non-sick companies.
The analytical procedure applied for testing the predictive power of financial ratios on univariate basis can be divided as follows.

a) The computation of mean values of financial ratios of sick companies and non-sick companies, and

b) Dichotomous classification test.

a) The computation of mean values of financial ratios of sick companies and non-sick companies

The mean values of financial ratios are computed for the sick companies and non-sick companies in each of the years prior to sickness. The comparison of mean values of ratios for the two groups - sick group and non-sick group is undertaken in order to identify the discriminating power of ratios taken individually. It is not a predictive test but a convenient approach of sketching the general relationship between the sick and non-sick companies’ financial ratios. Student’s t-value of each ratio is also computed in order to judge whether the difference between mean values of ratios of the two groups is statistically significant or insignificant.

b) Dichotomous classification test

The dichotomous classification test predicts the sickness status of a company based solely upon a knowledge of financial ratios. It is a simple predictive test measuring the relative differentiating power of various financial ratios. The classification test makes a dichotomous prediction, i.e., a company is either classified into sick group or non-sick group. To make predictions of sickness the ratios of mixed sample of sick and non-sick companies are arrayed, i.e., each ratio is arrayed in
ascending order marking the sick company with (x). The array of each ratio is inspected to find a best cut off point, i.e., a point that minimises the percentage of classification error rates.

2.1.2 Multi-ratio Approach

Criticism levelled against univariate approach clearly indicates that financial ratios taken individually cannot provide sufficient information for understanding the various economic dimensions of a company. A set of financial ratios may contain more useful information than any particular representative ratio. Therefore, the long list of ratios usually provided to users is substantially redundant.

2.1.3 Multivariate analysis

In multivariate analysis, several ratios are considered simultaneously in order to develop an index or a meaningful predictive model. The construction of ratio index amounts to a formulation of a model designed to describe and predict industrial sickness. The formulation of sickness-prediction model involves specific problems which are to be considered.

2.1.4 Computer Techniques

We have been witnessing tremendous progress in the information technology, and in recent years there is a growing interest in the application of computer techniques particularly in the area of financial management. The finance function which includes numerous specific tasks that are of a repetitive nature and yet require a certain degree of judgement and expertise, offers tremendous potential for using computer technology.
Expert Systems (ES) are problem solving programs that solve substantial problems generally considered as being difficult and requiring expertise. They simulate the behaviour of a human expert in a specialized domain, offer advice and justify line of inference. The principal power of expert systems is derived from the knowledge that the system embodies rather than from search algorithms and specific reasoning methods. An expert system successfully deals with problems for which clear algorithmic solutions do not exist (Yasdi and Zianco, 1988).

Application of expert system techniques is found in a wide area of financial management. Mostly they are found in financial services sector, such as banking insurance, and trading. Business and commercial loan evaluation and customer credit granting are areas where expert systems are in practical use. A brief review of the use of financial ratios as predictors of corporate sickness is given in the following paragraphs.

2.2 CORPORATE PERFORMANCE EVALUATION STUDIES: A REVIEW

Significant difference between the ratios of failed firms and non-failed firms was observed by Fitz Patrick (1932). He published a study of 19 pairs of failed and non-failed firms and found that there were persistent difference in the ratios for at least three years prior to failure. Winaker and Smith (1935) examined 183 firms which failed between 1923-1931 for ten years prior to the year of failure. Twenty one ratios for each of the firms were computed and examined after the financial statements had been standardised. The mean ratios of the middle half of all the firms were used to compare individual changes for the whole group. It was concluded that the ratios of the failed...
firms were frequently below the mean value used for comparison and showed deterioration as the date of failure drew near and also pointed out that the ratios of net working capital to total assets was the most accurate and steady indicator of failure, with its decline beginning ten years before the occurrence of failure.

Hickman (1958) found that the times interest earned ratios and the net profits to sales ratio were useful predictors of the default experience of corporate bond issues during 1900-1943. Moore and Atkinson (1961) concluded that the ability to obtain credit was correlated with several ratios.

The above studies were generally descriptive and did not face directly the normative problem of predicting corporate failure.

Beaver (1966), in spite of the ubiquity of financial ratios, attempted to emphasise its usefulness for firm failure prediction. The underlying predictive ability of the financial ratios was demonstrated by him by comparing the mean values of a selected set of ratios and proved that cash flow/total debt was the major contributor in the process of failure prediction. Beaver (1968) continued his study and made an investigation to the extent to which changes in market prices of stock can also be used to predict firm failure. For this purpose, a sample of 79 failed and 79 non-failed firms which appeared in Moody’s Industrial Manual during the period 1954 to 1964 have been included. For every failed firm in the sample, there is a non-failed firm from the same industry and from approximately the same asset size class. Using time series analysis it was found that investors forecast failure sooner than ratios.
While there were attacks on the relevance of ratio analysis as an analytical technique in assessing the performance of the business enterprise, Altman (1968), was the first who attempted to demonstrate the significance of the financial ratios by using the statistical analysis Multiple Discriminant Analysis (MDA) in the prediction of corporate bankruptcy. For this purpose he selected a sample of 33 failed firms and 33 non-failed firms in the manufacturing industries. On applying MDA technique on the financial ratios of the above firms, he ascertained five significant ratios (working capital/total assets, retained earnings/total assets, earnings before interest and taxes/sales, market value of equity/book value of equity, and sales/total assets), which classified the companies into failed and non-failed. Using the five selected ratios, he developed a Z-score model. The cut off point for the Z-score was determined in such a way as to minimise the overlap between bankrupt and non-bankrupt firms. He concluded that Z-score of 2.675 was the best cut off point which maintained minimum misclassification. The five variable model using data of one year before failure correctly classified 95 per cent of the total sample which reduced to 36 per cent when data of five years prior to failure were used.

Deakin (1972) made an attempt to develop an alternative to the Beaver and Altman models. A sample of thirty-two failed firms and matching sample of thirty-two non-failed firms was taken. Each of the failed firm was matched with a non-failed firm on the basis of industry, size and year of financial data. He conducted two major empirical experiments. First, he adopted a method of analysis similar to Beaver's study by applying the dichotomous classification test and percentage error of each ratio was ascertained. In the second test, discriminant analysis technique was applied. The results indicated that the discriminant analysis can be used to predict business failure using
ratios as prediction variables three years in advance with a fairly high degree of accuracy.

A stepwise regression programme, forward selection and backward reduction was used by Meyer and Pifer (1970) for prediction of bank failures. A classification test used by them correctly predicted 80 per cent of the initial sample banks and 72 per cent of the hold out sample with a lead time of one or two years before failure. Libby (1975) made an attempt to evaluate jointly (i) the predictive power of ratio information, and (ii) the ability of loan officers to evaluate ratio information in a failure prediction framework. Using principal component analysis, he identified five independent variable set with the 14 variables selected by him.

To construct a solvency model, Taffler and Tishaw (1977) developed a 'Z Model for the prediction of company's insolvency. Applying linear discriminant analysis to a sample of 46 failed firms and 46 financially sound firms matched by size and industry, it was found that four ratios taken together in the right proportions were able to measure the risk profile of the firm which was summarized by the single number, i.e., its Z-score.

Ohlson (1980) developed a conditional logit model which pointed out that the fundamental estimation problem can be simply reduced to the following statement: 'Given that the firm belongs to some pre-specified population, what is the probability that the firm fails within some pre-specified period'. He used a sample of 105 firms which experienced bankruptcy during the period 1970-1978 and 2058 non-bankrupt firms. Nine financial ratios were tested to form an opinion about the discriminatory
power of financial ratio. Three set of estimates were computed for the conditional logit model. The results indicated that the four factors derived from financial statements were statistically significant in assessing the probability of bankruptcy.

Dambolena and Khoury (1980) constructed a model using stability and level of financial ratios as explanatory variables in the derivation of discriminant function. The basic purpose of this study was to test the effect of stability of financial ratios on prediction of corporate failure. It was concluded that the inclusion of stability of ratios in the analysis improved considerably the ability of the discriminant function to predict failure.

According to Elton et al. (1981), modern investment theory does believe in that expectations about a firm characteristics are incorporated into security prices. He examined the importance of expectations concerning one variable earnings per share.

Subsequent to the application of discriminant analysis to two category (dichotomous) classification problems in empirical research by Altman (1968), researchers in many countries attempted to replicate and extend the Z-score model considering the local environments. Published study of this kind include Lis (1972), Marc Blum (1974), Maurice Joy (1975), Altman Loris (1976), Hennaway and Morris (1983), and Houghton and Woodliff (1991).

Altman et al. (1977), developed and marketed a 'second generation model' called Zeta Score which is essentially the same as Z-score model but it takes into account the changes in the financial reporting standards such as capitalisation of leases. An alternative to using discriminant analysis they used a conditional probability model
to estimate the probability of occurrence of a particular outcome. Similar classification model was developed by Föster (1978) using stepwise discriminant analysis.

Contrary to the above a popular model called 'Cashflow Situation Model' (CSM) was developed by Murali (1993) using cashflow ratios. He argued that the ratios in MDA models are related to the symptom and does not include the actual problem analysis. It is a conceptual model in which he underlined the dynamics of cashflow and the probable consequences if such situations are not properly dealt with. Also, he outlined that the process of financial distress takes at least seven stages commencing from the decrease in surplus to the actual financial distress stage.

Ademola Arya (1986), studied the behavioural evidence from 31 bank managers and officers of financial institutions in Nigeria on the appropriateness of the choice of variable for bankruptcy prediction. The study found that there was a consensus on short term liquidity ratios being consistent predictors of financial distress, a finding which confirm the usual choice of variables based on statistical model. He also found that the level of experience of the manager had an important bearing on the choice of variables to be used in predicting bankruptcy. Frydman et.al... (1985) used another useful statistical technique called recursive partitioning in the failure prediction model.

Research on organisational failure generally supports the portrayal of collapse as a downward spiral. Once a weakness develops, there is a tendency for additional debilitating problems to occur. A synthesis of the 'downward spiral' view of failure was set forth by Hambrick and D'Aveni (1988) who found that a sample of nine large
bankruptcies showed signs of financial weakness (relative to a matched sample of survivors) as many as ten years before failure.

For identifying the financial distress, Barniv and Reveh (1989), presented a non-parametric approach and the methodology seems to overcome some of the problems and shortcomings of the discriminant analysis as well as logit and probit analysis. They demonstrated that the continuous scoring system developed by them provide a less misclassification accuracy than obtained by the discriminant or logit and probit analysis.

Aharony et.al., (1980) examined the share price reactions prior to bankruptcy. Altman (1969), and Clark and Weinstein (1983) studied the share price movements around bankruptcy event. These studies uniformly support the contention that share prices deteriorate significantly prior to and around bankruptcy event.

Altman and Beaver (1981) indirectly tested the market efficiency by examining market reaction subsequent to release of bankruptcy from a discriminant model. The observation of an ex post negative price reaction would be evidence of market inefficiency. The result provided mixed support of negative market reaction following the annual report release data for the two factor form of market model only.

Gilbert et.al., (1990) argued that there is no obvious reason to expect that a bankruptcy prediction model developed along traditional lines would be able to distinguish distressed firms filing bankruptcy from others avoiding it. In their model, they demonstrated a bankruptcy model using a bankrupt/random estimation sample is unable to distinguish firms that fail from other financially distressed firms. Further, it
was demonstrated that a financial ratio-based bankruptcy model estimated from a sample comprised of distressed firms also performs poorly, suggesting that the result of distress is influenced by other, perhaps non-financial, factors. The results showed that the financial variables which showed any ability to distinguish between bankrupt and distressed firms are different from those discriminate between bankrupt and randomly selected non-bankrupt firms.

Keishiro Matsumoto et al., (1991), found that in some respects, credit analysis for both retail and manufacturing clients appeared similar. Among measures of liquidity the collection period, the current ratio, the selling period, and the receivables turnover are ranked highly for both groups of clients. Among measures of profitability, the after-tax profit margin (net income/sales) and cost of goods sold/sales are ranked high for both groups. Among measures of long term solvency, total debt/total equity is considered great importance in evaluating the credit worthiness of both retail and manufacturing clients. Using 5 per cent level of significance, four ratios were found to be of significantly greater importance in evaluating retail as compared with manufacturing clients.

Kaplan (1992), devised a “balanced scoreboard” - a set of measures that gives top managers a fast but comprehensive view of the business. The balanced scoreboard includes financial measures that tell the results of actions already taken. It complements the financial measures with operational measures on customer satisfaction, internal processes, and the organisation's innovation and improvement activities - operational measures that are the drivers of future financial performance.
2.3 CORPORATE PERFORMANCE STUDIES IN INDIA

Using the financial ratio profile, researchers in India too attempted to predict the corporate performance. Few of them is briefly explained below:

Rao and Sarma (1976), applied multiple discriminant analysis to a sample of 60 textile firms comprising 30 failed and 30 non-failed firms. The discriminant function found to be efficient included 5 financial ratios which were: net worth to total assets, debtors to turnover, working capital to total assets, retained earnings to total assets, earnings before interest and taxes to total assets.

Gupta (1979), has carried out a study on ‘corporate sickness’ using financial ratios. He has taken a sample from textile industry and tried to extend it to non-textile units as well. Fifty-six ratios, classified into two broad categories of profitability ratios and balance sheet ratios, were tested. A sample non-parametric test for measuring the relative differentiating power of the various financial ratios was used. The test was based on taking a sample of sick and non-sick companies, arraying them by the magnitude of each ratio to be tested. A cut off point was then selected which divided the array into two classes with a minimum number of misclassifications. A percentage of misclassification error was then chosen as a deciding parameter.

The sample included 41 textile companies of which 21 were non-sick and 20 were sick. The matching was done on the basis of product or products manufactured, age, and size measured in terms of paid-up capital, assets and sales. Ratios were computed and tested for each of the company in sample. Five profitability ratios were finally selected which individually had shown to possess highest predictive power when
applied to a **homogeneous** industry group. It was observed that companies with an inadequate **equity base** had little ‘reserve strength’ to weather adversities and are, therefore, **sickness-prone**. Another important observation was that all liquidity ratios proved to be very poor predictors contradicting the great importance traditionally attached to liquidity analysis in appraising corporate health.

Kaveri (1980), selected a sample of 524 small units comprising of good, regular and sick units which had an investment upto Rs.3.75 lakhs. Twenty-two ratios were considered for identifying the health of small scale industries. Of these only five significant ratios were selected on the basis of t-test. The five ratios are: the current ratio, stock/cost of goods sold, current assets/ net sales, net profit before taxes/total capital employed, and net worth/ total outside liabilities. The multiple discriminant analysis technique was applied to assign units in the sample to one of the groups viz. good, regular and sick. Accuracy of prediction was found to be 76 per cent in the initial sample and 69 per cent in the hold out sample for year before the event.

Srivastava (1981), used a combination of operational, technical, and financial parameters to discriminate between the sick and healthy units. He developed a linear discriminant function comprising seven ratio parameters. A computer model was built up using three financial ratios, and the predictive accuracy of the model was computed. The misclassification error was 15 per cent which reduced to ten per cent when five financial ratios were used. In continuation of the above study, Srivastava (1985) developed an MDA model to determine the effectiveness of working capital management so that the current operational practices in formulating the policies of working capital management. For this purpose he selected a sample of 78 companies-
39 sick companies and 39 non-sick companies and applied factor analysis and multiple discriminant analysis using financial ratios as variables, to classify the companies in terms of their effective or ineffective working capital management. The results indicated that 95 per cent of the companies in the sample are correctly classified by the discriminant function. To test the real effectiveness of the model, he selected another 40 textile companies not included in the previous analysis. Applying the discriminant function, he found that the model correctly classified 95 per cent of the companies in the sample.

Pandey (1990) attempted to study the following: a) Indian evidence on empirical-based classification of financial ratios; b) to examine the intertemporal stability/change. He selected 612 Indian companies belonging to 61 manufacturing and processing industries. Twenty ratios were computed for each of the above companies. On applying the factor analysis, R factor analysis, correlation and percentage mean absolute deviators to the above sample, ten factors were obtained representing liquidity, profitability, activity, and leverage.

Most of the studies dealing with corporate sickness have explored a number of financial ratios as predictors of corporate sickness and incorporated a large number of ratios in their predictive models.

2.4 THE PRESENT STUDY

The present study has emerged out of the following reasons:
Generally, these models are developed using two groups of financial ratios, one for failed companies and the other for sound companies. The statistical procedure is then designed to select the set of measures that together best discriminate between the groups of companies. It leads to the development of a linear model made up of selected ratios appropriately weighted by the technique such that the failed companies are separated as far as possible from the sound ones. Clearly the use of these models required two groups of firms. In addition, the methodology assumes that if a model is developed for a particular industry, then further companies in that industry have a good chance of being correctly classified as belonging to the failed or the sound companies. Many investigators, used data on manufacturing companies to develop their models. But, in practice it is difficult to know whether a company does meet such a specific industry norm. In many cases, even companies in the non-manufacturing category have been included. Keeping this in view, a new methodology has been developed based on several statistical techniques in order to assess the company performance. The methodology is general in nature and can be applied widely in the areas of credit evaluation, failure prediction, investment analysis and for internal control.

2.5 THE SAMPLE

The sample used in this study is taken from the 'Capital Market' a database which has been created and constantly updated for the use of investors and merchant bankers. This database has been installed at a leading share broking and merchant banking company, Chandrakala Money & Capital Management Company Ltd, Chennai. The database contains financial and non-financial information relating to the manufacturing and service industries in India from the year 1989. Among the
manufacturing sector, five major industries, namely, automobile, cement, chemical, electronic and steel industries have been selected for the present study. As the output of these five industries alone accounted for nearly a third of the total output in India during the year 1989, these five industries have been considered for the present study. All the companies including the ancillaries have been included for the purpose of analysis. Thus a initial set of 1200 companies which were available in the database between 1989-93 has been selected. However, due to lack of some information which are necessary for the computation of ratios, few companies have been omitted. Thus a final set of 1015 companies has been taken up for the present analysis. The break up of the number of companies in each selected industry for the five years is given table 2.1

### TABLE 2.1

<table>
<thead>
<tr>
<th></th>
<th>Automobile</th>
<th>Cement</th>
<th>Chemical</th>
<th>Electronics</th>
<th>Steel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>50</td>
<td>19</td>
<td>24</td>
<td>13</td>
<td>38</td>
<td>144</td>
</tr>
<tr>
<td>1990</td>
<td>61</td>
<td>20</td>
<td>30</td>
<td>30</td>
<td>42</td>
<td>183</td>
</tr>
<tr>
<td>1991</td>
<td>62</td>
<td>26</td>
<td>36</td>
<td>43</td>
<td>59</td>
<td>226</td>
</tr>
<tr>
<td>1992</td>
<td>62</td>
<td>30</td>
<td>44</td>
<td>44</td>
<td>65</td>
<td>245</td>
</tr>
<tr>
<td>1993</td>
<td>52</td>
<td>28</td>
<td>38</td>
<td>39</td>
<td>60</td>
<td>217</td>
</tr>
<tr>
<td>Total</td>
<td>287</td>
<td>123</td>
<td>172</td>
<td>169</td>
<td>264</td>
<td>1015</td>
</tr>
</tbody>
</table>

2.6 **RATIO SELECTION**

Though a number of ratios can be calculated from the financial statements considering the popularity and usefulness of ratios which were used by most of the
previous researcher, 112 ratios have been identified from the current literature. As some of the ratios are very similar in the definition, they have been omitted. Due to inadequate data, few ratios could not computed and therefore excluded. Thus a final set of 52 ratios which are commonly used by researchers for variety of purposes, has been selected for the purpose of investigation. Using a computer program, these 52 ratios were computed for all the companies in the five industries selected for the study.

2.7 METHODOLOGY

It is well-known that utilisation of financial statements in comparing performance of companies is highly subjective. Although new developments in computer technology have revolutionalised information detection, processing and reporting, little has been done to replace intuition and subjective evaluation in comparison of performance. Investment services do attempt to classify companies into groups on the basis of the selected financial indicators where companies within a given grouping are perceived by the analyst as similar with respect to the selected indicators. But, such classifications have remained subjective. Therefore, there is a need for developing a conceptual basis for classification of companies. In addition, whenever a vast amount of data are to be evaluated, there is a need to categorize the data into groups in order that objects within a group are very similar and objects in different groups are very dissimilar, mainly for ease of comprehension. Considering this, an attempt is made to apply a systematic quantitative analysis of affinity or similarity between companies and the utilisation of such relationship in clustering or grouping related companies. While developing a classification procedure, care has been taken to understand the distinction between technical and fundamental processes relating to companies. While technical data
related to price movements, trading volumes and dividends, the fundamental processes assume an underlying continuity of business performance, making the financial records a major factor in evaluating companies.

2.8 FACTOR ANALYSIS

The financial data reflecting company performance were analysed using several statistical procedures. To begin with, classification schemes for financial ratios have been developed. Faced with a bewildering array of potentially useful ratios, one is often forced to rely upon some system for reducing the array to a manageable number of ratios. Understanding the empirical relationships among ratios is pre-requisite to developing some system for classifying financial ratios. Keeping this in mind, a classification scheme has been developed for financial ratios using factor analysis, a technique designed to represent economically the variation in the variables of a data set via a smaller number of factors. Apart from aiming to investigate the potential for data reduction in financial ratios it was also intended to test for the possibility that the results of data reduction are dependent upon the precise period selected for the study. It was decided to perform data reduction using factor analysis on the financial ratios of 1015 manufacturing companies in the five selected industries for the period 1989 to 1993.

2.9 CLUSTER ANALYSIS

It is quite difficult and cumbersome too, to evaluate the performance of large number of companies taken together. In this connection, it has been a common practice to divide the companies into manageable number of groups to facilitate an effective
analysis of company performances. Therefore, it has been decided to divide the number of companies into three groups in each year for the five selected industries, with an intention of identifying them as good, average or as poor. Towards this direction, cluster analysis, a statistical technique that would help to classify the number of companies into required group has been applied.

2.10 DISCRIMINANT ANALYSIS

Stepwise discriminant analysis is performed to find out the classification accuracy for the five year data for all the five industries under study. This has resulted in the selection of key ratios from the 52 which are sufficient to classify the companies into three groups. The different key ratios are added for each industry and with the help of the reduced set of key ratios, cluster analysis is performed for all the companies for all the years in each industry maintaining the same three-groups. Finally to reduce the ratios further, stepwise discriminant analysis is once again applied on the three-group data for each industry.

2.11 COMPOSITE RULE INDUCTION SYSTEM

Over the last three decades, information technologies have progressed so extensively that one finds their application in decision making in every field. The proliferation of decision support systems (DSSs) and Expert Systems (ESs) in scientific, engineering, and commercial situations to aid decision-makers is an obvious manifestation. The DSSs, originated to help managers by presenting them with various alternatives ('WHAT IF' situations) and make managers decide on the course of action which is better. On the other hand, ESs employ artificial intelligence techniques in a
narrow, well-defined domains to aid managers in analytical and inferential tasks. An expert system is basically a computer program that employs artificial intelligence reasoning techniques, which simulates the inductive reasoning power of a human expert in a specific decision environment.

In recent years, application of ES in the area of financial management has been on the increase. Since a number of decisions has to be taken up by the top executives in the corporate sector under different hypothetical situations, ES has become more imminent to aid decision makers. Towards this end, a Composite Rule Induction System (CRIS), one of the efficient approaches of expert system has been developed in the computer language, C. CRIS aims to construct a set of rules from the given data to interpret, and facilitate decision making when a new case is encountered. Decision rules are induced in order to generate hypothesis concerning possible causal relationships in the input data. A hypothesis is a preliminary ‘IF-THEN’ rule whose probability is to be determined by the probability calculator and whose interpretative power is to be determined by rule scheduler.

2.12 SIMULATION TECHNIQUE

Finally, an attempt has been made to generate the hypothetical combination of the set of ratios which are selected under the ES using another computer technique called 'Simulation'. Originally, simulation technique was applied in the area wherever data is inadequate. However, considering the usefulness, application of this technique has been extended for different purposes.
In this study, simulation technique has been used to identify a new company not included in the present analysis, either a good company or a poor one after significant ratios of the new one is known. Since the generated set contains different combinations of significant ratios and in different proportions for both the good and poor cluster, a new company’s significant ratios might fall in either of the two groups. Essentially, it is quite possible to identify a new company as a good or a poor one without any difficulty. On the other hand generated data can also be helpful to a company for strengthening possible ratio combinations given in the simulated data set. About 2000 samples have been generated for the two-group classification (good and poor) to enable easy reference for the companies in the selected five industries.

It is not intended that a systematic quantitative procedure of comparing companies will serve as a panacea for all investment decision problems. However, profitable investment recommendations at a given point of time can be made. Since fundamental data at a point of time are historical in nature, any method of analysis is limited by uncertainties of the future. Other things being equal, the present method has an important advantage over conventional method of grouping companies in the sense that vast amounts of data can be processed efficiently using computers.

2.13 OBJECTIVES OF THE STUDY

The objectives of the present study include:

i) to develop a classification scheme for financial ratios in order to identify a smaller number of factors reflecting the variation in the performance of companies;
ii) **to develop** a conceptual basis for classification of companies in terms of selected financial ratios, replacing intuition and subjective evaluation of performance of companies hitherto followed;

iii) **to test the reliability of the groups of companies classified in terms of their performance**;

iv) **to develop** a rule based system which compresses the available financial data into a smaller set of rules and to rules for classification of companies;

and

v) **to generate** various hypothetical combinations of significant ratios for the ascertained clusters.

It is not intended that a systematic quantitative procedure of comparing companies will serve as a panacea for all investment decision problems, credit granting, prediction of bankruptcy or for internal control. However, suitable solutions can be pursued based on the recommendations of the computer model. Since fundamental data at a point of time are historical in nature, any method of analysis is limited by uncertainties of the future. Other things being equal, the present method has an important advantage over conventional method of grouping companies in the sense that vast amounts of data can be processed efficiently employing advanced statistical techniques using the modern computer facilities.
CHAPTER III

CORPORATE PERFORMANCE EVALUATION:
A STATISTICAL APPROACH