CHAPTER VI

CONCLUSION

6.1 INTRODUCTION

Corporate performance evaluation is a topic of much interest in recent years. The evaluation of firms has been done by a variety of users such as management, creditors including banks and financial institutions, shareholders, investors, and others. It is quite obvious that the management evaluates its own firm as a part of self evaluation. The creditors, banks and other financial institutions evaluate mainly to know the creditworthiness of a company in question. The shareholders analyse the financial statements of their company to know the safety of their investment as well as the return on the investment.

The performance of companies, generally, depend on both the qualitative and quantitative factors. The qualitative factors influencing the performance are, consumer satisfaction, product quality, quality of leadership, qualification of manager, political changes, business policy and others. The quantitative factors are the financial ratios which are considered to be the major indicators of corporate performance.

Traditionally, evaluation of a firm was carried out based on the intuition of person concerned. As it is not a desirable measure, subsequently, financial data have been used for this purpose. Financial ratios were considered by most of the researchers and academics as the very important variable in the corporate performance evaluation. Though a number of shortcomings over the use of financial ratios are evident,
considerable research has been devoted highlighting the significant use of financial ratios for the purpose of corporate performance evaluation. Thus, it has been widely accepted that financial ratios are the major indicators of a firm’s performance.

In the beginning, performance of companies have been evaluated with a single ratio namely, current ratio. However, subsequent studies conducted by a number of researchers confirmed that the use of multiple ratios were more significant than any single ratio. Studies were also conducted on identification of the potential ratios that were significant in the performance evaluation of manufacturing and service industries. The set of significant ratios which are used to measure a company’s performance varied significantly for manufacturing and service industries. Also, it has been found that the significant a set of ratios for the same manufacturing industries vary from country to country as different factors relating to geographical, legal, political and others are likely to influence the performance of firms in the respective countries.

Altman (1968) attempted to discriminate sick firms with that of non-sick firms using a statistical technique called discriminant analysis. Several firms in USA considered the Z value recommended by the above author for evaluating their firms. Following Altman, similar studies were undertaken by researchers in different parts of the world. In India, Sharma and Rao (1972) studied the performance of the textile industries based on the selected ratios used by Altman. The results indicated that eight ratios were significant in discriminating the failed firms from the non-failed firms. Gupta (1992) also studied the performance of manufacturing firms in India using discriminant analysis.
6.2 THE PRESENT STUDY

The objective of the present study is mainly to develop a classification scheme in order to identify a smaller number of factors. Secondly, it has been aimed to develop a conceptual basis for classification of companies as good, average and poor using selected financial ratios. Thirdly, it has been attempted to compress the ratio dimension further using a computer technique known as Composite Rule Induction System (CRIS). Finally, an attempt has been made to develop hypothetical combination of generated ratios using simulation technique.

Towards this direction, financial data of five manufacturing industries in India, namely, automobile, cement, chemical, electronic, and steel for the years 1989 to 1993 which were available in a database 'Capital Market' installed at Messrs. Chandrakala Money & Capital Management Ltd, one of the leading sharebroking and merchant banking companies in Chennai have been collected. As these five industries have been contributing nearly a third of the total output in India, it has been assumed that universal application of the results of the present analysis is possible.

After excluding companies for which adequate data were not available, data relating to 1015 companies which were available in the database for five years from 1989 to 1993 in the five selected industries have been collected. No restriction was made on the inclusion of companies for which data were available for all the five years. The total number of companies considered for the present study include 287 companies from the automobile industry, 123 companies from cement industry, 172 companies from chemical industry, 169 companies from the electronic industry, and 264 companies from the steel industry.
A list of 112 ratios have been identified from the studies relating to corporate performance evaluation especially in the areas of bankruptcy prediction, credit lending and investment analysis. The companies for which adequate data were not available have been excluded from the study. Few ratios which could not be calculated have also been omitted. Thus a final set of 52 ratios have been computed for the 1015 companies which have been subjected to further analysis.

6.3 PERFORMANCE EVALUATION: A STATISTICAL APPROACH

Initially, with an intention of identifying the a set of ratios which are significant in the measurement of corporate performance in the five manufacturing industries that are considered for the present study, rigorous statistical techniques have been employed in three stages.

In the first stage, factor analysis is carried out on the financial ratios of each year and for each industry with the help of SPSS, a widely used statistical package. Limitation on the number of factors was not made. The factor scores thus obtained from the above analysis have been used as input for the next analysis namely, cluster analysis. The intention of the cluster analysis is to classify the companies in each year into three groups. The idea behind maintaining the three groups classification in each year is to identify the companies as good, average or poor based their performance which are reflected by the financial ratios.

In order to select a few ratios that are significant for the three group classification, using all the 52 ratios, a stepwise discriminant analysis is applied for each of the five years maintaining higher classification accuracy. The ratios that are
significant for the classification in each of the five years are consolidated and this consolidated a set of ratios is used for carrying out the next analysis.

In the second stage, using the consolidated a set of ratios, factor analysis has been applied once again for each industry. However, for this analysis all the companies in the five years have been considered together as one. Making use of the factor scores, cluster analysis has been applied maintaining the same three group classification. A setpwise discriminant analysis similar to the one that had been applied in the first stage is performed in this analysis too. From the consolidated ratios, a significant a set of ratios is asertained for each industry with a higher classification accuracy at the end of this process.

In the final stage, using the significant a set of ratios that has been obtained from the second stage, cluster analysis is carried out for each year and for each industry with the three group classification. The purpose of cluster analysis at this stage is to group the companies based on the significant ratios so as to identify the groups as good, poor, or average companies. Finally, unlike in the previous stages, a normal discriminant analysis is applied for all the years in order to verify the existence of distinct groups and it was found that there were really three distinct groups maintaining a high percentage of classification.

The following ratios have emerged as the most significant a set of ratios for the five selected industries:
Table 6.1
DETAILS OF SIGNIFICANT RATIOS
SELECTED IN THE FIVE INDUSTRIES

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Automobile Industry</th>
<th>Cement Industry</th>
<th>Chemical Industry</th>
<th>Electronic Industry</th>
<th>Steel Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>NP/NW</td>
<td>NP/NW</td>
<td>EBIT/NW</td>
<td>EBDIT/NW</td>
<td>NP/NW</td>
</tr>
<tr>
<td>2.</td>
<td>CF/NW</td>
<td>EBIT/TA</td>
<td>SA/NW</td>
<td>NP/NW</td>
<td>CF/NW</td>
</tr>
<tr>
<td>3.</td>
<td>CF/TA</td>
<td>FA/TA</td>
<td>LA/TA</td>
<td>LTD/TA</td>
<td>SA/TA</td>
</tr>
<tr>
<td>4.</td>
<td>LTD/TA</td>
<td>CASH/TA</td>
<td>QA/NW</td>
<td>CF/SA</td>
<td>FA/TA</td>
</tr>
<tr>
<td>5.</td>
<td>NP/SA</td>
<td>CA/SA</td>
<td>LTD/TA</td>
<td>EXP/SA</td>
<td>RE/TA</td>
</tr>
<tr>
<td>6.</td>
<td>INT/SA</td>
<td>INT/SA</td>
<td>FA/TA</td>
<td>CL/TA</td>
<td>CASH/SA</td>
</tr>
<tr>
<td>7.</td>
<td>EBDIT/SA</td>
<td>CL/TA</td>
<td>CA/TA</td>
<td>EQ/TA</td>
<td>EQ/TA</td>
</tr>
<tr>
<td>8.</td>
<td>CF/TA</td>
<td>QA/CL</td>
<td>RE/TA</td>
<td>CF/TA</td>
<td>CASH/CL</td>
</tr>
<tr>
<td>9.</td>
<td>CASH/CL</td>
<td>SA/ST</td>
<td>CA/SA</td>
<td>LTD/EQ</td>
<td>EQ/TA</td>
</tr>
<tr>
<td>10.</td>
<td>CF/TA</td>
<td>NP/SA</td>
<td>CASH/SA</td>
<td>EQ/TA</td>
<td>EQ/TA</td>
</tr>
<tr>
<td>11.</td>
<td>LTD/EQ</td>
<td>CASH/SA</td>
<td>EQ/TA</td>
<td>CASH/CL</td>
<td>EQ/TA</td>
</tr>
<tr>
<td>12.</td>
<td></td>
<td>CGS/ST</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.4 PERFORMANCE EVALUATION : A COMPOSITE RULE INDUCTION APPROACH

The outcome of the advancement of computer technology is the Artificial Intelligence (AI) system. The development of the AI system has explicitly helped several domains such as medicine, engineering and financial management. Expert System (ES), a branch of AI, uses artificial intelligence reasoning techniques. Expert systems have been developed to replace human expertise in several areas of research including financial management. To overcome certain shortcomings in the expert systems, especially in the analysis of financial ratios, the Composite Rule Induction System (CRIS) has been developed. The aim of a CRIS method is to construct a set of
rules from a given data set, to interpret the data, and facilitate decision making when
a new case is encountered. It has been established that the CRIS method is an
appropriate technique for classification of good or poor companies based on a set of rules
constructed from a given data set. The rules are framed from the ratios used in the
analysis. This method has been employed for the present study in two stages.

Using cluster analysis, the companies in each industry are classified into three
categories, namely, good, average, or poor companies. In the first stage, the CRIS
method has been employed to construct a set of rules based on the two distinct classes,
good and poor companies. The rules generated from this method are applied to the
average companies. Based on the closeness of the ratios to the good or poor companies,
the average companies are assigned to good or poor companies. Finally, there are only
two categories of companies, viz., good or poor.

In the second stage, the CRIS method is applied to find out a set of ratios that
act as best discriminators between good and poor companies. The companies included
in different industries corresponding to the period 1993 are subjected to the CRIS
method.

The following ratios have been selected in the five industries under the CRIS
system:
The sets of rules needed for classification of companies in the five industries as
good or poor can be summarised as follows:

1. In automobile industry, a company is classified as a good if the ratios EBDIT/SA 
   >= 0.388 or CF/TD >= 0.322 or CASH/CL >= 0.476 and a poor company is 
one if its ratio CF/NW < -0.286. If all of these rules fail to make proper 
classification then the cut rule may be applied. The cut rule is: If CF/TD >= 
0.123 then the company is good else the company is poor.

2. The performance of company in the cement industry is assumed to be good if 
the ratio EBIT/TA, 0.027 or CL/td >= 0.706 and a company is likely to perform 
poorly if the ratio NP/NW < -0.027. If the above rules fail to classify, then the 
cut rule may be used. The cut rule for the classification of a cement company 
is: 'if the ratio SA/ST < 5.040, the company is poor; else the company is good'.
3. A company’s performance in the chemical industry is good if the ratios \( \frac{EBIT}{NW} \geq 0.189 \) or \( \frac{CA}{TA} < 0.25 \) or \( \frac{CA}{SA} \geq 1.829 \). On the other hand, a company is likely to perform poor if the ratio \( \frac{QA}{NW} \geq 2.275 \). The classification of companies in the chemical industry under cut rule is: If the ratio \( \frac{CGS}{ST} < 4.782 \), the company is said to be poor; else the company is good.

4. For a company to be classified as good in the electronic industry the ratio \( \frac{EXP}{SA} \geq 0.301 \) or \( \frac{CF}{TD} \geq 1.12 \). The cut rule, 'if \( CL/TD \geq 0.165 \) then the company is good; else it is poor’ has to be employed if the above rules fail to make proper classification.

5. A company in the steel industry is said to be performing well if the ratio \( \frac{CF}{NW} \geq 0.757 \) or \( \frac{SA}{ST} < 4.497 \); and it can be categorised as poor performing company if the ratio \( \frac{SA}{ST} \geq 4.971 \).

After the development of the CRIS system, an attempt has been made to simulate data using the selected set of ratios in each industry.

6.5 SIMULATION OF FINANCIAL RATIOS

There are many situations where simulation can be successfully used. It may be either impossible or extremely expensive to obtain data from certain processes in real world. In such cases, the simulated data are necessary to formulate hypothesis about the system. There may also be instances where the observed system may be so complex that it cannot be described in terms of a set of mathematical equations for which analytical solutions are obtainable. In some cases even though the mathematical models
can be formulated to describe some system of interest, it may not be possible to obtain a solution to the model analytical techniques. It may be either impossible or very costly to perform validating experiments on the mathematical models describing the systems. These necessitates to go in for simulation models for making an elaborate research on the specified topic.

Based on the available data, it is aimed to generate samples with ratios that would identify a company as a good or a poor company. Using the results of the CRIS system, the selected ratios, the factors, and the associated eigen values are obtained for both good and poor companies. Applying the technique described in chapter V, 2000 random samples are generated with different combination of ratios that would resemble the ratios of good performing companies, as well as another 2000 random samples with ratios reflecting the ratios of poor performing companies for each industry on the basis of data of the year 1993.

Four ratios namely, NP/NW, EBIT/TA, CL/TD and SA/ST has been ascertained as significant ratios for classifying the cement companies into good or poor. It was found that 20 good performing companies were in one cluster and the remaining eight poorly performing companies were in other cluster.

The results of the CRIS system application on the 38 companies from the chemical industry indicated that five ratios were significant for classifying the companies into two groups. The key ratios were EEBIT/NW, QA/NW, CA/TA, CA/SA, and CGS/ST. These four ratios classified the 38 companies into two groups, 28 in the first group (good companies) and 10 in the second group (poor companies). Using simulation
techniques, 2000 samples each have been generated for the two groups viz., good and poor.

The significant ratios in the electronic industry are selected ratios were EXP/SA, CL/TD and EQ/TD. These three ratios classified the 39 companies into two groups, 33 in the first group (good companies) and 9 in the second group (poor companies). Based on the data, 2000 samples each have been generated for both the groups.

The key ratios of the steel industry are CF/NW, RE/TA and SA/ST. These ratios classified the 59 companies into two groups, 48 in the first group (good companies) and 11 in the second group (poor companies). Using these three ratio, 2000 samples each have been generated for the two groups.

It is tested whether or not the generated ratios are different from the original ones using normality and student's t-tests. The null hypothesis that the means are equal for the original and generated ratios is validated using these tests. Statistical testing of means of the original and the generated data indicated that for all the five industries, it has been found that the means of the generated ratios are very close to the means of the original ratios. In other words, the test statistic values and the significance level indicated that there is no reason to reject the null hypotheses in all the cases.

If the ratios of a new company, belonging to any one of five categories of industries taken up in the current research, but not included in the present study, are known, it is possible to identify the company as a good or a poor company as the ratios of the new company would possibly be one of the combinations of the generated ratios in any one of the groups.
To sum up, the present research is an attempt to explore the possibility of evaluating the performance of companies based only on financial ratios. The study has been carried out with three fold objectives. The first objective is to list the ratios that are used to evaluate the performance of companies by different authors over the last five decades. The second objective is to explore the possibility of reducing the number of ratios retaining the maximum possible accuracy of classification through widely used multivariate statistical techniques. The third objective is to apply a computer oriented technique called CRIS system, a branch of expert system to deduce rules for classification of companies into good or poor performing companies and to use a modern technique called simulation to generate ratios that resemble like the ratios of good or poor performing companies. This type of approach is rather new and has been tried by the author for the first time in this part of the country. The results arising out of the analysis are very interesting and also likely to be quite useful for a variety of people who are interested in the evaluation of corporate performance.

6.6 LIMITATIONS OF THE STUDY

The limitations of the present study can be listed as below.

1) Owing to time constraint, the analyses have been restricted to only five manufacturing industries;

2) Few ratios could not be included for the present analyses as financial data required for computation of such ratios were not available in the database;

3) Development of an Expert System shell was not possible due to the non-availability of appropriate experts in the area of current research; and
4) Financial ratios are not the only indicators of performance. Therefore, the system developed in the present research may not be totally dependable in the real situation.

6.7 SCOPE FOR FURTHER RESEARCH

It is hoped that the present investigation is likely to provide ample scope for further stimulating research in the following areas:

Firstly, similar research can be undertaken for the remaining manufacturing industries as well as service industries leading to identification of tests of significant ratios for the respective industries.

Secondly, the present research provides an insight for the development of an expert system which includes both financial ratios and subjective factors; and Finally, the outcome of application of the composite rule induction system may be used to rank companies using indexing technique.

It is true to say that effective management depends on the effective measurement of performance and results. However, it is increasingly becoming accepted that 'traditional' measures centred on financial inertia are inadequate for the contemporary business environment. Attention to a wider range of measures related to quality, market share, customer and employee satisfaction can yield a greater insight into the factors which drive financial performance. Most crucially, a shortfall in these non-financial performance measures may provide an early warning of an impending shortfall in financial performance and enable timely remedial action to be taken in order to moderate the damage to the financial results.