Introduction
CHAPTER I

Introduction

The prosperity of a country depends, to a larger extent, on the performance of the economy. A major portion of any country’s Gross Domestic Product is contributed by its corporate sector. India is a country of more than 1000 million people with 3.28 square million kilometers of land and endowed with million kilometers of natural resources. The success of India depends on the exploitation of all these resources for its developments. Corporates provide the medium through which these resources could be profitably exploited. The success of the country and its economy to a larger extent depends on the performance of its corporations. By endowing the resources to the able performers, India could prosper well. So, it is imperative to evaluate the performance of the corporate sector.

Meaning and Concept of Performance Appraisal

The phrase “Performance Appraisal” is composed of two words i.e., “Performance” and “Appraisal”. The word “Performance” is used to mean the efforts extended to achieve the targets efficiently and effectively. The dictionary meaning of performance refers to “achievement”. The achievement of targets involves the integrated use of human, financial and natural resources. Performance directly reflects the disposition and utilization of the resources. Appraisal refers to a critical review of the activities for improving performance. It compares the actual performance with targets fixed, identifies causes of significant variations, and devises corrective actions.

This is naturally tuned to assessing whether the business operations would be safe, profitable, and appropriate in a given economic situation. It is known that in the interest of good health medical authorities generally advise every individual to have a periodical checkup and examination of his body. Similarly, in the interest of good operating results every concern should have a periodical appraisal - both diagnostic as well as preventive in nature. In the case of an already bad or deteriorating situation it locates the areas and indicates where to make an improvement, whereas in case of good condition, it shows the way to further improve the performance.

Performance might be improved by concentrating attention on why a unit has improved on an accepted standard so that the lessons learned may be applied with advantage to other units rather than directing the efforts to eliminate deviations from the plan. Checking performance is the third major management activity, which the financial planning and control function aims to assist in particular. It implies the existence of a benchmark against which actual results can be compared.² The assessment of business performance is more complex and difficult, since it must deal with the effectiveness with which capital is employed, the efficiency and profitability of operations and the value and safety of various claims against the business.³

Performance Appraisal through Financial Statement Analysis

Appraisal of performance of a company can be done through a careful and critical analysis of financial statements. Financial analysis helps managers in controlling their enterprise's performance. It does this by providing them with a system and set of procedures for analysing and understanding financial indicators of performance. The two important financial statements are the “Balance Sheet” and the “Profit and Loss Account”. Although any formal statement expressed in money value might be thought of as financial statement, the term has come to be limited by most accounting and business writers to mean the “Balance Sheet” and “Profit and Loss Account”. Financial statements indicate the operating results and financial position of a concern; therefore, by analyzing and interpreting these statements performance can be appraised. For this purpose, analysis of financial statements is made.

Financial statement analysis is a preliminary step towards the final evaluation of the results drawn by the analyst or management accountant. Appraisal or evaluation of such results is made thereafter by the management. The analysis of Financial statements spotlights the significant facts and relationship concerning management performance, corporate efficiency, financial strength and weakness, that would have otherwise been buried in a maze of detail.

According to Metoalf and Titard, Analysis of financial statements is a process of evaluating relationship between component parts of financial statement to obtain a better understanding of a firm’s position and performance.\(^8\)

**Process of Performance Appraisal**

The financial statements contain all the data relating to operating results and financial position of the business. Besides this, other documents such as reports, schedules and explanatory notes are also appended. Overall performance of the business is appraised by analysing these statements. Hence, the process of financial statement analysis is the key process of performance appraisal. The process of performance appraisal through financial statement analysis is summarized as:

1. Some logical arrangement of financial data is made in an orderly sequence in a condensed form. The balance sheet and profit and loss account figures are rearranged to facilitate performance appraisal.

2. Figures are approximated to the nearest thousands or lakhs or crores to simplify the process of appraisal.

3. The analyst should utilise his knowledge of financial statements to draw up performance appraisal programme, which must be tailored to fit in the specific needs.

4. Performance appraisal may be conducted either internally or externally. Internal appraisal is accomplished by those who are within the enterprise and have access to detailed records and all other information related to business.

---

Such appraisal is generally conducted by the management for their purposes. External appraisal on the other hand, is conducted by those or for those who are outside a business enterprise such as shareholders, creditors, bankers, trade unions, government agencies and research scholars. The present study is similarly executed by the research scholar.

**Importance and usefulness of Performance Appraisal**

In any economic society all active participants do become interested in varying degrees in the performance of the business enterprise. Within every commercial enterprise, of whatever size, there are inevitably many different interests to be served. Some of these interest groups include owners, employees, customers, society, government, suppliers and managers. By appraising the performance through financial statement analysis, management may review a company’s progress to date and decide upon the course of action to be taken in future. Performance appraisal helps management in the task of planning of operations.

The performance appraisal programme enables the management to operate the control system of the business organization more effectively. It helps to identify the spot weakness in the company’s operations and to take corrective action. Furthermore, it tends to restrain management as they are under pressure to maintain a favourable financial position.

Investors comprising shareholders and debenture holders, have a vital interest in the appraisal of performance of an enterprise. Investors are interested in two things:

---

Firstly, they want the safety of their investment; secondly, the ability of a company to earn profit. They are also interested in a concern whose future is bright. Through performance appraisal they get the information which they need. Creditors are interested in ascertaining whether the company can employ the funds loaned to in such a way that it will be to meet current interest obligations and reply loan when it falls due. They act as magic eye highlighting the credit worthiness of a company. Creditors often appraise the performance of a company before lending the money and supplying the goods. Government regulates economic activities in various spheres. Central and State Governments and local authorities are also interested in knowing the performance of a business in order to assess their revenues through various taxes to regulate capital issues and public utility regulations. Employees have an interest in the operating results and the financial strength of a company. The remuneration of workers must be generated from the company's revenues.

Thus, workers wages, to a great extent, depend upon the success of the firm. Labour Unions use the performance data as a basis for their demand for increase in wages. The past operating performance of the business as well as its current financial position is often studied to measure the ability of the enterprise to meet new wage commitments. Every business enterprise has its own social responsibility. Although managers, owners, creditors and employees are members of the society and have their respective interest in the business, individuals or groups of individual apart, the society as a whole has some expectations from the business. So they are all interested in knowing the social performance such as environmental obligations, labours and social welfare, employment generated, regional development etc., In addition to the above, news agencies, trade associations, economic and commercial research institutions, stock exchanges, economist and research workers, members of parliament, members of public accounts committee in respect of government companies are also interested in the results of performance appraisal to know the progress being made in the present position of an industry.
Areas of Performance Appraisal

The measurement of progress and the appraisal of performance are closely related. The performance measurement is concerned with the efficiency and effectiveness of converting inputs into outputs. Performance measures should be chosen which provide useful information for the control system of management. The important areas of performance appraisal are:

Production Trends

Production is one of the most important areas of performance. The indices of production by the sectors may give an idea as to how the company has performed in the year under consideration compared to the past or how the company has performed as compared to other sectors. Production performance of a company can also be measured by analyzing capacity utilization. The production of a concern can be compared for different years with that of the companies in the same industry and with the industry as a whole of which the company is a part.

Sales Trends

The figure of sales is the index of progress made by the company. It can also be used as an indicator of managerial efficiency. Marketing of the product is also one of the most important areas of operation. In the process of performance appraisal, sales indices are computed and compared with that of other similar companies, for arriving at an objective conclusion. Computed trend values of sales may also be derived by applying linear least square method and then performance of the company may be measured by comparing the actual sales with the estimated sales.

Cost Trends

A study of cost trend helps in measuring efficiency or inefficiency with which each task has been carried out. It also helps in having control over expenditure and in fixing prices. On the basis of the study of the cost trend
which plays an important role in forecasting, planning and budgeting and in break-even analysis, wasteful expenditure if any can be avoided.

**Profitability**

The existence of a business enterprise wholly depends on its ability to earn profit, which is now considered as the most important criterion of the "enterprise's performance". It is applied universally in absolute form as well as in its relative form. Profitability indicates the efficiency or the performance of an enterprise and shows how the enterprise is utilizing its resources. Various profitability ratios are calculated for appraising the performance of a business.

**Financial Strength**

Performance appraisal is also done by appraising the financial position of a business. The financial position or the financial strength shows whether a business is being operated on sound financial lines or not. Owners, creditors and lenders of a company are interested in the financial strength. It is also an important criterion of measuring performance. In this area of performance appraisal, short term financial strength and long term financial strength are measured by calculating various ratios.

**Productivity Analysis**

Productivity growth is a key factor in determining the growth of industries. Total factor productivity growth reflects technical progress and changes in technical efficiency. In India major economic reforms have been undertaken since July 1991 with the objective of increasing the productivity and competitions of the companies. The new policies have been liberalized like government controls on production capacity, import of capital goods, intermediate inputs and technology. Foreign investment has also been liberalized. These reforms have made imported inputs cheaper and more accessible for companies and have exposed the companies to both domestic and international competition. These reforms have altered the economic
environment in which the companies operate. Hence, it is necessary to study the productivity analysis of corporate sector.

**Funds Management**

Performance of the resources or funds invested in the business can be appraised by fund flow analysis. This criterion shows the funds used in the business and sources of funds received. Performance of a business will be better if effective system of management of funds is operating. In this measure of performance a statement of changes in working capital is also prepared. This also helps in judging the effectiveness of working capital management of a company. Fund flow statement is prepared to analyse the funds position in a business enterprise.

**Value Added**

An enterprise may exist without making profits but it cannot survive without adding value. Value added measures economic value created; it can be used as a measure of productivity. Value added indicates the wealth created by a business with the application of labour and capital. Various ratios related to value added are computed for appraising the performance.

**Techniques of Performance Appraisal**

Performance Appraisal through financial statements consists of a study of relationship and trend to determine whether the financial position and results of operations and overall progress of a company are satisfactory. The techniques of performance appraisal are frequently applied to study the accounting data with a view to determining continuity or discontinuity of the operating policies, investment value of the business, credit ratings and testing the efficiency of operations. The techniques of performance appraisal are developing fast and have acquired a scientific temper. The various important techniques which are used to get performance appraisal include ratio analysis, trend analysis, analysis of variance, common size statement analysis, cash flow analysis, statistical techniques such as average, range, index number, co-
efficient of variation, correlation and regression and diagrammatic and graphic presentation of data. All these techniques provide a scientific and objective assessment of the efficiency and effectiveness of the operations and financial and overall health of a business enterprise.

Statement of the Problem

India’s manufacturing sector used to account for only about 10 percent of its GDP in the early 1950s, but currently it accounts for about 19 percent. The sector was highly protected from any form both internal and external competition over a long period of time and until the early 1990s when the country embraced the new economic policy. Since 1991, the manufacturing sector in the country has been undergoing a wave of liberalization, the main objective of it is to reduce, both external and internal barriers to entry. Such a reduction, it was argued, would enhance the competitiveness of the sector and thereby making it more efficient. Since 1992-93, the manufacturing sector has grown at the rate of 6.9 per cent per annum, though there have been considerable fluctuations in its growth rate (Table 1.1). Against this background, it is very important to analyze the performance of manufacturing sector after liberalization to show how the liberalization has really led to an improvement in the growth performance of the sector.

In terms of distribution of industries in manufacturing sector, the chemical industry is one of the most significant (Table 1.2). The Indian chemical industry plays an important role in the overall economic activity of the country. In order to promote this highly technology oriented industry, a number of incentives have been given to promote development activities. With the liberalization policy of the Indian economy, major reforms have been undertaken in the Indian chemical industry. Except for a small list of the hazardous chemicals, all chemical items can be manufactured in India without requiring any industrial licensing. Even where licensing exists, the production has been streamlined. Therefore, entrepreneurs are now free to set up chemical industries, by intimating to the government through the industrial
entrepreneurs’ memorandum. The importance of chemical industry being what it is, it is imperative to study the performance of this sector so as to guide future policy makers to decide whether to continue, increase, and decrease or to drop the importance and assistance given to this sector. Therefore, the present study is undertaken to make the performance appraisal of the selected sectors of the Indian Chemical Industry. The performance appraisal of the chemical industry is analysed through production trend, cost trend, sales trend, profitability analysis, financial performance and productivity analysis of the industry.

Table 1.1
Growth Rate of Manufacturing Sector

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of Growth</td>
<td>2.3</td>
<td>6.0</td>
<td>8.9</td>
<td>13.1</td>
<td>6.1</td>
<td>6.6</td>
<td>3.8</td>
<td>8.1</td>
</tr>
</tbody>
</table>

Source: Reserve Bank of India (2000)
Table 1.2
Structure of Manufacturing Sector

<table>
<thead>
<tr>
<th>Manufacturing Sector</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemicals and Chemical products except products of petroleum and coal</td>
<td>17.64</td>
</tr>
<tr>
<td>Machinery and Equipment other than transport equipment</td>
<td>12.06</td>
</tr>
<tr>
<td>Food products</td>
<td>11.44</td>
</tr>
<tr>
<td>Basic metal and alloy industries</td>
<td>9.39</td>
</tr>
<tr>
<td>Rubber, Plastic, Petroleum and Coal products</td>
<td>7.22</td>
</tr>
<tr>
<td>Cotton Textiles</td>
<td>6.96</td>
</tr>
<tr>
<td>Non-Metallic mineral products</td>
<td>5.54</td>
</tr>
<tr>
<td>Transport equipment and parts</td>
<td>5.02</td>
</tr>
<tr>
<td>Metal products and parts (Except Machinery and Equipment) Wood and wood products,</td>
<td>3.54</td>
</tr>
<tr>
<td>furniture and fixtures</td>
<td>3.40</td>
</tr>
<tr>
<td>Paper and paper products and printing, published and allied activities</td>
<td>3.34</td>
</tr>
<tr>
<td>Other manufacturing industries</td>
<td>3.23</td>
</tr>
<tr>
<td>Manufacture of wearing Apparels</td>
<td>3.20</td>
</tr>
<tr>
<td>Beverages, Tobacco and related products</td>
<td>3.00</td>
</tr>
<tr>
<td>Manufacture of Wool, Silk and Man-made fibre textiles</td>
<td>2.85</td>
</tr>
<tr>
<td>Leather and leather and fur products</td>
<td>1.44</td>
</tr>
<tr>
<td>Manufacture of Jute and other vegetable fibre textiles</td>
<td>0.74</td>
</tr>
</tbody>
</table>

Source: Reserve Bank of India (2000)

Production is considered as the backbone of the manufacturing sector. Production function is considered as the effective tool to satisfy the customers' demand and to operate in an economical and efficient manner. The study of the production performance is important to know the operating level of the business and financial efficiency of the business enterprise. Survival of the business in the present competitive world depends on the quality production and the technological development in the business. Therefore, the present study attempts to study the production trend of the chemical industry in India after liberalization.

The profitability of the business depends on the cost incurred for the production of goods. If the cost increases, the profit of the business is reduced and ultimately the business may go to the liquidation stage. Moreover the
future development programme of the company can be designed according to the expenses and investment level. Future budgeting planning is based on the cost aspect of the companies. Therefore, the analysis of the cost trend of the chemical industry in India is of importance in the present day context.

Sales is the important component for the development of the business. Sales can be enhanced only by following good sales policy. Due to the pricing policy of the government, the companies have to face some fluctuations in the sales. These fluctuations may lead to increase or decrease the financial risk of the companies. In order to study the sales trends of the chemical industry in India, the present study is carried out.

The efficiency of the business is measured by the amount of profit earned. The greater the profit, the more efficient is the business considered to be. The profit of a business may be measured by studying the profitability of investment in it. Profitability may be defined as the ability of a given investment to earn a return from its use. This ability is referred to as lending power or operating performance of the concerned investment. Profitability is a relative term and its relation with the other objects by which the profit is affected. It is the test of efficiency, powerful motivational factor and the measure of control in any business. Hence, an attempt has been made to study the profitability of chemical industry after liberalization.

Actually profitability is highly sensitive economic variable which is affected by a host of factors operating through a variety of ways. Some of them affect product prices and quantities; some affect cost of production while others make changes in capital stock, size, market share and growth of the firm. Further, corporate policy relating to various functions will affect profitability. Some of them are relevant in short run while others have impact in the long run. It is difficult to build a theory of profitability, which accounts for all such factors. Because of these difficulties, it is quite natural to analyse the variation in profitability by taking the partial approach i.e., to find the effect of certain
major variables, ignoring the implications of other left out independent variables at a time. The present study is a step towards this direction.

Corporate liquidity is a vital factor in business. Excess liquidity, though a guarantor of solvency would reflect lower profitability, deterioration in managerial efficiency, increased speculation and unjustified expansion, extension of too liberal credit and dividend policies. Lack of liquidity implies lack of freedom of choice as well as constraints on management's freedom of movement. If sufficient liquidity is not maintained, the enterprise is technically insolvent and at least faces the financial embarrassment of renegotiating its obligations to creditors. The study also aims to analyse the liquidity position of the selected chemical industry.

Financial appraisal provides a method for assessing the financial strengths and weaknesses of the chemical industry using financial statements. There are two views of the financial strength of every organization based on the period of lending i.e., the short term and long term. The short-term financial strength relates to the technical solvency of an organization in the near future, while the long-term financial strength depends on the structure that has been imposed in financing more permanent assets requirements. The present study is made to analyse the short-term and long-term financial strength of the chemical industry after liberalization.

Productivity is the arithmetic ratio between the amount produced and the resources used in the course of production. Higher productivity becomes all more important than even before. Higher productivity will provide for a higher level of economic well being of the people. The role of productivity in accelerating the pace of economic growth is well reorganized in both the theoretical and empirical literature on growth. In the neo-classical growth, accounting framework, sum total of growth of capital accumulation, growth of labour and the growth of capital determine the productivity. An attempt is
made to measure the total factor productivity of Indian Chemical Industry through standard methods.

Liberalization in India has started in 1985 and culminated in 1991. This has opened up new business opportunities and allowed the expansion of the existing business similar of the corporations depended more than their performance and global competitiveness than on protection. This new situation demands more accurate tools of measuring the performance of the corporate. Shareholders, managers, employees, customers, governments and other interested people want to know whether the performance of the corporation justifies the investment made in them. For them the conventional tools did not provide enough of the required information. So this study aims to build new methods of analysing the performance of the corporations, by taking cues from accounting, statistics, finance and quantitative methods.

Selection of Chemical Industry

Chemical industry in India constitutes a group of heterogeneous and feeder industries and covers a wide range of industries from the giant heavy chemical and fertilizer industries to smaller light industries like pharmaceuticals and fine chemicals, paints and varnishes. Chemical Industry in India is to occupy a very important position in the national economy as they have made a vital impact in the national efforts towards planned development. Chemical products constitute less than three percent of the gross domestic product. But they have made a significant contribution towards augmenting food production by supplying fertilizers and pesticides. Chemicals of one type or the other are required in almost all the industries like textiles, paper, sugar, pharmaceuticals, plastics, man made fibres and so on.

They have also played some part in conservation of water resources, development of improved construction materials to substitute scarce metals and in meeting the needs of the health of the population. The sectors of the chemical industry include inorganic chemicals, organic chemicals, petro-chemicals, pharmaceuticals and drugs, dyestuffs, fertilizers, agro-chemicals and many others which include chemicals to produce products like paints, varnishes, plastics, man-made fires and so on. The chemical industry today ranks first among the manufacturing industries in India along with textiles, iron and steel and engineering industries. The total investment in the chemical industry and its various segments in India rose from Rs.3040 millions in 1961 to over Rs. 3500 millions in 1991 and the value of production rose from Rs.1200 millions in 1955 to well over Rs.40000 millions in 1991.11 The chemical industry has been selected for the analysis due to the reason is that the study of performance appraisal of chemical industry in India after liberalization has remained untouched. Therefore, chemical industry has been selected for the case study. Second reason is that for any country’s economic development, chemical industry should be given a priority. Because this industry, in fact improves the economic condition of a nation. So also, in case of our country. Thirdly, to meet the needs of growing population of India, production of chemical products should be increased. To increase the production of chemical products, a clear and elaborate performance appraisal is to be made to encourage entrepreneurship.

Significance of the Study

Performance appraisal is of special importance in industries. Chemical industry is one such industry. From the point of view of the socio - economic development of the country, chemical industry is significant enough in terms of investment and employment.

The sales, productivity and profitability function in chemical industry differs from that of other industries. Eventhough many studies in this direction have been conducted, the present one would be of greater significance to many. It would help to understand the pattern and the structure of the financial variables of leading companies apart from identifying the financial relationship of companies with their respective industries. The change in the economic policy of the government certainly has got impact on the performance of corporate units in India. A need at the present juncture is therefore felt to study the impact of such changes on the performance of corporate sector and hence the research problem has to be changed to “Performance Appraisal of an Indian Chemical Industry after Liberalization”. The topic has particular relevance to the changes in the economy in the nineties and the effect of such changes on the performance of chemical industry. This particular topic has been selected for the study because no continuous effort has been made to examine the changes that might have occurred in the performance of chemical industry due to the changes in the government policy.

As such, the study is expected to help the corporate management, the financiers, the investors and the government at large, to take valuable decisions at their own. The study has academic relevance too in so far as new theoretical and practical knowledge would be added to the existing stock of knowledge undoubtedly. The present study will act as a masterpiece on the subject for further research and development. There is no study on performance appraisal of Indian Chemical industry after liberalization. Therefore, to cover the gaps in the earlier studies, the present study is undertaken to give an insight into the performance of selected sectors of Indian chemical industry. It would also enable shareholders, investors and investment analysts to identify the determinants of corporate performance. Further, it would provide insight to banks, financial Institutions and long term lenders to understand the financial capability and effectiveness of the companies. Moreover, it would open up new vistas to the industry association and the Government in understanding the
characteristics of the companies for inter and intra firm comparison. It might also help the academic researchers, researchers in securities, industry and company by providing different perspective of the analysis.

**Objectives of the study**

The following are the objectives of the study:

1) To survey the profile of Indian Chemical Industry with a view to discuss their achievement since their inception.

2) To analyse the trends of production, sales and costs of the selected sectors of chemical industry in India after Liberalization.

3) To study the profitability position and determinants of the profitability of the selected sectors of chemical industry in India after Liberalization.

4) To measure the liquidity position of the selected sectors of chemical industry in India after Liberalization.

5) To assess the financial strength of the selected sectors of chemical industry in India after Liberalization.

6) To study the total factor productivity and analyse the production functions of the selected sectors of chemical industry in India after Liberalization.

7) To present summary of the study and to make suitable suggestions for improvement for further successful survival in the competitive business world.
Hypothesis

The selection of the topic is made with a view to evaluating and appraising the operational and financial performance of the selected chemical industries in India after liberalization and measuring the efficiency and effectiveness of the companies in performing different activities in various areas of operations. Against this backdrop, the following hypotheses are formulated in order to test their validity in the context of selected chemical industry in India.

1) There is no significant difference in percentages of different component costs to the total cost of production between years and between sectors in the selected chemical industry in India.

2) There is no significant difference in profitability ratios between years and between sectors in the selected chemical industry in India.

3) There is no positive relationship between the size and profitability of the selected chemical industry in India.

4) There is no significant difference in short term and long term financial ratios between years and between sectors in the selected chemical industry in India.

Methodology

Sampling Design

The study is ex post facto based on survey method making a survey of 129 companies in Indian Chemical Industry. There are 834 companies operating in the Indian chemical Industry. The companies under chemical industry are classified into twelve sectors. The details of the sectors with the available companies of chemical industry are presented in Table 1.3 and Table 1.4.
Table 1.3
Sectors with Total Number of Companies Available in Indian Chemical Industry

<table>
<thead>
<tr>
<th>S. No</th>
<th>Sectors</th>
<th>11 years data available companies</th>
<th>Total available companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Drugs, Medicines &amp; Allied products</td>
<td>39</td>
<td>318</td>
</tr>
<tr>
<td>2.</td>
<td>Organic Chemicals</td>
<td>20</td>
<td>107</td>
</tr>
<tr>
<td>3.</td>
<td>Inorganic Chemicals</td>
<td>22</td>
<td>107</td>
</tr>
<tr>
<td>4.</td>
<td>Fertilizers</td>
<td>21</td>
<td>55</td>
</tr>
<tr>
<td>5.</td>
<td>Paints and Dyes, etc.</td>
<td>15</td>
<td>78</td>
</tr>
<tr>
<td>6.</td>
<td>Pesticides</td>
<td>12</td>
<td>58</td>
</tr>
<tr>
<td>7.</td>
<td>Cosmetics &amp; Toilet Preparations</td>
<td>06</td>
<td>32</td>
</tr>
<tr>
<td>8.</td>
<td>Soap, Washing Preparations, Waxes, etc.</td>
<td>07</td>
<td>26</td>
</tr>
<tr>
<td>9.</td>
<td>Miscellaneous Chemicals</td>
<td>04</td>
<td>23</td>
</tr>
<tr>
<td>10.</td>
<td>Explosives</td>
<td>04</td>
<td>14</td>
</tr>
<tr>
<td>11.</td>
<td>Starches Modified, Adhesives, etc</td>
<td>02</td>
<td>08</td>
</tr>
<tr>
<td>12.</td>
<td>Photographic &amp; Cinemographic Goods</td>
<td>02</td>
<td>08</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>154</td>
<td>834</td>
</tr>
</tbody>
</table>

Source: Prowess Database

Table 1.4
Selected Sectors with Total Number of Companies for the Present Study

<table>
<thead>
<tr>
<th>S. No</th>
<th>Sectors</th>
<th>11 years data available companies</th>
<th>Total Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Drugs, Medicines &amp; Allied products</td>
<td>39</td>
<td>318</td>
</tr>
<tr>
<td>2.</td>
<td>Organic Chemicals</td>
<td>20</td>
<td>107</td>
</tr>
<tr>
<td>3.</td>
<td>Inorganic Chemicals</td>
<td>22</td>
<td>107</td>
</tr>
<tr>
<td>4.</td>
<td>Fertilizers</td>
<td>21</td>
<td>55</td>
</tr>
<tr>
<td>5.</td>
<td>Paints and Dyes, etc.</td>
<td>15</td>
<td>78</td>
</tr>
<tr>
<td>6.</td>
<td>Pesticides</td>
<td>12</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>129</td>
<td>723</td>
</tr>
</tbody>
</table>

Source: Prowess Database
In order to select the sectors for the purpose of study, only top six sectors have been selected based on the average paid up capital of 11 years from 1991-92 to 2001-02. The selected sectors include drugs, medicines and allied products, organic chemicals, inorganic chemicals, fertilizers, paints and pesticides. The selected six sectors include 723 companies. Out of 723 companies 318 are under drug, medicines and allied products, 107 under organic chemicals, 107 under inorganic chemicals, 78 under paints, 58 under pesticides and 55 under fertilizers. Out of 723 companies of the selected sectors, 11 years data is available for 129 companies only. Therefore, all the 129 companies are included in the sample. It accounts for 17.57 per cent of the total companies available in the selected chemical industry. The selected 129 companies include 39 in drug, medicines and allied products, 20 in organic chemicals, 22 in inorganic chemicals, 21 in fertilizer, 15 in paints and dyes and 12 in pesticides. List of companies selected for the study has been given in the Appendices.

Sources of Data

The study was mainly based on secondary data. Secondary data were collected from Prowess, which is the most reliable and empowered corporate database of CMIE. It contains a highly normalized database built on a sound understanding of disclosure in India on around 8000 companies, which include public, private, co-operative and joint sector companies. The database provides financial statements, ratio analysis, fund flow, product profiles, returns and risks on the stock markets, etc. The application areas include credit evaluation, security analysis, industry analysis, bench marking, evaluation of competition, feasibility studies, consulting, journalism and research.

Besides Prowess Database, the data were also collected from Center for Monitoring Indian Economy Reports, RBI Bulletin, Annual Survey of Industries, Reports on Currency and Finance, Department of Company Affairs Publications, Institute of Chartered Financial Analyst, Institute of Financial Management and Research, Libraries of various institutions, Research

**Tools of Analysis**

In the course of analysis of this study, various accounting and statistical techniques have been made. Accounting technique includes ratio analysis, while among statistical techniques the arithmetic mean \( (\bar{X}) \), Coefficient of Variation (CV), test of significance ('t' test), compound annual growth rate, simple regression, analysis of variance have been applied. In addition, multiple regression and discriminant analysis have also been applied using financial ratios as variables. Productivity models such as Solow Index, Kendrick Index, Divisia Index and Cob-Douglas Production function have been applied to study the productivity performance of the chemical industry.

**Ratio Analysis**

Ratio analysis is regarded as one of the best tools of analysis and comparing the time series accounting data of different firms. That is why it has been extensively used in the present study. Various ratios computed in order to analyze the production trends, cost trends, sales trends, profitability, liquidity, short term and long term financial strength and its various components have been explained at the relevant places in different chapters. However, in this study the use of ratios has not been made in the course of analysis directly. To make the analysis and interpretations more precise and accurate, the values of \( \bar{X} \), CV and CAGR have been computed from the ratios.
Arithmetic Mean ($\bar{X}$)

It gives a single value to describe the whole data. It has been obtained by adding the values of all observations and dividing it by the number of observations.

$$\bar{X} = \frac{\sum X}{N}$$

Where $\sum X$ - Sum of variables and $N$ - Number of observations. For the purpose of different profitability ratios between the years and sectors, mean values should be computed.

Co-efficient of Variation (CV)

It is used in problems, which require to compare the variability of two or more than two series. The series, for which the co-efficient of variation is greater, is said to be more variable or conversely less consistent, less stable or less homogenous. On the other hand, the series for which co-efficient of variation is less, is said to be less variable or more consistent, more stable or more homogeneous. In ratio analysis of financial data, less coefficient of variation in a ratio is taken to mean relatively better control of the management on that ratio. It is determined as follows:

$$CV = \frac{\sigma}{\bar{X}}$$

where $\sigma$ is the standard deviation and $\bar{X}$ is the mean. Therefore, for the purpose of comparison of variability in the profitability ratios between the years and the sectors co-efficient of variation should be computed.

Compound Annual Growth Rate (CAGR)

The year over year growth rate of an investment over a specified period of time is calculated by taking the nth root of the total percentage growth rate
where \( n \) is the number of years in the period being considered. This can be written as:

\[
\text{CAGR} = \left( \frac{\text{Ending Value}}{\text{Beginning Value}} \right)^{\frac{1}{\text{# of years}}} - 1
\]

**Trend Indices**

In order to compute the index of change in a variable, the following formula has been used

\[
I_t = \left( \frac{Y_t}{Y_0} \right) 100
\]

where \( Y_t \) is the value of the variables in the year \( t \) for which the index is to be computed and \( Y_0 \) is the value of the variable in the base year. In order to measure the change in the production and sales, such indices have been computed.

**Analysis of Variance**

The analysis of variance has been developed specially to test the hypothesis whether the profitability ratios have significant difference or not between the sectors and years. From this technique, one is able to determine whether the samples have the same mean as the population from which they have been drawn. The technique of analysis of variance is also applied for the analysis of cost trend, profitability ratios, liquidity ratios and short term and long term financial ratios. In a two-way classification the analysis of variance table has the following form.

<table>
<thead>
<tr>
<th>Sources of Variation</th>
<th>Sum of Squares</th>
<th>d.f</th>
<th>Mean square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Columns</td>
<td>SSC</td>
<td>( (c-1) )</td>
<td>MSC = SSC /(c-1)</td>
<td>MSC / MSE</td>
</tr>
<tr>
<td>Between Rows</td>
<td>SSR</td>
<td>( (r-1) )</td>
<td>MSR = SSR /(r-1)</td>
<td>MSR / MSE</td>
</tr>
<tr>
<td>Residual (or) Error</td>
<td>SSE</td>
<td>( (c-1) ) ( (r-1) )</td>
<td>MSE = SSE /(r-1)(c-1)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>SST</td>
<td>( n-1 )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SSC – Sum of squares between the columns
SSR – Sum of squares between the rows
SSE – Sum of squares due to error
SST – Total sum of squares

The F values are calculated as follows:

\[ F(V_1, V_2) = \frac{MSC}{MSE} \]
Where \( V_1 = (c-1) \) and \( V_2 = (c-1)(r-1) \)

\[ F(V_1, V_2) = \frac{MSR}{MSE} \]
Where \( V_1 = (r-1) \) and \( V_2 = (c-1)(r-1) \)

The calculated values of F are compared with the table values. If calculated value of ‘F’ is greater than the table value at pre assigned levels of significance, the null hypothesis is rejected otherwise accepted.

Regression Analysis

Linear regression equation is fitted using Ordinary Least Square (OLS), by regressing dependent variables on the independent variables as

\[ Y = a + bx + u \]

where \( Y \) - dependent variables
\( X \) - independent variables
\( u \) - Error term

The statistical significance of “b” is worked out by applying ‘t’ test and \( R^2 \) is computed to determine the percentage variations in the dependent variable explained by the independent variables. As the purpose of determining the relationship between the production, sales and time of the Indian chemical industry, the Linear Regression equation has been used in the study.
Multiple Regression Analysis

In order to estimate the degree and the extent of interrelationship between a dependent variable and the number of independent variables, simple regression techniques are generally used. To identify variables affecting the profitability of Indian chemical industry, the simple regression technique has been applied to compute the $R^2$ in the following form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \mu$$

Where $X_{1,2,3,..n}$ - Independent Variables

$Y$ - Dependent Variable

$\beta_1$ - Regression Co-efficient value

$\mu$ - Error term

The regression co-efficient and the overall variations are tested respectively by computing t value and F ratios. The goodness of fit of the estimated equation is worked out with the help of $R^2$ - squared and $R^2$ - Adjusted square values.

The Discriminant Analysis

The use of ratio to judge the liquidity position of the enterprise is not free from certain limitations. The limitations arise from the fact that the methodology is basically univariate; that is, each ratio is examined in isolation. Due to this, the financial analyst has to use his own judgement to assess the combined effects of two or more ratios.\(^{12}\) A linear discriminant analysis has been applied in finance to problems involving more than two groups. Altman\(^ {13}\) has applied the discriminant analysis in predicting bankruptcy but here it is applied in liquidity predication context.


This study considers a simple case in which two variables $X_1$ and $X_2$ are used to discriminate between two groups - good and poor risks with regard to liquidity. The two variables used are current ratio ($X_1$) and liquid ratio ($X_2$).

$$Z = a X_1 + b X_2$$

is a linear combination of $X_1$ and $X_2$. The problem is to determine the values of ‘$a$’ and ‘$b$’ by means of past data and some criterion that proves ‘$Z$’ useful as an index for discriminating among members of the two groups. In this study, discriminant analysis has been performed for all the selected years. However, its limitation is that only two variables are being considered.

**Methods of Measurement of Total Factor Productivity (TFP)**

The trends in Total Factor Productivity (TFP) in this study have been measured by using the following three different methods of productivity Kendall Index, Solow Index and Divisia Index.

**Kendrick Index**

The Kendrick Index is the ratio of the actual output to change in output, which would have resulted from the use of increased inputs in the absence of technological changes. It is defined as

$$\text{TFP}(K) = \frac{V_t}{W_0 L_t + r_o K_t}$$

Where $V$ stands for indices of real value added, $L$ for indices of Labour, $K$ for indices of Capital, $W_0$ and $r_o$ being the share of labour and capital in value added in the base year.
**Solow Index**

Solow Index of TFP is based on the rate of productivity change and is obtained as follows:

$$\frac{\Delta A_t}{A_t} = \frac{\Delta V_t}{V_t} - \left\{ W_t \frac{\Delta L_t}{L_t} + r_t \frac{\Delta K_t}{K_t} \right\}$$

Where \( \Delta V_t \), \( \Delta L_t \), and \( \Delta K_t \) are the rates of change in real value added, labour and capital and \( W_t \) or \( r_t \) are the share of labour and capital in value added in year \( t \). The total factor productivity is

$$A_{t+1} = A_t \left[ 1 + \frac{\Delta A_t}{A_t} \right] \text{ for base } A_t = 1$$

**Divisia Index**

Divisia index of TFP is also based on the rate of productivity change and is obtained as follows

$$\frac{\Delta P_t}{P_t} = \frac{\Delta V_t}{V_t} - \left[ \bar{W}_t \frac{\Delta L_t}{L_t} + \bar{r}_t \frac{\Delta K_t}{K_t} \right]$$

Where \( \Delta V_t \), \( \Delta L_t \), and \( \Delta K_t \) are approximated by corresponding log of ratios of variables over successive year respectively and

$$\bar{W}_t = \frac{1}{2} (W_{t+1} + W_t) \text{ and } \bar{r}_t = \frac{1}{2} (r_{t+1} + r_t)$$

Where \( W_t \) and \( r_t \) are the shares of capital and labour in value added. The Divisia Index is then derived as
\[ \frac{\Delta P_t}{P_t} = P_{t+1} \left[1 + \frac{1}{P_t} \right] , \text{Where } P_{t+1} = P_t \]

The above methods of measuring TFP are based on the assumption of constant returns to scale, perfect competition and payment to factors according to their marginal product.

**Production function Method of Estimating Growth Rate of TFP**

In the production function approach to measure TFP, we relax the constant return to scale.

**Cobb-Douglas (CD) Production Function**

The CD production function including the technological progress variable can be stated as follows

\[ V = Ae^{\lambda t} L^\alpha K^\beta \]

Where \( V \) is value added, \( L \) is Labour, \( K \) is Capital and \( t \) is time. Further elasticities of Labour and Capital are given by \( \alpha \) and \( \beta \) respectively and exponential growth rate of TFP is given by \( \lambda \). This function implies unitary elasticity of substitution. The log form of CD production function is given by

\[ \log V = \log A + \alpha \log L + \beta \log K + t \]

It can also be reformulated as

\[ \log \frac{V}{L} = a + b_1 \log \frac{K}{L} + b_2 \log L + t \]

Where \( b_1 = \beta \) \quad \( b_2 = \alpha + \beta -1 \)

If return to scale is unity, then the co-efficient of \( \log L \) should be significant.

**Constant Elasticity of Substitution (CES) production Function**

CES production function including exponential technological progress variable can be stated as follows:
\[ V = A e^{\lambda t} \left[ \delta L^p + (1-\delta) K^p \right]^{1/p} \]

Where \( V \) is value added, \( L \) is Labour, \( K \) is capital, \( t \) is time and \( \delta \) is distribution parameter. \( V \) gives returns to scale. \( P \) is related to elasticity of substitution by the following formula:

\[ \sigma = 1/(1 + p) \]

and \( \lambda \) is exponential growth rate of TFP. For estimating CES production function we consider equation based on equality of marginal productivity of labour to wages \((w)\). Under the assumption of perfect competition and profit maximization:

\[ \log V/L = a + b_1 \log w + b_2 t + b_3 \log L \]

Where \( b_1 = V / (V+P) \)
\[ b_2 = \lambda p / (V+P) \]
\[ b_3 = P (V-1) / (V+P) \]
\[ \sigma = b_1 / (1 + b_3) \]

If a return to scale is constant, then co-efficient \( b_3 \) is significant. If co-efficient \( b_3 \) is insignificant implying returns to scale to be unity, then co-efficient \( b_1 \) gives elasticity of substitution.

**Functions for Annual Variations in Factor Productivity**

It is postulated that factor productivity depends on scale of production and institutional framework such as labour-management relations. Growth in scale of production permits adoption of technologies, which improve productivity. Expansion of scale also provides division of labour, which in turn improves the productivity. Labour management relations affect motivation of workers, which in turn affects their will to work.
Based on the above hypothesis function for TFP is specified as below:

\[ P = f(V, t) \]

where \( P \) = Productivity index

\( V \) = real value added as proxy for scale of production

\( T \) = time variable as proxy for management and labour relations.

For \( P \), all measures of total factor productivity (TFPK, TFPS, TFPD) and partial productivity of labour are taken separately. The functions are estimated in log form.

**Geographical Coverage and Period of Study**

This study covers only companies, which were listed in the prowess database and operating in India. The period of study was from the financial year 1991-92 to 2001-02 covering a period of 11 financial years.

**Limitations of the Study**

i. This study is based on secondary data taken from published annual reports and accounts of selected companies and as such its findings depends entirely on the accuracy of such data.

ii. There are different methods to measure the profitability of an industry in this connection views of experts differ from one another.

iii. The present study is largely based on ratio analysis which has its own limitations.

iv. The analysis of financial statements of business enterprise gives diagnostic indicators. Researcher being outside external analyst obviously has no access to internal data. Therefore, inside view of the organization can’t be characterized in the study.
Chapter Scheme

The study has been organized into six chapters, each devoted to some aspects of the study of performance appraisal of chemical industries in India after Liberalization.

Chapter I deals with the introduction of the study, performance appraisal through financial statements, process of appraisal, areas and techniques of performance appraisal, statement of the problem, significance of the study, objectives of the study, hypothesis of the study, methodology, sources of data and chapter scheme.

Chapter II deals with the profile of the selected Indian chemical industries and the review of empirical studies on performance appraisal.

Chapter III deals with analyses of production, costs and sales performance of selected Chemical Industry in India.

Chapter IV deals with the profitability analysis, determinants of profitability, liquidity assessment and analysis of long term and short-term financial strength of selected Chemical Industry in India.

Chapter V deals with the measurement of Total Factor Productivity and Production Function of the selected chemical industry in India.

Chapter VI summarizes the findings and make suggestions for the successful survival of industry.