CHAPTER-III
RESEARCH DESIGN
3.0 Introduction:

The present chapter deals with the research design which relates to collection, presentation and analysis of data for the study. This chapter discuss the need, scope, objective, hypothesis and methodology of the study. The nature of information required, sources of data, sample design, selection of variables and period selected for the study. The tools and techniques used for the analysis, to test the formulated hypothesis and interpretation of data.

3.1 Need of the Study:

The new Indian industrial policy of 1991 has put India to a reform process through the opening up of the economy as a step forward towards a free market economy. The liberalization and globalization emerged as principal instruments of achieving the two main objective i.e. stabilisation and structural adjustments, of new industrial policy. Many steps have been taken by the government to facilitate inflow of foreign investment by increasing the limited of foreign equity holding in many priority industries.

The financial market reforms relates to banking sector, insurance sector and the capital market have been initiated. The government passed many regulations and take many steps to restore macroeconomic imbalance in order to avert defaults in international payments controlling inflation and the balance of payment deficit.

All these financial reforms were aimed at bringing about operational improvements in order to facilitate and expedite the process of market orientation. Despite all progressive steps taken
by the government the incidence of industrial sickness in India continued unabated.

The growing incidence of industrial sickness in India has posed serious threats affecting the industrial development in our country. A lot of amounts has been tied up in sick industries. New jobs have not been created. Small scale industries (SSI) have suffered to the point of extinction. The wave of industrial sickness has not only affects the traditional industries like, cotton, jute and sugar industry but even some other important industries like engineering, chemical, rubber, cement, iron and steel and paper industries etc. have also been affected by it.

This is evident from the information compiled by Reserve Banks of India (RBI) from the scheduled commercial banks as is given in Table-3.1 that as on March 31, 2002, there were more than 1,80,597 sick units comprises of which 1,77,336 units in small scale industries (SSI) and 3,261 units in non-SSI sector and more than Rs. 26,000 crore have been blocked in these units with very little chance of recovery. No doubt, there is a declined in the numbers of sick units but the amount blocked in these has increased in manifolds. It was Rs. 10,767.80 crore at the end of March, 1991 and has increased to Rs. 26,064.59 crores at the end of March, 2002. However, if the number of sick units are to be worked out as per the new definition of a sick unit incorporated by the government in the Indians Companies Act, 1956 section-2, new sub-clause 46 (AA) there will be a vast increase in the number of sick units as compared to the number of sick units identified in the earlier definition and that cause all, the more concern.
Table-3.1

Position of Sick Units in India

(Rs. in Crore)

<table>
<thead>
<tr>
<th>Particular of Sick Units</th>
<th>March 31, 1991</th>
<th>March 31, 2001</th>
<th>March 31, 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Credit O/S</td>
<td>Number</td>
</tr>
<tr>
<td>S.S.I.</td>
<td>2,21,472</td>
<td>2,792.04</td>
<td>2,49,630</td>
</tr>
<tr>
<td>Non S.S.I.</td>
<td>2,337</td>
<td>7,975.78</td>
<td>3,317</td>
</tr>
<tr>
<td>Total</td>
<td>2,23,809</td>
<td>10,767.82</td>
<td>2,52,947</td>
</tr>
</tbody>
</table>

Source: WWW.rbi.org.in
SSI= Small Scale Industry
O/s = Out standing

Industrial sickness of such a magnitude not only affects the production and capital adversely but also causes loss of employment which again aggravates the acute unemployment problem prevailing in our country and has become a threat to the national economy. The government, financial institutions and banks are worried about the un-precedent increase in the number of units becoming sick and blocking their limited resources with them.

The common effects of such occurrence are: the workers, staff and managers will be displaced during the periods of acute unemployment creating social tensions; the promoters and entrepreneurs get demoralised and their very confidence is shaken up; the shareholders and other investors will become wary of their need to protect their uncertain future. At this crucial point of time, an action oriented programme should be framed taking into consideration all the aspects of sickness to deal with it effectively.

Forwarding methods are to be designed and developed for each sector and industry group. This will help in identifying the cause of sickness and the magnitude in different industry groups.
RESEARCH DESIGN

so that timely action can be taken to overcome the problem to the greatest possible extent because 'a stitch in time saves nine'. Factually speaking, the timely actions are curative, preventive, constructive in character and can help to prevent the incipient sickness or to nip the sickness in the bud.

Thus, in the present study an attempt has been made to develop a forwarding model for all the industries to detect, identify, analyse and measure the latent sickness in Indian industries and to suggest timely actions to alleviate the sickness. This model will help the commercial banks, financial institutions (both at state level as well as at national level) and others, to grant loans and advances to sick units when they actually need it as well as to refuse the credit.

This present attempt can also help the development banks like ICICI, IDBI and IRCI in making judicious use of their technical consultancy services. Thus, these services should be given only to reprimand and repair the latest and temporary sick company and not the manifest and permanent sickness.

Present study will also help the government to timely weeding out the inefficiently and ineffectively managed companies. To maintain and increase the healthy competition among the efficient so that overall efficiency of the business economic system could be improved significantly. It can be used as sixth sense to bring the acute problem of industrial sickness under control and escape India out of the social and economic dangers of industrial sickness.
3.2 Scope of the Study:

The scope of the present study is limited to the randomly selected sample from four industries. Four industries are selected as per the use base classification of industries given by the Reserve Bank of India (RBI). The selected industries are basic goods industry, capital goods industry, intermediate goods industry and consumer goods industry. The basic goods industry includes cement, iron and steel, mining and quarrying, aluminum non-ferrous basic metals and electricity industry. The industries covered in the capital goods industry are, plant and machinery, equipment, engineering, hand tools and small tools, specialised equipment, agriculture machinery, heavy electrical equipment, electric motors, rail and road equipment and heavy vehicle industry.

Industries included in the intermediate goods industry are cotton textile, juts and silk textile, petro chemical, glass, paper and fertilizer industry. Consumer goods industry have tea plantation, paints, food manufacturing, tabacco, soap and glycerine, electronics and telecommunication units.

Only those manufacturing companies from public as well as from private sector has been selected in the study which are listed on Bombay Stock Exchange (BSE). The study is based on secondary data collected from the annual financial statements of the sample companies. The study period of the analysis is five years i.e. from 1997-1998 to 2001-2002. This study period has a special significance as the large number of companies become sick during this period. Twenty five financial ratios, classified in five groups namely, profitability, cash flow, turnover, liquidity and solvancy ratios have been computed for each companies included in the sample for the five years. Both, the univariate and multivariate analysis has been applied to analyse the data.
3.2.1 Objective of the Study:

The present study mainly focus on the following three objectives:

(i) To ascertain prominent profitability, cash flow, liquidity, turnover and solvancy ratios which can significantly discriminant between sick and non-sick companies. Further to find out the best set of ratios which can predict sickness within an industry.

(ii) To study the discriminating power of predictors (Financial Ratios) of sickness over a period within an industry and among industries, whether predictors changes over a period of study within an industry or not.

(iii) To study the accuracy of multiple discriminant model in predicting sickness in the proceeding five years within an industry, as well as to suggest a forewarning model against corporate failure for each industry based on financial ratios.

3.2.2 Hypothesis of the Study:

Keeping in view the objective of the study the following hypothesis have been formulated for testing in the present study:-

1. $H_0$ - Financial ratios used univariately and multivariately can not discriminate between the financial state of health of sick and non-sick companies.

2. $H_0$ - There is no difference in the predictive power of financial ratios over the time period as well as in various industries.
3. **H₀**: Financial ratios used univariately/multivariately can not predict the chance of survival or failure of a company.

### 3.2.3 Limitation of the Study:

Following are the limitations of the study:

(i) The study is based on secondary data collected from the financial statements of the sample companies. Hence, the limitations of secondary data and that of company's financial statements are found in the study.

(ii) The size of the sample is limited, therefore the limitation of small sample size, is also applicable to the study.

(iii) The data collected from the 'PROWESS' a software package of centre for Monitoring Indian Economy (CMIE) are not detailed in nature and study incorporates all the limitations those are inherent condensed published financial statements.

(iv) The study is based on financial ratios which have their own short comings and will also apply to the study.

(v) There are some statistical techniques used in the study and shortcoming do exist in these techniques.

(vi) Lastly the limitations of Multiple Discriminant Analysis or multivariate analysis that assumes that discriminating variables have a multivariate normal distribution and have equal variance-co-variance within each group. But, there is hardly any point that can fully support the normalcy of the multivariate distribution.
Thus, the user of the findings of this study should be careful and should use the same judiciously.

3.3 Sample Design and Data Collection:

3.3.1 Nature of Informations:

At the outset, an attempt has been made to identify the information required and sources to collect them. The following information's have been identified for the present work:

(i) A set of sick and non-sick companies in the private as well as in the public manufacturing sector;

(ii) Information in respect of the above identified units with regards to industry to which they belongs;

(iii) Financial statements i.e. balance-sheet and profit and loss accounts of the sampled companies for the five years i.e. for the years 1997-98 to 2001-2002.

3.3.2 Selection of Companies:

The selection of sick companies have been made on the basis of following three criteria:

(i) The company which has incurred cash losses for one year and likely to continue to incur cash losses for the present as well as for following years and which has an imbalance in its financial structure such as current ratio of less than 1:1 and worsening debt-equality ratio. [sick unit definition give by Reserve Bank of India (RBI)]

(ii) The company which has been recorded sick during the period under study i.e. during 1997-98 to 2001-2002 (both years included).
(iii) Finally, the availability of the data of the company for the five years selected in the study.

To start with, those companies that had failed during the period under study were identified in the directory of joint stock companies in India and compiled in a list. Any sick company listed in first tested by the above mentioned three criteria than has been included in the final list of sample of sick companies. The final list of sick companies contains 109 companies consisting of 27 in basic goods industry, 32 in capital goods industry, 29 in intermediate goods industry and 21 in consumer goods industry.

To compare non-sick companies with the sick companies, sample of non-sick companies is selected on the basis of following criteria.

(i) Non-sick companies are chosen from the same industry as that of sick company.

(ii) The company which has shown consistency is earning sufficient profits during the time span of the study.

(iii) Availability of the financial statements of non-sick companies for the five years i.e. from 1997-98 to 2001-2002.

The non-sick companies have been selected from the official director of Bombay Stock Exchange. The non-sick company which fulfil the above given four conditions has been finally selected for the sample of non sick companies. The sample of 112 non-sick companies inclusive of 27 companies from basic goods industry, 31 companies in capital goods, 29 companies in intermedial goods and
25 in consumer goods industry, have been selected in the present study. The number of sick and non-sick companies included in sample of each industry is given below in the Table-3.2.

Table-3.2
List of Number of Companies included in the Study

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the Industry</th>
<th>No. of Sick Units</th>
<th>No. of Non-Sick Units</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Basic Goods Industry</td>
<td>27</td>
<td>27</td>
<td>54</td>
</tr>
<tr>
<td>2.</td>
<td>Capital Goods Industry</td>
<td>32</td>
<td>31</td>
<td>63</td>
</tr>
<tr>
<td>3.</td>
<td>Intermediate Goods Industry</td>
<td>29</td>
<td>29</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>109</strong></td>
<td><strong>112</strong></td>
<td><strong>221</strong></td>
</tr>
</tbody>
</table>

In order to identify the company, four digit code number has been assigned to each company. The first digit of the code number states the group of the company i.e. 1 denote non-sick and 2 denote sick. Second digit denote the industry to which it belongs (1 for basic goods industry, 2 for capital goods industry 3 for intermediate goods industry and 4 for consumer goods industry). Last two digit depicts the serial number of the company in its groups and industry.

Sick companies of basic goods industry have been coded from 2101 to 2127 and non-sick companies from 1101 to 1127. In case of capital goods industry, non-sick companies have been coded from 1201 to 1231 and sick companies from 2201 to 2232. Similarly companies coded from 1301 to 1329 are non-sick units of intermediate goods industry and coded from 2301 to 2329 are sick
companies while in case of consumer goods industry non-sick companies are coded from 1401 to 1425 and sick companies from 2401 to 2421.

3.3.3 Data Collection:

The required financial data has been collected from the annual financial statements of the selected companies. The data has been collected primarily from the secondary source i.e. from 'PROWESS' a software package of centre for monitoring India Economy (CMIE). The data have been collected from single source keeping in view the uniformity in the method of preparing and presenting financial statements.

Editing, classification and tabulation of the financial data collected from the above mentioned source have been done as per the requirement of the study.

3.3.4 Selection of Financial Ratios:

Financial ratios have been selected for the construction of forewarning model to predict the company's chances of survival of failure on the basis of their popularity in the literature i.e. the frequency of appearance of a financial ratio in the earlier studies and their potential relevance for the present work. Finally twenty five financial ratios have been selected.

These ratios are categorised under five groups, namely, profitability, cash flow, turnover, liquidity and solvancy ratios. The exhaustive list of initial ratios selected for the study is given in the Table-3.3 along with the studies in which these ratios were used to predict the corporate health.
Table 3.3
List of Financial Ratios Selected for the Study

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Ratios</th>
<th>Abbreviation</th>
<th>Study / Work (in which appear)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Profit before Depreciation Interest and Tax to Net Sale</td>
<td>PBDIT/NS</td>
<td>Gupta (1983)</td>
</tr>
<tr>
<td>R2</td>
<td>Profit before Interest and Tax to Net Sale</td>
<td>PBIT/NS</td>
<td>Bhattacharya (1982), Sahu &amp; Mishra (1992)</td>
</tr>
<tr>
<td>R5</td>
<td>Profit before Interest and Tax to Total Assets</td>
<td>PBIT/TA</td>
<td>Altman (1968), Kaven (1980), Yadav (1986)</td>
</tr>
<tr>
<td>R7</td>
<td>Equity Dividend to Profit after Tax</td>
<td>ED/PAT</td>
<td>Bhaskar (1979), Joshi &amp; Aggarwal (1992)</td>
</tr>
<tr>
<td>R8</td>
<td>Equity Dividend to Equity Capital</td>
<td>ED/EC</td>
<td>Bhaskar (1979), C. Mohan (2002)</td>
</tr>
<tr>
<td>R10</td>
<td>Profits before Int. &amp; Tax to capital Employed</td>
<td>PBIT/CE</td>
<td>Sahu (2000)</td>
</tr>
<tr>
<td>R12</td>
<td>Profit before Dep, Int, &amp; Tax to Interest</td>
<td>PBDIT/Int.</td>
<td>Gupta (1983), Sahu &amp; Misra (1992)</td>
</tr>
<tr>
<td>R16</td>
<td>Receivables Turnover Ratio</td>
<td>RTR</td>
<td>Sarma &amp; Rao (1971)</td>
</tr>
<tr>
<td>R17</td>
<td>Creditors Turnover Ratio</td>
<td>CTR</td>
<td>Debasis (1996), Bhaskar (1979)</td>
</tr>
<tr>
<td>R22</td>
<td>Working Capital to Total Assets</td>
<td>WC/TA</td>
<td>Daakin (1972), Altman (1968), Merwin (1942), Sarma &amp; Rao (1971)</td>
</tr>
<tr>
<td>R24</td>
<td>Total Liabilities to Total Assets</td>
<td>TL/TA</td>
<td>Joshi &amp; Aggarwal (1992), Daakin (1972), Sahu &amp; Misra (1992), Bhawasray (1997)</td>
</tr>
<tr>
<td>R25</td>
<td>Net Worth to Total Assets</td>
<td>NW/TA</td>
<td>Srivastava (1984), Winakar (1935)</td>
</tr>
</tbody>
</table>
3.4 Methodology:

3.4.1 Computation of Financial Ratios:

For every set of financial statements or for each company selected in the sample of sick and non-sick groups in each industry, 25 financial ratios as given in Table-3.3 have been computed for all the five years covered in the study. The brief description and the method of calculation of above mentioned 25 financial ratios is as follow:

(A) Profitability Ratios:

Profitability ratios are designed to measure and evaluate the operational performance of the company as well as the efficiency of the company in generating income on investment. Poor operational performance may indicate the poor sales and hence poor profits. The earning capacity is measured by relating the net profits to net sales, net total assets, capital employed, interest and equity capital. The following profitability ratios are worked out and studied in the present work:

(i) PBDIT/NS Ratio (R-1):

This ratio establish the relationship between profits before depreciation, interest and taxes (PBDIT) to net sales (NS) and measure the management’s efficiency in manufacturing, administrating and selling products. It is important from a profit stand point that the company will be able to generate adequate profits on each unit of sale to cover its fixed costs and charges and to earn a profit for share holders. Thus the higher value of PBDIT/NS ratio indicates the better efficiency of the management and vice-versa. The ratio has been calculated as follows:
(ii) **PBIT/NS Ratio: (R-2):**

This ratio also known as operating profit ratio is an indicator of ability of the company to withstand against adverse conditions, which may arise from several reasons i.e. falling prices rising costs, declining sales etc. This ratio depicts what percentage of sales is finally retained as operating profits by the company and inadequacy of operating profit will leads to unsatisfactory returns for its (company's) investors. The ratio has been computed by dividing profit before interest and taxes by net sales as given below:

\[
\text{PBIT/NS ratio(\%)} = \frac{\text{Profit before Interest \& Taxes}}{\text{Net Sales}} \times 100
\]

(iii) **PAT/NS Ratio (R-3):**

The profit after tax to net sale ratio measure the profits that is available from each unit of sales after all expenses and taxes have be paid or profit after cost of goods sold; selling, general and administrative expenses; depreciation; interest; and taxes. This ratio is also known as net profit ratio.

\[
\text{PAT/NS ratio(\%)} = \frac{\text{Profit after tax}}{\text{Net Sale}} \times 100
\]
(iv) **PBDIT/TA Ratio (R-4):**

The relationship of PBDIT/TA is an important indicator of the effectiveness of management in influencing a return to supplier of capital as well as a method of predicting future earnings. It is calculated as:

\[
PBDIT/TA \text{ ratio (\%)} = \frac{\text{Profits before depreciation, interest and taxes}}{\text{Total Asset}} \times 100
\]

(v) **PBIT/TA Ratio (R-5):**

This ratio is a measure of the true productivity of the company's assets, obstructing from any tax or leverage factors. It is expressed as:

\[
PBIT/TA \text{ ratio (\%)} = \frac{\text{Profits before interest and taxes}}{\text{Total Asset}} \times 100
\]

It indicates how effectively the operating assets are being employed in generating profit. This ratio is a real test of economic success or failure of the firm. Since the survival of a company is based on the earning power of its assets, this ratio appears to be appropriate particularly for the studies dealing with the prediction of chances of survival or failure of a company\(^1\). Smaller PBIT/TA ratio of a company is claimed to provide premonition of financial crises in the future. Therefore, a negative relationship is understood to be exist between this ratio and the probability of company's failure.
(vi) **PAT/TA Ratio:**

This ratio established the relationship between net profits after tax and total assets. It is expressed in form of formula as given below:

\[
\text{PAT/TA ratio(\%) = } \frac{\text{Net Profit after Taxes}}{\text{Total Asset}} \times 100
\]

The explanation of this ratio is similar to EBIT/TA ratio, the only difference is that interests and taxes have been deducted from the net profit.

(vii) **ED/PAT Ratio (R-7):**

This ratio reflects the proportion of the profit that has been distributed in the form of dividend to the equity shareholders. This ratio has been worked out by dividing equity dividend by profit after tax as given below:

\[
\text{ED/PAT ratio (\%) = } \frac{\text{Equity Dividend}}{\text{Profit after Tax}} \times 100
\]

By analysing the above ratio one can judge the dividend payment capacity of the company as well as regularity in the declaration of dividend.

(viii) **ED/ED Ratio (R-8):**

This ratio is an important profit indicator to shareholders of the company. It is calculated by the formula:

\[
\text{ED/ED ratio(\%) = } \frac{\text{Equity Dividend}}{\text{Equity Capital}} \times 100
\]
RESEARCH DESIGN

This ratio indicates the degree to which the company is able to convert operating income into dividend that can be claimed by equity shareholders. The ratio is useful for analyzing the ability of the company's management to realize an adequate return on the capital invested by the equity shareholders.

(ix) RE/TA Ratio (R-9):

The retained earnings are that part of profits which belongs to the equity shareholders but has not been distributed to them and has been reinvested in the business. RE/TA ratio depicts the relationship between retained earnings and total assets and states the percentage of total assets which has been financed by retained profits. It has been expressed as follows:

\[
\text{RE/TA ratio(\%) = \frac{\text{Retained Earnings}}{\text{Total Asset}}} \times 100
\]

(x) PBIT/CE (R-10):

This ratio, also known as return on capital employed ratio, indicates how the management has used the funds supplied by creditors and owners. The higher the ratio, the more efficient the firm is in using funds entrusted to it. PBIT/CE ratio provides a true test of profitability because it takes into consideration the efficiency of operation and the margin of profit as well as the way in which the business is capitalized.2 Return on capital employed is calculated by dividing the figure of earnings or net profits before interests and taxes by the figure of capital employed as described below:

\[
\text{PBIT/TA ratio (\%) = \frac{\text{Profits before Interest and Taxes}}{\text{Capital Employed (Net)}}} \times 100
\]
In the present study, for computing capital employed the term net capital employed has been taken after deducting interest on short term borrowing.

(xi) **PBDIT/Interest Ratio (R-11):**

PBDIT/Interest ratio also known as modified interest coverage ratio measure the debt servicing capacity of a company so far as interest on loan is concerned. This ratio has been computed as follows:

\[
\frac{\text{Profits before Depreciation, Interest & Tax}}{\text{Fixed Interest Charges}} = \text{PBDIT/TA ratio (times)}
\]

This ratio shows the number of time the interest charges have been covered by the cash flow of the company. In order to calculate the interest coverage ratio profits have been taken before charging depreciation because the source of interest payment is cash flow before interest and taxes, not earning before interest and taxes.

(xii) **PBIT/Interest Ratio (R-12):**

\[
\frac{\text{Profits before Interest and Taxes}}{\text{Fixed Interest Charges}} = \text{PBIT/Interest ratio (times)}
\]

It may be noted that profit before interest and taxes have been used in the numerator of this ratio because the ability of a firm to pay interest is not affected by tax payment as interest on debt is a tax deductible expense. This ratio,
purportedly, measure the margin of safety the firm enjoys with respect to its interest burden. A high interest coverage ratio means that the firm can easily meet its interest burden even if PBIT suffered a considerable decline. However, low interest coverage ratio may result in financial embarrassment when PBIT decline.

(B) Cash Flow Ratios:

Cash flow ratios are computed to judge the extent to which the operations of the enterprises have generated sufficient cash flow to maintain the operating capability of the firm, pay dividends, repay loans, and make new investments without recourse to external sources of financing. Moreover, profits measured gross of interest (viz, PBDIT and PBIT) serves as a measure of operating efficiency but ignores the effect of interest burden which is a factor behind sickness.

"The effect of operating inefficiency and that of a large interest-burden during an unfavourable period represent two separate factors, which affects different firms differently. One firm may be hit by low operating efficiency, another by high interest burden. OCF is a composite measure of profit and takes into account the combined effect of both these factors. It is therefore a safer guide than PBDIT and PBIT in terms of providing a warning signal against potential sickness"3.

In cash flow group, operating cash flow (viz., operating profit after interest and tax, with depreciation added back) has been compared to sales as well as to assets and two ratios are calculated in this group as given below:
(i) **OCF/NS Ratio (R-13):**

Operating cash flow to net sale ratio (OCF/NS) shows the percentage of sale which has been earned by the firm in terms of cash profit. The smaller the ratio the more likely the firm to be classified as sick. This ratio has been stated as:

\[
\text{OCF/NS ratio(\%) = \frac{\text{Operating Cash Flow}}{\text{Net Sales}} \times 100}
\]

Where as O.C.F. = [Profit-Interest-Tax + Depreciation]

(ii) **OCF/TA Ratio (R-14):**

This ratio is one of the measure to ascertain the firms efficiency in generating cash profit with regards to its assets and indicates the effectiveness of the company in utilising its assets. A company with low OCF/TA ratio will be considered as forwarding towards sickness. The ratio is expressed as follows:

\[
\text{OCF/TA ratio (\%) = \frac{\text{Operating Cash Flow}}{\text{Total Assets}} \times 100}
\]

(C) **Turnover Ratios:**

"These ratios relate the level of investment in various current assets to the level of the company's operation". These ratios also referred as activity ratios measure how efficiently the company is utilizing it assets. These ratios are based on the relationship between the level of activity and level of various assets. Five ratios which fall under the turnover ratio category are given below:
(i) **Inventory Turnover Ratio or ITR (R-15):**

Inventory turnover ratio indicates the rate at which the inventories are converted into sales and them into cash ultimately. This ratio also throws light on the inventory policy pursued by any firm and reasonableness of the same. A high ITR is good from sound inventory management point of view whereas a low ratio implies excessive inventory levels than warranted by its volume of operation. The ratio is denoted as:

\[
\text{I.T.R. (times)} = \frac{\text{Net Sale}}{\text{Average Inventory}}
\]

(ii) **Receivable Turnover Ratio or RTR (R-16):**

This ratio indicates how well receivables are turning into cash and reflects the efficiency of the credit and collection policies of the firms as well as the quality of the receivables. The higher the RTR the greater is the degree of efficiency in debt management and vice-versa. This ratio has been computed with the following formula:

\[
\text{R.T.R. (times)} = \frac{\text{Net Credit Sale}}{\text{Average Receivables}}
\]

(iii) **Creditors Turnover Ratios or CTR (R-17):**

This ratio indicates the average credit enjoyed by a firm from the suppliers of raw materials. "If the more time is given by the creditors then, naturally, the firm will have breathing time and to that extent there is no need to raise funds from others". This indicates the efficiency of the management to fetch the longer period of credit. A very low value of the ratio means that either the firm is very strong to dictate the terms or it is short of cash. The later situation may exists in case of sick firms. This ratio has been expressed as:
(iv) **Assets Turnover Ratio or ATR (R-17):**

The assets turnover ratio, measures the relationship between the amount invested in assets and the results occurring in terms of sales. It indicates the efficiency in the utilisation of assets of the company. "The ratio may show whether there is a tendency towards over-investment in assets as in case the volume of sales is too low compared to the investment or an increase investment is not going to result in a proportionate or greater improvement in sales. Such over-investment in total assets in relation to sale has serious consequences. Excessive debtors and inventories can be turned into cash in few months, but investment in total assets burdens the company permanently with heavy operational, maintenance and interest charges. If larger investment in assets is not matched by a large volume of sales and greater managerial efficiency, it may weaken the financial position especially, if the expansion is financed through current liabilities or borrowings. The ratio is derived as:

\[
\text{ATR (Times)} = \frac{\text{Net Sale}}{\text{Total Assets}}
\]

The high values of ATR means more sales has been generated with the given assets and assets have been efficiently utilised and vice-versa.
(v) **Working Capital Turnover or WTR Ratio (R-19):**

This ratio has been worked out by dividing net sales by working capital to know how efficiently the company has been utilising its working capital in generating sale. A high WTR reveals the company's ability to generate large volume of sales with respect to a given amount of working capital vice-versa.

"A high ratio of WTR may be the result of over-trading, or may indicate the need for additional funds to support a capital structure unbalanced by top heavy investment in fixed assets. Similarly, a low ratio may be the result of under-trading or investment of more funds in the business than generally required". Thus this ratio should be interpreted judiciously. The ratio is computed as given below:

\[
\text{WTR (times) = } \frac{\text{Net Sale}}{\text{Average Working Capital}}
\]

(D) **Liquidity Ratios:**

The objective of the liquidity ratio is to indicate the firm's ability to meet its short-term financial obligations. It measures the relative strength which is a prerequisite for the very survival of a firm. Short-term creditors like banks and merchandise suppliers give more attention on the liquidity measure. These ratios regarded as spot light which show the size of the reservoir of liquid assets to its maturing liabilities. The important ratios covered in this category are:

(i) **Current Ratio (R-20):**

This ratio establishes the relationship between the current assets and current liabilities. It indicates the ability of a company to meet its short-term obligation. The higher the CR, the larger the amount of funds available for meeting
short-term obligations and the greater is the feeling of security. Keeping in view the 50% shrinkage in the value of current assets, the rule of thumb about CR has been set at 2:1.

The criterion of hundred per cent margin of current assets over current liabilities is based on the practical knowledge of the possibility that may occur at any time in the proprietary values of a business. Current ratio therefore, "aids in the prediction of industrial sickness. Since the current assets are generally regarded as the reservoir from which maturing obligations can be paid, it seems reasonable to assume that the larger the current ratio, the smaller the probability of sickness"^7

\[
\text{Current Ratio (times)} = \frac{\text{Current Assets (CA)}}{\text{Current Liabilities (CL)}}
\]

(ii) Quick Ratio (R-21):

This ratio is refinement of current ratio and it is concerned with the establishment of relationship between quick assets (i.e. current assets- (stock & Prepaid expenses) and current liabilities. As this ratio excludes stock which may be slow moving it can measure more effectively the short-term debt paying ability of the firm. In normal business conditions, a quick ratios of 1:1 is taken as standard and therefore, an organisation with quick assets equivalent to 100 per cent of its current liabilities is said to be in a fairly good liquidity position.

\[
\text{Quick Ratio (times)} = \frac{\text{Quick Assets}}{\text{Current Liabilities}}
\]
(iii) **Net Working Capital to Total Assets Ratios (R-22):**

The net working capital to total assets ratio is a measure of the net liquid assets of a firm relative to the total capitalisation. "An increasing trend of this ratio implies maintenance of unnecessary high liquidity to meet current obligations which adversely affects profitability. An increasing negative trend of this ratio accompanied by continuous losses is a sign of sickness".\(^8\)

\[
\text{Net Working Capital} \quad \text{NWC / TA Ratio \( (\%) = \frac{\text{Net Working Capital}}{\text{Total Assets}} \times 100\) }
\]

**Solventy Ratios:**

These ratios are used to measure the ability of the company to meet the long term obligations with regard to (i) periodic payment of interest during the period of loan and (ii) repayment of principal on maturity or in pre-determined instalments at due dates. "These ratios indicate the relative proportion of internal and external resources of business funds and the level of risk that the firm is accepting in its operation"\(^9\). The bankers, financial institutions and investors are interested in the long term solvency of the company and concerned with the amount of risk that they bear in relation to owners. "Owners should provide the majority of the assets and bear the majority of risk, since unlike that of creditors their share of future income has no upper limit."\(^10\) The three important ratios falling under this category are:

(i) **Debt Equity Ratio (R-23):**

The relationship between borrowed funds and owners capital is a popular measure of the long term solvency of a firm. This relationship is shown by debt equity ratio. This ratio reflects the relative claims of creditors and shareholders against the assets of a firm.
The term debt signified total indebtedness of a company, consisting of its long term obligations. Equity refers to owned fund represented by net worth. It can be expressed thus in formula form:

\[
\text{Debt Equity Ratio (times)} = \frac{\text{External Equity or Debt}}{\text{Internal Equity or Net worth}}
\]

The debt equity ratio is an important tool of financial analysis to appraise the financial structure of a firm. "A high ratio shows a large share of financing from creditors and large claim of creditors against the assets of the firm as well as the lesser the security available to them. While a small ratio implies a smaller claim of creditors and more security to their. The ideal norm of the ratio is 1:1, that is debt should not exceed the owned funds in the business".\(^{11}\)

(ii) **Total Liabilities to Total Assets Ratio or TL/TA (R-24):**

This ratio measure the share of total liabilities in total assets whereas total liabilities include all liabilities, current and long term. "A lower trend of this ratio denotes less dependence on external funds whereas a higher trend reflects more dependence on external funds. The later is not a healthy sign because the amount of outside liabilities increase the debt burden which again results in a weak liquidity position and financial crises of the firm"\(^{12}\). The formula applied to calculate the above ratio is:

\[
\text{Total Outside Liabilities (i.e. Long term + Short term)} \\
\text{TL/TA Ratio (\%) = } \frac{\text{Total Assets (i.e. Fixed + Current Assets)}}{\text{Total Assets (i.e. Fixed + Current Assets)}} \times 100
\]
(iii) **Net-Worth to Total Assets Ratio (R-25):**

This ratio, often called proprietary ratio has been calculated to show the proportion of assets financed by the shareholders. This ratio measures the importance of shareholder's equity in relation to borrowed funds and indicates the margin of safety available to creditors. The higher the ratio, the stronger the financial position of the company and the more satisfactory its financial structure from the point of view of creditors.

This ratio also reflects the balance between internal and external equities and serves as an important test of capitalisation. The higher the ratio, the lower the earning per share, and vice-versa. A less ratio means that a large proportion of funds is supplied by the creditors. In periods of business inactivity and depression, the losses incurred may reduce shareholders equity to a dangerously low level and the position of creditors may be jeopardised. NW/TA ratio has been computed in the following way:

\[
\text{NW/TA Ratio (\%) = \frac{\text{Net worth}}{\text{Total Assets}} \times 100}
\]

It leads to conclude that above mentioned 25 financial ratios, which have been included for the analysis, are logically sound and moreover are in wide use in different predictive models.

**3.4.2 Analysis of Financial Ratios:**

The above mentioned 25 financial ratios are analysed univariately as well as multivariately. In the univariate analysis, the mean values, the coefficients of variation and t-values of all the selected 25 financial ratios have been computed.
(i) Mean Value:

The mean values of 25 financial ratios of sick and non-sick companies are computed for the five years to observe whether there is any difference between the financial ratios of sick and non-sick group or not.

It has been computed as follow:

\[
\bar{x} = \frac{\sum x}{n} \text{ or } \frac{x_1 + x_2 + x_3 + \ldots + x_n}{n}
\]

where

\[x = \text{variable/financial ratio}\]
\[n = \text{number of variables/financial ratio}\]

(ii) Coefficient of Variation:

The coefficients of variations of all the selected ratios of sick and non-sick units, for the five years, are calculated to compare the variation among the ratios of both the groups of companies. It indicates the stability and consistency in their operations.

It has been obtained as given below:

\[
\text{C.V.} = \frac{\sigma}{\bar{x}}
\]

where

\[\sigma = \text{standard deviation} = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}\]

(iii) t-test:

In order to test, whether the difference between the mean values of financial ratios of sick and non-sick units statistically significant or not, the student t-test (independent
RESEARCH DESIGN

variables) has been applied, t-values of each ratios has been computed as follows:

\[ t = \frac{\bar{x}_1^i - \bar{x}_2^i}{s} \sqrt{\frac{N_1 N_2}{N_1 + N_2}}, \]

where

\[ \bar{x}_1^i = \text{Mean of } i\text{th variable of sick companies} \]
\[ \bar{x}_2^i = \text{Mean of } i\text{th variable of non-sick companies} \]
\[ N_1 = \text{Number of sick units} \]
\[ N_2 = \text{Number of Non-sick units} \]

\[ S = \sqrt{\frac{\sum (x_1^i - \bar{x}_1^i)^2 + \sum (x_2^i - \bar{x}_2^i)^2}{N_1 + N_2 - 2}} = \text{combined S.D.} \]

Where, \( \sum (x_1^i - \bar{x}_1^i)^2 \) = sum of squared deviation of sick units and \( \sum (x_2^i - \bar{x}_2^i)^2 \) = sum of squared deviation of non-sick units.

The ratio having t-value more than the table value at 1 per cent or 5 per cent level of significance has been considered as significant ratio having sufficient discriminating power. While the ratio with lower t-values then the table value has been adjudged as non-discriminating ratio.

The univariate analysis is a crude technique of predicting the chances of corporate failure because each ratio is considered individually and thus provide a partial information relevant to a particular ratio and is susceptible to faulty interpretations or may be confusing. Hence, precautions should be used while interpreting ratios univariately. The main limitation of the univariate analysis are as under:
The univariate approach ignores the interdependencies among the various ratios overtime which may exist on account of (i) some items in financial statements tend to move in the same direction as others, e.g. net income and dividends, sales and marketing costs; and (ii) many ratios have common components e.g. total sales in various activity ratios;

Conflicting conclusions based upon faulty interpretation and ambiguous inferences are often drawn about the business phenomena, in the univariate analysis. For instance, a firm with a poor profitability and/or solvency may be regarded as a potential bankrupt. However because of its above average liquidity, the situation may not be considered serious; and

In the univariate approach conclusion are generally based upon only one parameter, namely the mean \( \bar{x} \) or the expected value of a given variable or ratio. They ignore the fact that the second parameter of the variable, i.e. this variance \( \sigma^2 \), is equally important in determining how far the observed situation deviates from its expectation. Substantial difference may exist between the variance of the given variables having identical mean values. In fact, this alone may constitute the most important limitation of techniques based upon univariate analysis.

Criticism leveled against univariate analysis clearly brings out that financial ratio taken individually can not provide the 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 ratios.

To overcome the shortcomings of univariate analysis and in order to provide the necessary explanation for prediction of corporate health, researchers in the field of corporate failure have increasingly adopted the multivariate analysis. In present study, more systematic attempt has been made to apply the multivariate analysis in which several financial ratios have been combined in order to predict the chances of survival or failure of a company.

3.4.3 Multivariate Analysis:

In multivariate analysis, several ratios are considered simultaneously in order to develop a meaningful model to predict industrial sickness. The conclusions arrived at on the basis of several interacting variables are certainly more dependable as compared to the conclusions based on the univariate analysis. But one important aspect worthy of consideration in the multivariate analysis is (i) the very identification of the right variables or financial ratio to be combined together in detecting the industrial sickness; (ii) weights that should be attached to the ratios.

In multivariate analysis, there are two important techniques to discriminant between sick and non sick companies i.e. multiple discriminant analysis (MDA) and logistic regression analysis. Multiple discriminant analysis provide much more detailed information in comparison to logistic regression analysis. In most of the earlier empirical works, same technique is applied as is evident from the review of earlier empirical works. In the present study, same technique is applied.
Multiple Discriminant Analysis (MDA) is a multivariate technique that classify an observation into one of several a priori grouping on the basis observation’s individual characteristics under appropriate assumptions. The basic assumptions of discriminant analysis are as under:

(i) The $n$ variables are normally distributed;
(ii) The groups are discrete and known; and
(iii) Each observation in each group is described by a set of variables.

The primary objective of the multiple discriminant analysis is to classify or to make prediction in problems where the dependent variable appears in qualitative form e.g. good or bad; failed or non-failed; sick or non-sick. Therefore the first step is to establish the groups explicitly, as in present study two groups, namely, sick and non-sick have been established. Multiple Discriminant Analysis then tries to derive a linear combination of variables which best discriminate between the groups.

The general form of discriminant function as linear form of variables is as follows:

$$Z = b_1x_1 + b_2x_2 + b_3x_3 + \ldots \ldots \ldots + b_nx_n$$

where

- $b = \text{discriminant coefficients}$
- $x = \text{discriminant variable}$

The optimum value of discriminant coefficients are calculated in such a way that the differences between mean discriminant scores for the two group will be maximised relative to variation.
within groups. The functions to be maximised, as first defined by R.A. Fisher, is the ratio (i.e. F-ratio) between groups variance to the within groups variance. When this ratio of the form:

\[
F = \frac{(\bar{z}_s - \bar{z}_{ns})^2}{\frac{N_s}{\sum (z_i - \bar{z}_s)^2} + \frac{N_{ns}}{\sum (z_i - \bar{z}_{ns})^2}}
\]

where \((\bar{z}_i - \bar{z}_s)^2\) = sum of squares of the difference between mean of the discriminant scores of the two groups, namely sick \((s)\) and non-sick \((ns)\)

\[
\sum (z_i - \bar{z}_s)^2 + \sum (z_i - \bar{z}_{ns})^2 = \text{sum of squares with groups}
\]

is maximised, it has the effect of spreading the groups means of z-score and simultaneously reducing the dispersion of individual scores around the groups means.

After careful analysis of the nature of the problem and objective of the study, the discriminant analysis has been chosen as an appropriate statistical technique to classify the companies into sick and non-sick group. Multiple discriminant analysis has been used in a variety of disciplines since its first application in the 1930's by Fisher. Moreover, this method has been applied in various empirical studies successfully in the area of finance specifically to the financial problems such as consumer credit evaluations and investment classification classification of high and low price earning ratio firms classification of firms into standard investment categories and prediction of rate of return.
It has also been used with proven results for predictions of corporate failure in the recent years as mentioned earlier in chapter-II (Review of Literature). In the present study Discriminant Analysis has been used as an appropriate technique since it has the merit of considering an entire profile of ratios common to the relevant companies as well as the interaction of these properties. Secondly, it has the merit of yielding a model with a relatively small number of selected variables i.e. ratios which has the potential of conveying a great deal of information.

In the present study financial ratios are used as discriminating variables and corporate health (sick or non-sick) as predicted variables. It is assumed for the application of discriminant analysis that financial ratios used as discriminating variables are having normal distribution. This assumption is, however, based upon some of the earlier works, which have concluded that financial ratios have normal distribution. Bird and McHugh\(^{24}\) found in their study the distribution of ratios within industry can be approximated by a normal distribution. Horrigan\(^{25}\) has also suggested the same. Similarly Deaken\(^{26}\) has also found that with the exception of TD/TA ratio, most of the ratios are normally distributed.

In multiple discriminant analysis, the following steps has been taken to arrive at the final best discriminant functions and to ascertain its predictive accuracy:

(i) **Selection of Financial Ratios:**

One of the important aspect of MDA is to selected the important or most discriminating financial ratios which can be used in the discriminating function. Selection of the
financial ratio is done in the earlier empirical works through univariate analysis, (i.e. on the basis of t-test, f-test or dichotomous classification test and factor analysis). These all methods were tried in the present analysis but failed to screen out the ratios. In univariate analysis very large set of ratios was selected. Factor analysis did not provide even a single ratio, hence these methods were discarded in the present study. In the present study, step-wise multiple discriminant analysis has been applied to reduce the large number of financial ratios to smaller one. This statistical technique has been applied in all the five years and all the 25 financial ratios have been used as input. The ratios which have been retained by the step-wise multiple discriminant analysis in most of the years (i.e. either in three or more than three years) are finally selected for the development of final model.

(ii) Discriminant Coefficients:

To assign the weights to the selected financial ratios and then to derive a discriminant function the un-standardized discriminant coefficients have been computed.

Understandize discriminant coefficients explains the absolute contribution of a ratio in a discriminant function. The discriminant function helps in computing the z-scores of the companies. These coefficients maximise the between group variance and minimize within group variance so that maximum discrimination can be made between two groups. These coefficients represent the amount of change in a discriminating score corresponding to unit change in a
variable in the present study. Separate discriminant function has been derived for each year as well as in each industry to compute the z-scores of the sample companies.

(iii) Relative Discriminating Power of Financial Ratios:

In order to measure the relative strength or contribution of a financial ratio in a discriminant function, the standardize discriminant coefficients, structure coefficients and relative coefficients have been computed.

The standardized discriminant coefficients are computed from the standardized data i.e. unit free data and explain the relative contribution of a financial ratio in a discriminant function. These coefficients are used to measure the predictive power of a ratio or to determine which ratio contributes the most in determining scores.

The structure coefficients also known as product moment correlation. It explains how closely a financial ratio and discriminant function are related. The magnitude of the structure coefficients of a ratio near to ± 1.0 depicts that the function is carrying nearly the same information about a company as that ratio and if it is near to zero it means that they have very little in common.

Relative coefficients are the product of standardized coefficients and structure coefficients of the financial ratio and has been computed to rank the ratios on the basis of these coefficients so as to determine their significance in predicting the event i.e. sickness/ failure. The higher is the relative coefficients of a ratio, the more is the discriminating or predictive power of that ratio and vice-versa.
(iv) **Testing the Statistical Significance of Discriminant Functions:**

A good discriminant function is that which has much between groups variability when compared to within groups variability. In fact, the coefficients of the discriminant function are chosen so that the ratio of between group sum of squares to within groups sum of squares is as large as possible and any other linear combination of the predictor/variables will have a smaller ratio"27.

To test the statistical significance of the discriminant functions, one way analysis of variance is applied using the discriminant scores as the dependent variable and the group variables as independent or classification variable. Further eigen values, eta values, Wilk's Lambda values and chi-squares value are computed to test the statistical significance of the discriminant function to discriminate or to predict the corporate health of a company.

**Eigen Values:**

Eign values is the ratio of the between-groups to within groups sum of squares. Mathematically, it is:

\[
\text{Eign value} = \frac{\text{Between-groups sum of squared deviation}}{\text{Within-groups sum of squared deviation}}
\]

**Eta value:**

Eta value is the ratio of between groups sum of squared and deviation to total sum of squared deviation and eta has been expressed as under:
**RESEARCH DESIGN**

\[
\text{Eta value} = \sqrt{\frac{\text{Between group sum of squared deviation}}{\text{Total sum of squared deviation}}}
\]

From one way analysis of variance, the eta value is equivalent to Karl-Pearson's correlation coefficient between discriminant scores and group variable. Thus eta is the proportion of between group variation to total variation. Larger the eta value near to ± 1.0, the better is the discriminating power of that function. A value closer to zero shown no discriminating power of a function.

**Wilk's Lambda Value:**

Wilk's Lambda is a multivariate measure of group differences over several variables. Wilk's Lambda (also known as u-statistic) value is the ratio of the within-groups sum of squared deviations to the total sum of squared deviations. It is the proportion of the total variance in the discriminant scores not explained by differences among groups (Lambda plus eta sum to 1). Thus lambda is:

\[
\lambda \text{ or Wilk's Lambda value} = \frac{\text{Within groups sum of squared deviations}}{\text{Total sum of squared deviations}}
\]

Small values of lambda are associated with function that have much variability between groups and little variability within groups. A lambda of 1 occurs when the mean of the discriminant scores is same in all groups and there is no between group variability. Values of lambda near to zero denotes high discrimination.
Chi-square Value:

The wilk's Lambda values of the discriminant functions are converted into an approximation of chi-square distribution. Chi-square are theoretical distribution which measure the probability that a difference in group means observed in the sample is due to chance sampling variation when in fact three is no difference in the population"28.

If the computed value of chi-square is more than the table value at 1.0 per cent or 5.0 per cent level of significance then the discriminant function is to be considered as significant. It depicts significant difference between the group mean discriminant scores.

(v) Computation of Z-Scores:

Once the discriminant function has been established it is possible to calculate the discriminant scores of each company included in the sample and then to classify them into sick and non-sick group on the basis of these z-scores. The companies have been classified into sick and non-sick group by comparing their z-scores with the cut off z-scores or critical values.

The cut off z-scores is an optimum value which results in minimum number of misclassification. "The essence of determining a cut-off point or critical value is to take decision i.e. to extend credit to such units whose z-score is above the cut-off point and refuse credit to the unit whose z-score is below the cut-off point"29. The cut-off point has been computed as given below:
RESEARCH DESIGN

\[ Z_c = \frac{\bar{Z}_s + \bar{Z}_{ns}}{2} \]

\( Z_c \) = Cut-off Z-score or critical value

\( Z_s \) = Mean discriminant score of sick units

\( \bar{Z}_{ns} \) = mean discriminant score of non-sick units.

The mean discriminant scores of sick and non-sick units is computed by putting the mean value of selected ratios in the discriminant function of the respective years. A separate cut-off point has been taken in all the five years as well as for each industry. The companies with the z-scores above the cut-off z-score \( (Z_c) \) are classified as healthy companies and that of below the cut-off point as sick companies.

Two models have been tested to calculate the z-score of sick and non-sick companies as well as to measure the predictive accuracy of the discriminant model and financial ratios to predict the corporate health of the sample companies. In the first model separate discriminant function is used to compute the z-scores whereas in second one the latest discriminant function i.e. discriminant function for the year 2001-2002, is used in the previous four years to compute the z-scores.

(vi) The Presentation of Predictive Accuracy of the Models:

The predictive accuracy of the discriminant models is presented in the form of accuracy matrix as given in the following format. The important factor of the discriminant analysis is the accuracy of group classification. The accuracy
is considered in two aspects. Type-I accuracy is the accuracy of correctly classifying the sick companies and type-II accuracy is the accuracy of correctly classifying the non-sick companies. Type-I error would predict a sick company not to fail i.e. non sick and a Type-II error would predict a non-sick company to fail or sick..

The analysis of the data has been carried on the computer with the SPSS package (a statistical programme).

3.5 Plan of the Study:

The first chapter of the study deals with the conceptual framework of the subject, financial statements analysis of financial statements, corporate failure, the dimensions of corporate failure or sickness, signal and symptoms of sickness and legal framework of corporate failure. The review of earlier research work in the area of evolving financial ratios for predicting corporate failure/ sickness is done in chapter two. Chapter three provides the research design used in present study. Need, scope, objective, hypothesis, limitations, sample design and methodology are explained in this chapter.

Chapter four to seven forms the core of the study and deals with the task of empirically testing of a wide variety of financial ratios of sample companies in basic goods industry, capital goods industry, intermediate goods industry and consumer goods industry respectively. Both, univariate and multivariate analysis is done to arrive at clear cut inference. In the last chapter the concluding observations and suggestions are discussed.
REFERENCES


12. Ibid 8, P. 577.

13. Ibid 5, P. 85.


