Chapter-3

Review of Literature & Research Design
Review of Literature

Industrialization is vital for economic development. It is an effective tool for reducing regional disparities and increasing the standard of living. It also triggers the process of all-round economic development of a country. The industrial structure of India today comprises of cottage, small scale, medium and large scale industries. These three categories of industries are indispensable for fostering industrial development of the country, since each type has a definite role to play. Small industries also play a key role in the growth of developing countries like India. But industrial sickness found in small scale sector has restricted its role in the process of industrial growth. In this part of study an attempt has been made to review the recent literature on industrial sickness with particular emphasis on small scale industries.

Stephanak and Prien (1950) depicted that it was easier to raise capital for many small-scale units than for a few large ones, because the small-scale industries might involve those who have little savings and satisfy their instinct of creativity.

The industrial policy resolutions of (1948) and (1956) highlighted the importance of small-scale sector in the generation of additional employment opportunities with lower capital investment.

The international planning team (1955) concluded that there was lack of capital as well as credit largely because of low productivity and overpopulation in many branches.

Dhar (1958) in his survey in Delhi found that the major sources of external finance were relatives, friends and traders. The society for social and economic studies (1959) emphasized that the dearth of capital resulted from a low income level, small capacity to save and hence a lack of capacity to invest.

The national council of applied economic research (1959) in the survey of handloom industry in Karnataka and Sholapur found that on the whole, master weavers and money lenders constituted the major source of funds both in urban and rural areas.
Lakdawala and Sandessara (1960) in their study in Bombay found that 342 firms had 391 cases of borrowings.

Baljit Singh (1961) in his study in Moradabad found that of the indebted establishments, 33 percent were indebted to traders and dealers, 27 percent to relatives and friends and 21 percent to money lenders.

Balakrishnan (1961) analysed the financial experience of joint stock companies in the small-scale sector and found that these had a low profit-earning capacity due to higher cost of production and higher rate of interest.

Ramakrishna (1962) analysed the causes of the prejudice of financial institutions against small industries in the matter of lending.

The national council of applied economic research (1963) found that the highest contribution was made by financial institutions in Mysore and 41 percent of the total loan had come from commercial banks.

In a study of Hyderabad, Rajkot, Delhi (Okhla Estate) and Ludhiana undertaken by the UNESCO Research Centre on Social and Economic Development in Southern Asia (1966), it was found that entrepreneurs had an attitude of "skepticism" towards government policy. In Hyderabad, none of the surveyed units had borrowed from the government or a bank; in Okla. 9 percent had obtained loans from one of these sources and in Rajkot 45% had obtained loans from these sources.

Sandesara (1966) examined the relationship between size and capital intensity and also between size and other economic characteristics, like output, wages and surplus each per worker and output and surplus each per unit of capital. He observed that there is positive relation between size and output capital ratio, size and surplus capital ratio and size and wage rate were seen to be positively associated but there was little positive association between size and capital intensity.

The working group on small scale industries set up by the administrative reforms commission stated on the basis of a survey conducted by the central small industries organization that on an average, only 20 percent of the credit needs of the small scale sector were being met by institutional sources. Mishra (1970) in his study in Saugor district found that industrialists preferred a 'bania' (private money lender)
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to a cooperative bank for meeting their needs because of complicated formalities, cumbersome procedure and undue delay.

Jain (1971) observed that financial agencies had developed a preference of investing their funds in the medium and large scale units. As a result small-scale concerns, which were in need of credit facilities mostly take recourse to the traditional money lenders at an exorbitant rate of interest.

Vepa (1971) found that despite a well-developed institutional framework, it was urban-based and the bulk of the advances were made to the large units.

Kopardekar (1974) lays emphasis on the composition of investment in selected units and mode of disposal of output. He dealt more with the internal structure and efficiency of the units by paying a little attention to the external sources of finance. Ramakrishnan (1975) in his study in Delhi found that entrepreneurs were prepared to pay or had paid a much higher rate of interest to non-banking sources to avoid bank formalities.

Godbole (1978) examined that small-scale units in the developing areas suffered from several handicaps. They lacked the necessary background and experience in various areas like finance, marketing, production and personnel management. It also highlighted the issue on which national policies need to be evolved.

Pareek (1978) conducted a study based on the data collected from both financial institutions and small-scale units located in various parts of Rajasthan. He analysed the role of various agencies, particularly the financial institutions in meeting the vital needs of finance of the small-scale industrial sector.

According to Patel, (1980) since public money was involved, it would be worthwhile to examine whether the schemes were bankable or not. Therefore, proper monitoring and evaluation of the schemes so as to remove the gaps in planning and implementation of the programme is essential. Monitoring is helpful in identifying problems, modifying project designs and in providing the link to measure the benefits accruing from the schemes as well as for making suitable adjustments for the effective utilization of funds.
Dawar (1980) examined that the small-scale industries at the start level had been supplying pant and machinery on hire purchase basis. He suggested that the state government should provide the corporation with adequate funds as grants or loans at concessional rate of interest and the corporation should simultaneously improve its recovery positions by proper monitoring.

Sandesara (1980) attempted to study the impact of the incentives to the small scale industry. The incentive selected for the purpose was long term financial assistance to small industrial units. Three criteria were adopted in selecting this incentive: (I) that the incentive should be capable of producing an enduring impact on the units; (II) that the numbers of units which have availed the incentives should be sufficiently large; and (III) that the list of such units should be available or compilable from the relevant records without excessive efforts.

Mahajan (1980) revealed that the entrepreneurs, particularly those who came from the category of skilled workers, preferred to pay higher rates of interest rather than to approach the government financial agencies owing to their ignorance about the alternative financial facilities, their lack of education and lack of exposure to elementary financial management.

Upadhaya (1980) depicted that the small-scale units suffered from chronic shortage of working capital and long term capital. He concluded that the small industry might have to depend on its own sources.

Papola (1981) emphasized that in order to make concessional finance effective, it would also be necessary to develop a minimum threshold level of industrial activity preferably with strong inter-relationships among industries. An organization having representatives from the financial institutions, promotional institutions, state and district administration and potential industrial entrepreneurs would be required for such planning for each of the backward districts. According to Papola, even with the relatively low level and undiversified structure of industries, institutional finance seems to have produced a significant impact in the two backward district and one non-backward district studied here. Concessional finance naturally had a greater impact in the backward districts.
Unmarkhan (1981) while examining the role of SFCs in small loans and in promotional activities, found that the preferential role of SFCs in financing small-scale industries was the result of various policies pursued by the central and state governments, the Reserve bank of India and the Industrial Development Bank of India etc.

Anderson and Khambata (1982) discussed how the factors, namely the control on interest rates and high initial risk and administrative costs, lead to the unwillingness of financial institutions to finance small scale industries in the developing countries.

Ojha (1982) in his study came to the conclusion that as a result of the multi-agency approach initiated by government and Reserve Bank of India, not only had the growth of small-scale industrial sector accelerated, but also a large group of new entrepreneurs, particularly those who are technically qualified was emerging.

Reddy and Brahmanandam (1983) advocated the establishment of the small industrial development bank of India (SIDBI) on the pattern of IDBI and NABARD to meet the financial needs of the small-scale sector. This proposed apex institution could monitor and guide various financing agencies of the small-scale sector such as SFCs, commercial banks, etc.

Dhall (1983) in his work pointed out that the traditional security cum-guarantee based lending practices of banks would be clearly anachronistic in the period of social control and nationalization of banks. His study also pointed out that in the context of restrictive credit policy there was a need to ensure equitable distribution among different units. Sonalkar and Kaveri (1985) in their work made an attempt to analyse the time involved in credit sanction to small scale industrial units and offered useful suggestions to minimize that time and improve and credit decisions.

Nadar (1985) conducted a study on small scale industry inter relationship with the large scale industry. The main objective of the study was to study the extent and variation of inter relationship and benefits of inter relationship accruing to small scale units. The study revealed the trend of inter relationship existing between small and large scale units in the engineering industry of the Coimbatore region. The study presented the problems faced by the small scale units. These problems are shortage of
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skilled labors, financial problems, power cut, irregularity of order, shortage of raw materials, lack of marketing facility etc.

Dave (1987) conducted study on “Industrial sickness and key area of management”. This study was devoted to industrial sickness in textile industry in Gujarat. He concluded that textile industry is the victim of hostile environment, such as historical factors, government policy, technological development, shift in demand, power shortage etc. He stated that the management is also not able to identify the problems in time and the management is indifferent to planning which is considered as the essence of management. It has been observed that the root cause of the industry failure is the capability to forecast the current problems. The study suggests that the textile mills should plan to expand its spinning section in order to absorb the surplus labour and to enter the national yarn market with some cost benefit.

Joshi (1987) conducted a study on management of industrial sickness. He stated that financial institutions are no more continuing their lending operations to persons with financial standing who can offer adequate securities and guarantees but are providing finances to first generation entrepreneurs who have limited resources. The study suggested that before providing finances for any project, the financial institutions should have a close look at the top management as well the complete organizational set up.

Deshpande, (1989) has conducted study on “Entrepreneurship of small scale industries”. He observed that the Government efforts create favorable considerations for the development of industrial sectors in the underdeveloped regions. Government incentives like central subsidy, development of industrial areas and the development of infrastructure had initiated an accelerated process of industrialization and had encouraged some people to take up entrepreneurship. The study suggests that before financing the project it may be insisted that the prospective entrepreneurs should complete satisfactorily a training programme which will atleast expose them to the required knowledge and skills.

Nagpal (1990) suggested the need for evolving a mechanism which would make the small entrepreneurs aware of updated technology. Innovative financing methods like venture capital might serve a useful purpose. These steps would help in
giving a shot in the arm to the small-scale units which have a crucial role to play in the economy.

Rao (1990) discussed some practical problems of small-scale industries and pointed out that the attempt to solve the problems of small units by financial means alone, like making large borrowings available, would only add to interest and repayment burden of the units and make them more sick. The disabilities of small units sprung from many non-financial factors and applying financial solutions would not work, he observed. On the contrary, such approach would add to the loan carried by financial institutions and would have an adverse impact on the ability of banks to optimize the end-use of credit created by them.

Ramesha (1990) studied the inter state disparities in bank credit to the SSI sector. The study revealed that commercial bank credit to the SSI sector had shown an upward trend. But it is disturbing to note that along with the increasing bank credit to the SSI, inter state disparities in the distribution of credit have also widened. The increasing doses of bank credit to the SSI sector have been cornered by a few states like Maharashtra, Tamil Nadu and Gujarat.

Misra, (1990) conducted study on “Monitoring of industrial sickness”. He stated that the industrial sickness is normally caused by internal factors which are mostly related to the mismanagement in various areas of operation like technical, financial, operational, marketing etc. However the significant internal factors causing industrial sickness are managerial sickness, poor implementation of plans, poor marketing mismanagement, poor technical and operational management and poor financial management.

Misra, (1991) has conducted a study on “Industrial sickness’ Role of entrepreneurs”. The purpose of the study was to highlight the problems of small scale industries in Bihar, leading to their sickness. The findings of the study state that the labour problem, machinery shortage and lack of technical know how were dominant problems faced by unhealthy units. The study suggests that the development of entrepreneurship can be an effective solution to the problem of industrial sickness in small sector.
Sunil K. Saikia, (1992) had studied the different problems faced by small scale industries in north east region of the country. He pointed out that lack of infrastructural facilities, absence of training facilities, marketing problems, lack of techno-economic information and lack of coordination among different industrial units are the important emerging problems in these industrial units. He pointed out that due to these problems the region is still industrially backward in spite of vast deposits of mineral and forest resources available in the region. He suggested that these problems of small scale industries should be removed in order to increase the industrial development of the region.

Nayak Committee Report (1993) has suggested that small unregistered units with credit limits of not more than Rs.1 lakh should have the first claim on the priority sector credit and the new priority sector credit dispersion, when adopted, should fully provide for the working capital equipment of all tiny units with credit limit upto Rs.10 lakh. To overcome the operational difficulties of SSIs the committee has made detailed recommendations, the more important of which are having a system of annual budgeting for working capital requirements of SSI borrowers, computerization of information on SSI borrowers which would facilitate timely decisions by banks, delegation of adequate discretionary powers to branch managers, opening of specialized branches to cater to SSI needs, creation of an “ombudsman” type of authority within the banks to look into the grievances of SSI borrowers, revitalizing the state-level forums and setting up of district level forums for overseeing and monitoring credit to SSI, particularly village-level and smaller tiny industries, and the allocation of districts exclusively to SFCs and commercial banks for extensive financing of SSI’s, particularly the units coming within the norms of single window scheme of SIDBI.

S.S. Khanka, (1993) conducted study on “industrial sickness and the repercussions”. He stated in his study that the growing industrial sickness aggravated the problem of unemployment following the closure of sick industries. The study was divided into two parts. First part discusses the growing incidence of industrial sickness in India. The second part focuses on the loss of employment following the closure of sick industries. He found in his study that locking up of country’s limited financial resources, wastage of capital assets, loss of production and decrease in employment and increase in unemployment have been the major repercussions of
industrial sickness and industrial closure. He further found that in relative terms about 6% of total employment in industrial sector is likely to be affected by industrial sickness.

Manohar (1994) discussed the recovery performance of the SFCs and pointed out that overdues of SFCs were mounting, due to which the non-performing loan assets in their portfolio were on the rise. Mounting overdue curb fresh lending and affects profitability and liquidity. He suggested that in order to survive in business, specially in the present economic scenario in the country, the SFCs must maximize their recovery performance. N.C. Joshi, (1995) in his study on “Rejuvenating small industrial sector” found that despite the increasing incidence of sickness in the small scale industrial sector, this sector registered a growth rate of 9.81% compared to the performance of 8.1% for the whole industrial sector. He found in his study that there was 7.84% growth in sick units in the year 1994-95 as compared to 1993-94. He further stated that the shortage for power is seen as the foremost constraint by the small scale industry. He suggested that the RBI should establish venture capital banks for providing capital to small scale units.

Abid Hussain Committee (1995) has proposed highly debatable and sweeping reforms in the small-scale sector to make it globally competitive. Major recommendations include:

(i) Scrapping of 24% equity participation ceiling by large companies and foreign investors to SSI.

(ii) Earmarking 70% of priority sector lending allocated to the small-scale sector for the tiny enterprises.

(iii) Specialized commercial bank branches for SSIs for easy credit facilities.

(iv) Restructing the state financial corporations (SFCs).

(i) Credit rating for small business to enable them to avail of funds at lower costs.

R.S. Pamar, (1995) conducted a study on “Preventing SSI sickness: Some policy implications”. According to R.S Pamar the financing institutions should arrange compulsory training in project implementation and management before
project finance is disbursed. A preventive policy would, therefore on the one hand encourage the establishment of only conceptually and economically strong units, and on the other hand it would ensure a fair degree of external support in terms of timely and adequately finance.

Anuradha Seth (1995) in her study on “C efficiency of small manufacturing enterprises-implications for employment policy” stated that the viability of small firms depends in large part on their linkages with the market. This study examines the relative cost efficiency of small manufacturing firms for three Indian industries. The study covered 32 small and large firms in there industries; diesel engine, leather footwear and the polyvinylchloride (PVC) pipe industry. The study found that small firms are relatively cost inefficient in these industries.

R. Parmar, (1995) conducted a study on “SIDBI and small units”. He found in his study that the weak equity base of SSIs renders them vulnerable to the business environment. He found that small scale entrepreneurs, being low on financial resources, find it difficult to mobilize funds to meet the equity requirements for project finance. He suggested that assistance by way of bridging this equity gap helps the new promoter to develop his project.

J. Justus & S Kevin (1997) in their study “SSIs in Kerala: A study” stated that SSIs play an important role in the economic development of a country. The small scale sector has certain inherent advantages like low capital intensity, high employment generation potential, shorter gestation period, more equitable distribution of income and wider dispersal of industries. In this paper an attempt has been made to study the impact of four variables namely, capacity utilization, profit retention, credit sales and delay in payment by debtors, on the profitability of small industrial units. They found in their study that the percentage of customers who delay payments of dues has no impact on profitability. The other three variables have a positive impact on profitability. Capacity utilization has the highest impact followed by profit retention and credit sales.

Mitra, (1998) attempted to examine the various factors affecting the flow of credit to the SSI sector and he categorized these factors in two segments. One set of reasons indicate shortcomings inherent in the SSI sector
(a) A weak financial base which eventually prompts the entrepreneurs to bring in funds by way of loan rather than capital.

(b) Improper maintenance of book of accounts,

(c) Inability to provide collateral security

(d) Delay in payments by the larger units

(e) Lack of appreciation of financial data required by banks/financial institutions.

The second set of reasons were attributed to be operational restraints and perceptions of banks and financial institutions. (a) The administrative cost of lending to small borrowers are relatively high thereby resulting in a disincentive to lend to SSI units, (b) High morality rate/sickness amongst the SSI units, (c) The concessional interest rate does not motivate the financial institutions intrinsically to invest in SSI units.

R. Neelamegam R. and M.R. Inigo, (1999) in their study on “Managing small industries with strong equity” stated that small scale sector provides employment on large scale in rural areas. It also reduces to a great extent the regional imbalances by dispersal of the small industrial units. The study reveals that SSI units with strong equity base were able to do well in the industry. The SSI units with strong equity position could really contribute much to the economy in terms of providing more employment opportunity, increase in production, reduction in regional imbalances and so forth. Therefore, it is suggested that more equity type of assistance has to be provided to SSI units in addition to normal type of loan assistance, which will strengthen funds of the SSI units.

S.B. Mathur (1999) conducted a study on “Sickness in small scale sector: causes and cures with special reference to the role of commercial banks”. He stated that SSI sector has contributed towards developing the national economy. However, one of the serious problems this sector is confronting today is the high and growing incidence of sickness.

S.I, Bagalkoti & R.V. Dadibhavi, (1999) conducted study on “:Growth of Agro processing industries in India.” They found in their study that the API’s face a number of problems like underutilization of capacity, erratic supply of raw materials,
demand constraints, infrastructural bottlenecks and higher taxes. They further suggested that a national policy for better utilization of scarce resources and its conservation is essential to promote the economic development.

R. Mukherjee and other (1999) conducted a study on “Small scale industries in West Bengal”. In this study an attempt has been made to examine the growth profile of SSI’s in West Bengal by districts. For this purpose, alternative growth rates were calculated for the number of SSI units as well as for employment for each district. They found that there exist considerable difference in the rates across districts both for the number of units as well as employment. So far as the flow of new registrations is concerned, inter temporal variations are not large. Also disparities in these flows seems to be decreasing over time.

Bala Subrahmanya (2000) in his study suggested that to meet the diversity of investment demand requirements, it was essential to broaden the financial infrastructure for small industries. This would enable the development of an appropriate financial infrastructure which, in turn, would contribute to the overall development of a competitive small scale sector in India.

Rao and Revathy (2001) in their research examined that lack of access to credit represented a strong restriction in the expansion of small scale industrial establishments, with the proprietors themselves typically perceiving financing as their most pressing input constraint. Different types of enterprise have significantly different needs. As the firm grows in size and composition, its financial requirements change. In particular, the relative importance of fixed and working capital and the size of each, will change.

M.H. Bala Suibrahmany (2003) conducted study on “Technological innovations in small enterprise-comparative study of Bangalore and North East England”. The major objective of the study is to analyse the nature of dimensions of technological innovations of small enterprise in a developing country (India) as compared to a developed country (U.K.). He stated that the technological innovations of small enterprise may take different firms depending upon various factors internal as well as external to an enterprise. He concluded in his study that both micro and macro factors at the regional as well as national level are likely to be significant for successful technological innovations in small enterprises.
J. Dagar, (2003) in his study on “Industrial relations in small scale industry- A study of internal factors” stated that good industrial relations are prerequisite for economic development of a country. He concluded that the employees or their unions, the employer’s and the government have a role to play in the labour management relations in the small scale industry. The factors related to worker, their unions and management are basically specific to each enterprise. The industrial relations depend upon the internal factors. The employer’s should be aware about them as well as about their relative importance in influencing the labour management relations in the small scale industry. He further stated that proper policies for them may help the employer’s in minimizing labour turnover and establishment of good employer’s relations in the small scale units.

R.B. Deb, (2004) in his study on “Employment generation in small units-A case study” stated that in the developed nations also, the employment potential of small scale industrial sector has gained universal recognition. The bulk (66%) of new jobs were created in the small scale enterprises. He further stated that small scale sector in great Britain creates more than 2.5 lakh jobs every year. In Germany, Spain and the Netherlands the SSIs are equally important. He suggested in his study that the district industries and commerce center should encourage the growth and development of the modern small scale units in the rural areas, small industries service institute should accelerate its development programme, the financial institutions should minimize the procedural formalities in granting financial assistance to the modern small unit as far as practicable.

M.H. bala Subrahmanya (2004) conducted study on “Small industry and globalization: implications, performance and prospects”. The objective of the paper is to study the impact of globalization and domestic economic reforms on small industry. Small industry has suffered in terms of growth of units, employment, output and exports. But the policy changes have opened new opportunities and markets for the sector. He suggested that to avail these opportunities, the focus must be on technology development and strengthening of financial infrastructure in order to make Indian small industry internationally competitive.

Attempts have been made to predict the industrial sickness by Beaver, W.H. (1966), Altman E.I. (1968), Deakin E.B. (1972), Blum (1974), Frederikslust (1978),
Ohlson (1980), Ginoglou and Agorastos (2002) and Abid and Zouari (2002) either by considering the predictive ability of the individual financial ratios or using discriminant analysis. Earlier to the above mentioned attempts, the studies were made on the efficiency of ratios as predictors of business financial difficulties by Fitzpatrick P.J. (1932), Winakor A.H. (1935) and Merwin C.L. (1942). In India useful attempts had been made by Gupta L.C. (1979), Kaveri (1980) and Yadav (1986) in this regard.

The whole empirical work on prediction of industrial sickness of firms has been divided into two parts

- Basic research in the area of developing models for prediction of corporate sickness
- Other models

**Basic research in the area of developing models for prediction of industrial sickness**

Beaver (1966) focused on the ability of ratios to predict failure. He defined the failure in broader terms. A firm was considered to be failed firm when any of the following events has occurred: bankruptcy, bond default, over drawn bank A/c or non-payment of preferred stock. A univariate prediction model of corporate failure was developed. A sample of 79 failed and 79 non-failed firms was selected over a period of 1954-64. The financial data of the failed firms were grouped years by year for five years before failure. It was matched with non-failed firms. Thirty financial ratios over a period of 5 years prior to failure were computed.

**Group I**

(Cash Flow Ratios)

1. Cash flow to sales.
2. Cash flow to total assets.
3. Cash flow to net worth.
4. Cash flow to total debt.

**Group II**

(Net income ratio)

1. Net income to sales.
2. Net income to total assets.
3. Net income to net worth
4. Net income to total debt.

**Group III**

*(Debt to total asset ratio)*

1. Current liabilities to total assets.
2. Long term liabilities to total assets
3. Current + Long term liabilities to total assets.

**Group IV**

*(Liquid asset to current debt ratio)*

1. Cash to current liabilities.
2. Quick assets to current liabilities
3. Current assets to current liabilities
4. Cash flow to total debt

**Group V**

*(Turnover ratios)*

1. Cash to sales
2. Debtors to sales
3. Inventory to sales
4. Quick assets to sales
5. Current assets to sales
6. Working capital to sales.
7. Working capital to sales.
8. Net worth to sales
9. Total assets to sales
10. Defensive interval ratio
11. No credit interval ratio

**Group VI**

*(Liquid assets to total assets ratio)*

1. Cash to total assets
2. Quick assets to total assets
3. Current assets to total assets
4. Working capital to total assets

The comparison of mean values, dichotomous classification test and analysis of likelihood ratios were used for analysis. A comparison of the mean ratios for the failed firms provided evidence that the financial ratios of these firms showed deterioration and were worse than those of non-failed firms as early as five years prior to failure. Failed firms not only have lower cash flows than non-failed firms, but also have less liquid assets. Failed firms although have less capacity to meet obligations; they tend to incur more debt than the non-failed firms.

The dichotomous classification test was made to test the existence and extent of predictive power of the ratios. Under this technique the firms were randomly divided into two sub samples. For a given ratio, the data of the first sub samples were arranged in ascending order. The array is inspected to find an optional cut off ratio, a cut off point that minimizes the percentage of the incorrect predictions. If a firm’s ratio is below the cut off ratio, the firm is classified as failed and vice versa. The optimal cut off point in first sub sample was used to predict the failure status of firms in second sub sample. Lower the error of prediction, the greater the predictive power of the ratio. The ratio with the smallest percentage error was considered the best predictor. The most powerful predictor was cash flow to total debt ratio (CFO/TD).

**Predictive Accuracy of Beaver’s Cash Flow to Total Debt**

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<th>Year Before Failure</th>
<th>% of correct classification</th>
<th>% of error</th>
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<tbody>
<tr>
<td>1</td>
<td>87</td>
<td>13</td>
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<tr>
<td>2</td>
<td>79</td>
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<td>5</td>
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It was concluded that ratios were successful in predicting failure for at least five years before failure, but the predictive power of all ratios was not equal and ratios did not predict correctly failed and non-failed firms with the same degree of success. The classification error was more in case of failed firms than non-failed firms.

The likelihood ratio analysis indicates the extent to which a decision maker’s assessments at the probability of failure were altered by looking at financial ratios. In
order to assess the likelihood ratios from the financial ratios, histograms were prepared and inspected. The conclusion of this analysis supported that the ratios were useful indicator of failure of the firms at least five years prior to failure.

In the second study 1968, by using the same data of study of 1966, Beaver applied the concept of liquidity. The main purpose of this study was to test whether liquid or non-liquid asset measures were far better predictors of solvency. It was concluded that non-liquid asset measures were far better predictors of corporate failure as contrary to a prior belief.

He extended his study to a comparison of the predictive power of financial ratios with that of stock market prices. He examined the impact of market prices in the prediction of corporate failure he found that stock market prices indeed predicted failure sooner than individual financial ratio.

Tamari (1966)² used financial ratios in the multivariate model to indicate the possibility of failure. These ratios were given weights according to their importance in the views of financial analysts, economists and credit men.

The profit trend, equity capital and reserves to total liabilities ratios were given maximum weights, showing that these ratios were considered to be best indicators of failure. He compared the value of failed companies in the year prior to failure against the value of index for all industrial companies between 1956-1960. He observed that 75% of the failed firms had less than 35 points and 50% had less than 25 points. It was concluded that firms with less than 30 points were more likely to go bankrupt than those with over 60 points.

These conclusions were confirmed by the empirical verification that 50% of the firm securing less than 30 points failed while only 3% of the firms with more than 30 points failed. Only 1% of the firms securing less than 30 points rose to over 60 points and none of the firms coming in the category of over 60 points fell into the lower category.

Altman (1968)³ studied a sample of 33 bankrupt and 33 non-bankrupt firms for developing a model of corporate bankruptcy. Multiple discriminate analysis (MDA) was applied to discriminate the bankrupt firms from non-bankrupt firms on the basis of financial ratios.
Altman used twenty-two financial ratios in various combinations as predictor of failure. The ratios, which were included, and the weights given were determined by the significance of the contribution they made to the predictive ability of the model. The final set of ratios was determined by F-tests and computed analyzing the possible alternatives. The following five ratios did the best job in discriminating between failed and non-failed firms.

\[
Z = .121 + .14X_2 + .33X_3 + .066X_4 + .999X_5
\]

Here \( Z \) = Overall index

\( X_1 = \) Working capital 
\( \quad \frac{\text{Total assets}}{\text{(Liquidity measure)}} \)

\( X_2 = \) Retained earnings 
\( \quad \frac{\text{Total assets}}{\text{(a measure of reinvested earnings)}} \)

\( X_3 = \) EBIT 
\( \quad \frac{\text{Total assets}}{\text{(Profitability measure)}} \)

\( X_4 = \) Market value of equity 
\( \quad \frac{\text{Book value of debt}}{\text{(measure for firms capital structure or financial leverage 20)}} \)

\( X_5 = \) Sales 
\( \quad \frac{\text{Total assets}}{\text{(measure for sales generating ability of firm’s assets)}} \)

A cut off point for the \( Z \) score was determined in such a way as to minimize the overlap between bankrupt and non-bankrupt group. He concluded that the \( Z \) score of 2.675 was the best cut off point, which maintained minimum misclassification. The \( Z \) value was computed for each company and based on this score and on the cut off point determined earlier the particular company was classified as bankrupt and non bankrupt.

**Classification Accuracy for Predicting Future Bankruptcy**

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<th>Year before failure</th>
<th>% of correct classification</th>
<th>% of error</th>
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<tbody>
<tr>
<td>1</td>
<td>95</td>
<td>05</td>
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<tr>
<td>2</td>
<td>72</td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>48</td>
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<td>4</td>
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<td>71</td>
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<tr>
<td>5</td>
<td>36</td>
<td>64</td>
</tr>
</tbody>
</table>
Altman further tested the model on a secondary sample taken irrespective of its size and industry and formed the predictive power to be similar to that reported above, 96% correct classification. He applied the scaled vector to determine the relative contribution of each variable to the total discriminating power of the function and interaction between them. The earning before interest and taxes to total assets (EBIT/TA) ratio contributed the most in the group discriminant function.

Deakin (1972) conducted a study to predict corporate failure taking a sample of thirty-two failed firms and a matching sample of thirty-two non failed firms. Each of the failed firms was matched with a non-failed firm on the basis of type of industry, year of financial data provided and asset size in order to mitigate the impact of industry, size and year of information on failure. His original model included 14 ratios and his revised model included only 5 ratios, which could best predict corporate failure in each of 5 years prior to failure.

Deakin adopted dichotomous classification test in which he ascertained the percentage error of each ratio, then he made the comparison of mean values of ratios and used Spearman’s rank correlation coefficient to indicate the order of predictive power of ratios. He observed higher correlation of relative predictive ability of various ratios. The rank order correlation coefficients were found to be significant in four to five years. The coefficient of correlation in third year before failure was relatively very low. To find the reason, a comparison of mean values of the ratios was made, which indicated that the failed firms tended to expand rapidly in the third and fourth year to failure.

It was observed from capital structure that expansion was financed by debt and preference capital rather than common stock or retained earnings. The funds raised were invested in fixed assets rather than liquid assets. Therefore, they lost their assets rapidly after third year prior to failure. In the second test Deakin used discriminant analysis on same sample data. He applied 14 financial ratios.
Classification Accuracy for Predicting Corporate Failure

<table>
<thead>
<tr>
<th>Year before failure</th>
<th>% of correct classification</th>
<th>% of error</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>97</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>95.5</td>
<td>4.5</td>
</tr>
<tr>
<td>3</td>
<td>96</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>79</td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td>83</td>
<td>17</td>
</tr>
</tbody>
</table>

The results of testing the model on independent sample drawn as random, consisting of 11 failed and 23 non-failed firms were 22%, 6%, 12%, 23% and 15% error rates respectively for the 5 years prior to failure. It was concluded that discriminant analysis can be used to predict failure using ratios as prediction of failure three years in advance with a high degree of accuracy.

March Blum (1974) developed failing company model (FCM) to access the probability of business failure. The discriminant analysis was applied to a paired sample of 115 failed and 115 non-failed firms to evaluate the predictive accuracy of the model. He developed a cash flow framework for variables selection.

Failing company model (FCM) included 12 variables and was constructed with reference to the three common dimensions-liquidity, profitability and variability. The accuracy of the model was tested by using discriminant analysis.

1. Liquidity
   A: Short Term Liquidity
      1. Quick flow ratio
      2. Net quick assets/inventory
   B: Long Term Liquidity
   Cash flow/total liabilities
   Net worth at market value/total liabilities
   Net worth at book value/total liabilities

2. Profitability
   Rate of return to common stock holders (who invest for minimum of three years).
3. Variability

Standard deviation of net income
Trend break for net income
Slope for net income

The predictive accuracy of the model is as follows:

**Classification accuracy for predicting future bankruptcy**

<table>
<thead>
<tr>
<th>Year before failure</th>
<th>% of correct classification</th>
<th>% of error</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>94</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>3 to 5</td>
<td>70</td>
<td>30</td>
</tr>
</tbody>
</table>

An experiment was also conducted to test the predictive accuracy of a non-ratio model. Five of the nine ratios used in the FCM were broken down into their 8 independent variables and were used with four non-ratio variables to form a non-ratio model. When tested the non-ratio model in the first year before failure was found to be consistently more accurate thereafter.

*Frederikslust (1978)* made an attempt to predict business failure based on testable financial theory of cooperate failure. He defined failure as a negative cash balance, which was expressed in the following form:

\[
CB_t = CB_{t-1} + S_t - (AR_t - AR_{t-1}) + OI_t - GS_t - GA_t - (BI_t - BI_{t-1}) + (SD_t - SD_{t-1}) - ALD_t
\]

Where,

\[
CB_t = \text{Cash balance at the end of period } t \\
S_t = \text{Sales in period } t \\
AR_t = \text{Accounts receivables in period } t \\
OI_t = \text{Other income in period } t \\
GS_t = \text{Cost of goods sold in period } t \\
GA_t = \text{General administrative and sales expenses in period } t \\
BI_t = \text{Business inventories at the end of period } t \\
SD_t = \text{Short term debt at} \\
ALD_t = \text{Additional long term debt obtained in period } t
\]
A firm will fail at a certain movement when its cash balance is smaller than zero (CBt < 0). On the basis of financial theory he identified the following observable failure prediction variables: liquidity, profitability, solvency and variability of liquidity and variability of profitability over time, industry variables and general economic variables.

The prediction equations for each year are as follows:

\[
\begin{align*}
Y_1 &= .5293 + .4488x_1 + .2863x_2 \\
Y_2 &= .4885 + .4459x_1 + .3789x_2 \\
Y_3 &= .4086 + .5760x_1 + 1.273x_2 \\
Y_4 &= .4215 + .3095x_1 + 1.0977x_2 \\
Y_5 &= .3808 + .2602x_1 + .6986x_2
\end{align*}
\]

Where

\[
Y_1, \ldots, Y_5 = \text{the equation score of the firm for one year to five year prior to failure.}
\]

\[
X_1 = \text{the liquidity ratio of the firm}
\]

\[
X_2 = \text{the profitability ratio of the firm}
\]

The above equation statistically discriminated between the two groups and Lachenbruch's method was used to determine the predictive accuracy of the model. The two variables using data of one year before bankruptcy correctly classified 92.5% of total sample which reduced to 92.5, 77.5, 72.5 and 70 percent respectively when data of two, three, four and five year prior to bankruptcy was used. The predictive accuracy of the model was better for the non-failed than the failed group. The classification error rate was more or less same when the model was applied on secondary sample. The model was extended by adding additional variables i.e. the growth rate, the prediction error in the prediction year and the coefficient of variation for both liquidity and profitability, but the predictive power was not significantly improved.

However, Frederikslust tried to develop bankruptcy prediction model based on a testable financial theory of corporate failure, but could achieve it partially. As he defined failure as a negative cash balance, but he changed this definition to bankruptcy or liquidation when the empirical work was undertaken. Since many firms had negative cash balances from time to time and were not bankrupt.
Ohlson (1980)\(^5\) developed a conditional model which pointed out that the fundamental estimation problem can be simply reduced to the following statement:

‘Given that the firm belongs to some prespecified population, what is the probability that the firm fails within some prespecified time period’. The conditional Logit model made no assumptions regarding prior probabilities of bankruptcy and or the distribution of predictors.

He used a sample of 105 firms, which experienced bankruptcy during the period 1970-1976 and 105 of non bankrupt companies. Nine financial ratios were computed and tested to form an opinion about the discriminatory power of financial ratios. First he made use of profile analysis technique, which explained that the ratios deteriorate as one moves from two years prior to failure to one year prior to failure. The standard deviation of the ratios were larger for bankrupt firms compared with non-bankrupt firms, the differences were found to be significant at 5% level. Three sets of estimates were computed for the conditional logit model. The results indicated that the four factors derived from financial statements were statistically significant in assessing the probability of bankruptcy. They are: size, financial structure as reflected by a measure of leverage (TL/TA), some performance measures (NI/TA) and some measures of current liquidity (WC/TA and CA/CL).

Ginoglou and Agorastos (2002)\(^6\) developed logit and probit models of corporate failure to generate a probability of failure as a financial risk measure and to test the pattern of significant failure as a cardinal measure of risk proved to be more useful than the dichotomous classification usually obtained from discriminant analysis and LPM model.

The study is based on 40 industrial firms data analysis-20 healthy and 20 problematic firms. A set of sixteen ratios was used for analysis. The discriminant analysis, linear probability model, logit and probit models were used. The seven ratios were effective in discriminating between healthy and problematic firms. These were fixed assets to total assets, net profits to total assets, gross profit to total assets, gross profit to financial expenses, total debt to total liabilities, total debt to shareholders equity and working capital to total assets.
The degree of accuracy was 85%, 87.5% in one and two years before bankruptcy and 85% from three to five years before bankruptcy. The degree of accuracy was 86.7% in one and two years before bankruptcy and 83.3% from three to five years before bankruptcy with LPM model and logit & probit models.

Abid and Zouari (2002)\(^7\) developed a model for financial prediction using neural network approach. Based on the financial ratios calculated from the five year (1992-96) annual data, nine different network models for different information structures and for different forecasting horizons are constructed.

In order to test the models predictive capability a set of fifteen financial ratios were used. Based on the financial statements for 87 firms from 1993 to 1996 results prove that more the predictability horizon is short and the input information structure recent, more and better is the predictive capability of the neural model.

The short debt, capital structure and sales growth and liquidity ratios contribute meaningfully in discriminating and predicting the firm’s financial distress, since they have high positive or low negative weight values.

The best model is based on the information structure giving the best predictive capability. Time variations of the forecasting horizons should confer upon the neural network model in predicting financial distress.

The predictive capability of the model is better with most recent financial information structures than the models performed with less recent one. The correct test classification percentage is upgraded from 70% to 83.33% with 1993’s input data and 1996’s input data. The best neural network model with regard to predictive capability, 86.67%, is obtained when two consequent years information is used. Time varying neural models provide a weak predictive capability (72% and 82%) than the models using the same information structure.

Gupta (1979)\(^8\) examined both Altman's model and Beaver's model for predicting corporate failure and concluded that Beaver's method would be more suitable for preparing a practical forewarning system.

The sample included 41 textile companies of which 20 were sick and 20 were non-sick. The list of sick companies was prepared from the following sources:
i) Sick cotton textile companies coming under NTC.

ii) Companies assisted by I.R.C.I.

iii) Companies listed as sick by the ICICI in its portfolio.

iv) Other companies taken over by central govt. explicitly for reasons of sickness.

The non-textile sample includes 39 companies of which 21 were non sick and 18 were sick. 56 financial ratios were selected for testing and computed for each company for each year for a period of 1962-1974.

Among profitability ratios, earnings before depreciation, interest and taxes to sales (EBDIT/sales) and operating cash flow to sales (OCF/S) were the best ratios in predicting future bankruptcies. These two ratios have the least classification error among all profitability ratios for textile companies.

**Profitability Ratios**

1. EBDIT to sales
2. EBDIT to total assets
3. EBDIT to (total assets + accumulated depreciation)
4. EBDIT to (Interest + 0.25 Debt
5. EBIT to sales
6. EBIT to total assets
7. EBIT to (total assets + accumulated depreciation)
8. EBIT to interest
9. Operating cash flow (OCF) to sales
10. OCF to total assets
11. OCF to (total assets + accumulated depreciation
12. OCF to debt
13. OCF to current liabilities
14. PBT to net worth
15. PAT to net worth
16. Retained profit to total tangible assets.
17. Total dividend to net profit after tax.
18. [Retained profit + depreciation] to debt
19. 
Retained profit + depreciation] to [total tangible assets + accumulated depreciation]

20. 
[Retained profits - 0.3 of additions during the year to trade debtors & inventory] to total tangible assets.

21. 
(Retained profits + depreciation) to total tangible assets.

22. 
(Retained profits + depreciation) to gross real investment)

23. Depreciation to sales

24. Depreciation to net fixed assets

25. Depreciation to gross fixed assets

Balance Sheet Ratios

1. Net worth to debt.

2. New to net fixed assets.

3. Net worth to sales.

4. Net worth to long term debt.

5. Debt to tangible assets.

6. All outside liabilities/tangible assets.

7. Interest to sales.

8. Short term bank borrowing/sales.

9. Short term bank borrowing to working capital gap + short + term borrowing from non-banking sources.

10. Short term bank borrowing/working capital

11. (Sort term bank borrowing-cash and bank balance) to (Inventory + trade debtors)

12. All bank borrowing to total assets

13. Current assets/current liabilities

14. Quick assets/current liabilities

15. Net working capital/sales

16. Net working capital/debt

17. Net working capital/all long term debt

18. Net working capital/tangible assets

19. Current liabilities/tangible assets

20. Current liabilities/sales

21. Trade creditors/sales
22. (Trade creditors + misc current liabilities)/sales
23. (Trade Drs- Trade creditors)/sales
24. Current assets/sales
25. Average current assets/sales
26. Average tangible assets/sales
27. Inventory + advances to supplies/sales
28. Trade debtors + advances to supplies)/sales
29. Net fixed assets/gross fixed
30. Net fixed assets/gross fixed

The classification error rate was 11-13% in 1962 and only 8% in 1964 and still less thereafter. After the above two ratios following ratios come in order of rank:

- EBDIT/Total assets + accumulated depreciation
- OCF/Total assets + Accumulated depreciation
- EBDIT/(Interest + .25 debt)

In order to minimize the classifications error rates, he recommended a combination of following four profitability ratios:

- EBDIT/Sales (net of excise)
- OCF/Sales (Net of excise)
- EBDIT/Total assets + accumulated depreciation)
- OCF/ (TA + Accumulated depreciation)

The ratios related to net worth were found to be worst predictor of bankruptcy among profitability ratios.

Among balance sheet ratios, the empirical tests showed that the solvency ratios were more reliable indicators of strength than any liquidity ratios. The following two were the best balance sheet ratios: -

- Net worth/total debt
- All outside liabilities/tangible assets.
It was observed that companies with an inadequate equity base have little reserve strength and are sickness prone. All liquidity ratios proved to be very poor predictors, which contradict the importance traditionally attached to liquidity analysis in appraising corporate health.

Kaveri (1980) attempted to predict the borrower's health by using financial ratios as predictors of sickness. A sample of 524 small units comprising of good, regular and sick units was taken. The units were defined as good, regular and sick on the basis of irregularity in the accounts.

22 ratios were calculated for identifying the health of the companies and were classified into five categories:

- Working capital
- Assets usage
- Profitability
- Turnover
- Financial stability

The F test, T-test scaled vector and multiple discriminant analysis were used. Following five ratios were found to be statistically significant to the bankers:

i) Current ratio (CA/CL)
ii) Stock/cost of goods sold (stock/COGS)
iii) Current assets/net sales (CA/NS)
iv) Net profit before taxes/total capital employed (PBT/TCE)
v) Net worth to total outside liabilities (NW/TL)

The multiple discriminant model was tested on initial sample and held out sample for a period up to seven years before the event. The model correctly classified 76 of units in the initial sample and 69 units in the hold out sample for one year before the event. It was found that the accuracy of the model was reduced as the lead time before the event increased.

Yadav (1986) developed discriminant model by using financial ratios. He has taken a total sample of 78 companies out of which 39 were failed companies and
39 were non-failed companies. He has tested 36 ratios univariability and multivariability.

**Solvency Ratios**
1. Total tangible assets to current debt.
2. Total tangible assets to total debt
3. Net worth to total debt.
4. Net worth to long term debt.

**Liquidity Ratios**
a) **Liquid asset to total tangible asset rates**
   1. Cash to total tangible assets.
   2. Quick assets to total tangible assets.
   3. Current assets to total tangible assets.
   4. Net working capital to total tangible assets.

b) **Liquid assets to current debt ratios**
   1. Cash to current liabilities
   2. Quick assets to current liabilities
   3. Current assets to current liabilities.

**Profitability Ratios**
a) **Cash flow ratios**
   1. Cash flow to net sales
   2. Cash flow to total tangible assets
   3. Cash flow to net worth
   4. Cash flow to total debt.

b) **Income ratios**
   1. Net income to net sales
   2. Net income to total tangible assets.
   3. Net income to net worth.
   4. Net income to total debt.
   5. EBT to total tangible assets.
   6. EBIT to net sales
   7. Net operating profit to net sales.
   8. EBIT to interest
9. Net income of net working capital

**Turnover Ratios**

1. Net sales to debtors.
2. Net sales to inventory.
3. Net sales to quick assets.
4. Net sales to current assets.
5. Net sales to net working capital.
7. Net sales to total tangible assets.
8. Net sales to fixed assets
9. Cash to total operating expenditures.
10. Defensive assets to total operating expenditures.
11. Defensive assets-current liabilities to total operating expenditures.

He found that cash flow to total tangible assets (CF/TTA) has the highest predictive power followed by earning before interest and taxes to total tangible assets (EBIT/TTA) ratio. Among the solvency and liquidity ratios he concluded that solvency ratios are more reliable predictors of corporate health than the liquidity ratios. All liquidity ratios proved to be very poor in predicting corporate health. The companies with heavy debt and inadequate equity base are more prone to failure. The final discriminant function was as under:

\[ Y = 19.8927 V_9 + 0.0047 V_{25} + 0.7141 V_{31} + 0.4860 V_{35} \]

- \( Y = \) Overall discriminant score
- \( V_9 = \) Earnings before interest and taxes to total tangible assets
- \( V_{25} = \) Current assets/current liabilities
- \( V_{31} = \) Net assets /total tangible assets
- \( V_{35} = \) Defensive assets /total operating expenditure

The discriminant score \( Y = 1.425 \) has been determined as the best cut off point to classify the firms either into potentially failed or non failed group of companies. If \( Y \) score is below 1.425 it is to be classified as a potentially failed/sick company and if \( Y \) score is above 1.425, it is to be classified as non-failed company.
Predictive Accuracy of Discriminant Model

<table>
<thead>
<tr>
<th>Year prior to failure</th>
<th>No. of companies</th>
<th>No. of companies correctly classified</th>
<th>No. of companies misclassified</th>
<th>% of correct classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>78</td>
<td>74</td>
<td>4</td>
<td>98</td>
</tr>
<tr>
<td>2</td>
<td>78</td>
<td>68</td>
<td>10</td>
<td>87</td>
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<td>3</td>
<td>76</td>
<td>65</td>
<td>11</td>
<td>86</td>
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<td>4</td>
<td>72</td>
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<td>79</td>
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<tr>
<td>6</td>
<td>51</td>
<td>40</td>
<td>11</td>
<td>78</td>
</tr>
</tbody>
</table>

Predictive accuracy of the model is higher in short period than in long run. A high degree of accuracy is available in the shorter period because the indicators of failure from the study of the ratios are clearer in short run.

Other Models

Patric (1932) concluded a study in 1932 to examine whether there was a significant difference in the trend of ratios i.e. ratios for failed and non-failed firms at least three years before the failure. He had selected a sample of 19 failed and 19 non-failed companies during the period 1920-29. He had analyzed 13 ratios. The objectives was to examine whether or not the ratios of successful companies were satisfactory when the ratios of failed companies were unfavourable and whether the majority of the ratios of successful companies were favourable or unfavorable and to what extent. The ratios of both the groups were compared with the minimum level and found that successful firms surpassed the minimum level in most of the cases, while the ratios of failed firms were below the minimum level in the majority of cases. It was also found that the ratios of failed firms deteriorated as the year of failure approached. He concluded that all the ratios of failed firms were persistently different from the non-failed firms at least three year prior to failure. He observed that the ratios were the best indicators of failure.
Winakor and Smith (1935) examined 183 firms, which failed between the periods 1923 to 1931 for 10 years prior to the year of failure. He analyzed twenty one ratios. A modified mean ratio was computed from the inner half of the data.

The mean ratios of the middle half of all the firms were used to compare individual changes for the whole group. It was concluded that the ratios of the failed firms were frequently below the mean value used for comparison and showed deterioration as the date of failure approached and also pointed out the ratio of net working capital to total assets (NWC/TA) was the most accurate and steady indicator of failure, with its decline beginning ten years before the occurrence of failure. The study did not used any corresponding group of successful firms in the study.

Ramser and Foster (1931) analysed eleven financial ratios of 173 firms. It was found that the firms which turned out to be less successful and those which failed tended to have ratios which were lower than the successful firms. However two ratios—ratio of sales to net worth (S/NW) and ratio of sales to total assets (S/TA) showed an opposite tendency.

Merwin (1942) studied the sample of over 900 failed and non-failed firms for a period of six years before failure. The period of study was 1926-36. Two methods of comparison were used:

- To determine a high low range for each ratio for every year by using the surviving companies as indicators of what the highs and lows should be.
- To use an estimated normal ratios reflecting the success of the surviving firms. The estimated normal ratios are the estimates of what the failed firms ratios would have been if they had maintained the same average ratios as the non-failed firms.

It was found that the ratios of the failed firms were consistently below the 'estimated normal' and out of line with the high low range established by the surviving firms. A persistent decline from the 'estimated normal' was also found beginning with the sixth year prior to the failure. It was concluded that the three ratios were sensitive predictors of failure up to as early as four to five years prior to failure. These three ratios were :-
• Net working capital to total assets (NWC/TA)
• Current ratio (CA/CL)
• Net worth to total debt (NW/TD).

NWC/TA was found to be the best ‘Single indicator of failure.’

Meyer and Pifer (1970)\(^{15}\) developed a linear regression model for the prediction of bank failure. He selected a sample of 78 banks consisting of 39 failed and 39 solvent banks for the period 1948-1965 thirty-two financial ratios were used as independent variables in the regression models. The ratios for the period six years prior to failure were computed.

The classification test predicted correctly 80% of the initial sample banks and 72% of the banks in hold out sample with a lead period of one to two years before failure. When the lead time was three or more years, model failed to discriminate between failed and non-failed banks. Therefore, they concluded that financial ratios should be used along with other factors such as local conditions, general economic conditions, quality of management, integrity of employees to make a better prediction of sickness.

Satyanarayana and Sen (1970)\(^{16}\) in two separate models modified Altman’s model to suit Indian conditions. Profit after interest and before tax/total assets (PAIBT/TA) is a better predictor then profit before interest and tax/total assets (PBIT/TA). This was based on the study conducted in respect of the companies assisted by ICICI for a period of 3 years.

Srivastava (1981)\(^{17}\) used a combination of operational, technical and financial parameters to discriminate between the sick and healthy units. He developed a linear discriminant function comprising following ratios:

i) Net worth to total assets
ii) Net block to net worth
iii) Net profit to total assets
iv) Total liabilities to net worth
v) Current assets to current liabilities
vi) Capacity utilization ratios
vii) Plant utilization ratio

The classification error rate was 15% of linear discriminant function, which reduced to 10% when only 5 financial ratios were applied. It further reduced to 5% when first three ratios were combined with technical and operational ratio. The model was enlarged to include all the seven variables, which resulted in 10% predictive accuracy of the model at 1% level of significance.

Saihjpal (1987) done a study of financial management of sick cotton textile mills in the Northern Region. He studied the symptoms and causes of financial sickness of cotton textile mills. He evaluated the causes (both internal and external) and symptoms by giving ranks and codes. He obtained views through questionnaires from executives. Each cause and symptoms was given a code a.b.c... & participants were asked to rank in order of importance by giving rank up to third rank. Weights were given to those ranks as follows: -

<table>
<thead>
<tr>
<th>Rank</th>
<th>Weights</th>
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<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
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The weighted value of each item was calculated by multiplying no. of ranks given to the items by points allotted and then total was obtained. Causes and symptoms were arranged in order of their weighted value. Cause with highest weighted value was most significant cause. Cause with second highest weighted value rank second most significant cause and so on. Same was the case with symptoms.

He examined the financial position of the units under study. He employed common size statement and fund flow statement along with ratios analysis. The efforts done by different financial institutions to rehabilitate the sick units were examined and concluded that performance of both public and private sector sick cotton textile mills has been unsatisfactory, there is no recovery form sickness. Even the banks and financial institutions did not come forward to their help. He suggested necessary modifications. All sick cotton mills of both public and private sector in Northern Region were covered under study. A total sample of 17 mills was taken.
Kortikar (1997) has discussed the dimensions of industrial sickness in India. He has concentrated on prediction models. He has taken a sample of 348 units of which 112 are sick, 119 distressed and 117 healthy. He employed 20 ratios representing liquidity, leverage, activity, profitability and return aspects of financial health. By carrying out mean and standard deviation for 20 independent variables for the selected units (on the basis of F value) 6 variables were found to be less significant in terms of their discriminating ability. In discriminant analysis for calculation Z score weighs were given to the following variables:

i) Current ratio
ii) Operating cash flow/net sales
iii) Operating cash flow/Gross total assets
iv) Total debt/total assets
v) Net worth/total debt
vi) Earning before depreciation, interest and taxes/gross total assets.
vii) Receivables/Inventories
viii) Net income/Equity share capital
ix) Equity dividend/equity shareholder capital

Current assets/Total assets The range of Z score was:

❖ 0.84 or less for sick units
❖ -0.84 to 0.85 for distressed units
❖ Above -0.84 for healthy units

The accuracy of model for correct classification was 78% of the units in initial sample for one year in advances and 60% for 5 years and advance.
References


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3.1 Need and Significance of the Study

Small scale industry has been accorded an important place in the national economy by the national decision makers. Small units generate employment at relatively small capital cost, mobilize resources of capital and skill at micro levels and are expected to meet the rising demand for various goods and services required by the economy. Small scale industry forms an important sector constituting nearly 40 per cent of the total output in the private sector. Much more significant is the employment generation capacity of small scale industry. India operates today in sheer size what is perhaps the largest small industries programme in any developing country. Small scale sector as a priority sector of the national economy is protected and promoted in a number of ways. The growth of small industry has been sought to be promoted over years through various government policies and measures. However, presently the small scale industrial sector suffers from a high rate of mortality and growing incidence of sickness. According to latest estimates, the percentage of sick unit in the small industry varies from ten to fifty percent in various states. The closure of debilitated existence of an industrial unit involves heavy cost to the society, it renders idle its manpower; lays waste scarce financial and material resources invested in land and buildings, machinery and equipment inventories and stocks. The social cost involved is much more. Present study attempts to understand and analyse the problem of sickness in small scale industries. The problem of sickness in industrial units is a serious problem.

During the post liberalization period, no literature on corporate sickness using a predictive model appears to be available in the Indian context. No such study appears to have been done which has used discriminant analysis by taking actual financial data of sick units and healthy units in small scale sector along with the macro-economic variables data. Thus, it has been felt necessary to develop an analytical predictive model for prediction of bankruptcy of small scale units by taking financial data along with macro—economic data in respect of 30 sick units and 30 healthy units. It is believed that the model so developed will help lenders, management and shareholders to predict sickness at early instance and enable them to take remedial actions through necessary business, organizational and financial restructuring to the extent necessary.
3.2 Objective of the Study

The main objectives of the present study are:

- To identify the factors leading to industrial sickness in small scale industries in Punjab.

- To ascertain the prominent profitability, cash flow, liquidity, turnover and solvency ratios which can significantly discriminate between sick and non sick units. Further to find out the best set of ratios which can predict sickness within the small scale industry.

- To study the discriminating power of predictors (financial ratios) of sickness

- To study the accuracy of multiple discriminate model in predicting sickness in the preceding five years.

3.3 Methodology

3.3.1 Research Design

The present study aims at the prediction of industrial sickness in small scale industries in Punjab. In the first part an attempt has been made to find out various causes and symptoms of sickness. For this purpose a questionnaire (Annexure 1) has been given to 100 entrepreneurs of small scale units (50 healthy units and 50 sick units) and on the basis of their responses an attempt has been made to find out the relationship among various factors such as location, age of entrepreneur, educational qualification of the entrepreneur, nature of operations and nature of units with industrial sickness. An attempt has been made to find the various causes and symptoms of the sickness. The second part of study focused on the financial status of the units. For this purpose financial ratios have been selected on the basis of comprehensive review of existing literature, good performance of financial ratios in earlier studies and relevancy of the ratios for the present study.

Out of total 100 respondents only 60 respondents provided us with the complete information. Due to this a sample of 60 units i.e. 30 sick units and 30 healthy units has been selected for the univariate and multivariate analysis. While
making this selection it has been taken into consideration, that financial statements of these units are available for at least five years prior to the sickness. Six macro economic variables have been included in the research to study their effect along with the financial variables. The percentage change in these variables in relation to proceeding year has been considered in the study. These variables were: gross domestic product at factor cost, index of industrial production, bank credit, inter bank call money rate, yield on government of India 91 days treasury bills, whole sale price index for manufacturing goods.

3.3.2 Summary Statistics and Data Issues

The financial statistics of the sample companies have been collected from secondary sources. The data for sick and healthy units have been collected from the annual reports of sick units (balance sheets, profit and loss a/c, schedules, cash flow statements). The data has been collected for five years prior to the sickness. It was not feasible to take the healthy units of exactly same size as that of the sick units. Therefore, healthy companies were of comparatively larger size as compared to sick units. The range of capital employed for the sick units varied from Rs. 0.3 lacs to Rs. 22 lacs and for healthy units, it varied from Rs.1.30 lacs to Rs. 30 lacs. The range of total assets has been Rs. 3.80 lacs to Rs. 23 lacs for sick units and from Rs. 1.80 lacs to Rs. 29, lacs for healthy units. The average sales were Rs. 23.96 lacs for the sick units and Rs. 76.65 lacs for healthy units.

The t test has been applied for testing the statistical significance of the difference between the mean values of the financial ratios of the sick companies and healthy companies. The predictive model is based on two group linear – discriminant analysis. The linear – discriminant model has been developed for each of the five years separately prior to the sickness. The purpose of discriminant function is to derive the linear combination of variables, which best discriminate between the two groups i.e. sick companies and healthy companies.

3.3.3 The Model for Predicting Industrial Sickness

The discriminant analysis model takes the following form:

\[ D = b_0 + b_1 V_1 + b_2 V_2 + b_3 V_3 + \ldots + b_{54} V_{54} \]

\[ D = \text{Overall score} \quad b_0 = \text{Constant} \]
The predictive model has been Developed in Two Stages:

- In stage I, the discriminant function has been derived by taking fifty-four financial ratios. The financial ratios are categorized broadly into four parts: liquidity, activity, leverage and profitability (shown in Fig. 1.1).

- In stage II, the discriminant function has been derived by taking macro-economic variables along with the financial ratios. Following Six macro-economic variables have been taken for developing a predictive model:
  
  i) Annual percentage change in gross domestic product at factor cost;
  
  ii) Annual percentage change in index of industrial production;
  
  iii) Annual percentage change in bank credit, inter bank call money rate;
  
  iv) Annual percentage change in yield on Government of India 91 days Treasury bills;
  
  v) Annual percentage change in whole sale price index for manufacturing goods;
  
  vi) Annual percentage change in balance of trade

The predictive accuracy of the discriminant function was examined by comparing the classification of observation based on their discriminant function score with their actual classification. The proportion of cases correctly classified indicated the accuracy of the procedure and indirectly confirm the degree of group separation.
FINANCIAL RATIOS

Profitability Ratios

28. Debt Equity Ratio
29. Debt to Total Value Ratio
30. Loan Funds to (Loan Funds + Paid up Share Capital)
31. Unsecured Creditors to Total Assets
32. Secured Creditors to Total Assets
33. Long Term Debt to Total Assets
34. Short Term Debt to Total Assets
35. Fixed Assets to Shareholders' Fund

Activity / Turnover Ratios

15. Inventory Turnover
16. Debtors Turnover
17. Creditors Turnover
18. Capital Employed Turnover
19. Working Capital Turnover
20. Total Assets Turnover
21. Fixed Assets Turnover
22. Current Assets Turnover
23. Quick Assets Turnover
24. Net Sales to Cash
25. Cash Interval ratio
26. Defensive interval ratio
27. (Defensive Assets - Current liabilities) to Total Operating Expenditure

Profitability Ratios

36. Cash Flow from Operations to Net Sales
37. Cash Flow from Operations to Fixed Assets
38. Cash Flow from Operations to Net Worth
39. Cash Flow from Operations to Paid up Share Capital
40. Cash Flow from Operations to (Loan Funds + Share Capital)
41. Cash Flow from Operations to Total Debt
42. Cash Flow from Operations to Long Term Debt
43. Cash Flow from Operations to Interest
44. Cash Flow from Operations to working Capital
45. Net Income to Net Sales
46. Net Income to Fixed Assets
47. Net Income to Net Worth (ROE)
48. Net Income to Paid up Share Capital
49. Net Income to Total Debt
50. Net Income to Working Capital
51. Earning before Interest & Taxes to Net Sales
52. Earning before Interest & Taxes to Fixed Assets
53. Earning before Interest & Taxes to Interest
54. Earning before Interest & Taxes to Capital Employed

Fig. 1.1 Financial Ratios used to develop a predictive model
Various studies have indicated that financial ratios are useful for prediction of sickness up to five years prior to the bankruptcy. Beaver (1996) had taken data for five years prior to the corporate sickness. The predictive accuracy of Beaver's model was 87%, 79%, 77%, 76% and 78% from one to five years respectively prior to the failure. The classification accuracy for predicting future corporate bankruptcy in Altman's model was 95% one year before failure. 72% two years before failure, 48%, 29% and 36% for three, four and five years respectively before failure.

Deakin (1972) developed a model for predicting corporate failure by taking five years data before failure. The classification ratios as predicted by Deakin's model were 97%, 95.5% and 96% for first second and third year respectively before failure. It was further reduced to 79% in the fourth year. In the fifth year classification, the accuracy level was 83%.

Kaveri (1980) had taken seven years financial ratio for predicting the health of small-scale industries in India. The predictive accuracy of Kaveri's hold out sample was 69%, 67.41%, 69.5%, 67.3% and 62.06% from first to fifth year respectively.

Yadav (1986) had studied financial ratios for six years prior to failure. The predictive accuracy of model was 95%, 87%, 86%, 82%, 79% and 78% from first to sixth year before sickness.

Thus most of the earlier studies provided evidence that the financial predict failure with high degree of accuracy up to five years before failure. Therefore, in the present study data was collected for five years before sickness. The sample of selected sick companies has relevant period of study from 1990-91 to 2001-2002.

3.3.4 Selection of Variables

3.3.4.1 Financial Ratios

The financial ratios have been considered as predictors of company's sickness. The financial ratios have the capability to indicate the financial soundness or sickness of a company. These ratios have proven their performance in earlier studies. Therefore, the financial ratios have been selected for making predictions about company's soundness or sickness. It involves two steps:
REVIEW OF LITERATURE & RESEARCH DESIGN

i) making choice of financial variables; and

ii) establishing relationship amongst these financial variables.

Fifty-four financial ratios have been selected for the construction of discriminant function. The ratios were selected by the following criteria;

i) The popularity of the ratio in the available literature.

ii) The predictive performance of the financial ratio in earlier studies.

iii) The relevance of the ratios for the present study.

Fifty-four financial variables were chosen as predictor variables for applying two-group liner discriminant analysis. These financial ratios have been categorized broadly into four areas: liquidity, activity, leverage and profitability.

These fifty-four financial ratios have been computed for each of the five years in respect of both the sick units and the matched healthy units in the sample. The four ratios, having smallest tolerance, were deleted. After the deletion of four statistically least significant ratios from each of five years, the fifty financial ratios have been used for applying two-way linear discriminant analysis.

3.3.4.2 Proven performance of ratios in earlier studies

i) Net worth / debt and net profits to net worth (Fitz Patrick, 1932)

ii) Networking capital to total assets – (Winakor and Raymond, 1935)

iii) Net working capital / total assets, current assets / current liabilities, net worth to total debt – (Charles L. Merwin, 1942)

iv) Cash flow to total debt – (W.H. Beaver, 1996)

v) Working capital / total assets, retained earnings / total assets, earnings before interest and taxes / total assets, sales / total assets – (Altman’s model, 1968).

vi) Cash flow from operations / total assets, cash flow from operations to sales – (L.C. Gupta 1979)

vii) Earnings before interest and taxes / total assets, current assets/ current liabilities / net sales / total assets, defensive assets / total operating expenses – (Yadav, 1986)
1. However there were certain ratios, which performed well in predicting the chances of survival or failure of a company in recent studies, but those were not included in the study due to the non-availability of relevant data eg. Market value of equity to book value of debt considered in Altman’s (1968) model.

2. Four ratios were deleted from each year. The ratio, which were least significant from statistical point of view, were deleted. The ratios were deleted on basis of their tolerance. The tolerance for a variable is one minus squared multiple correlations between that variable and all variable already entered. A variable with a small tolerance is likely to cause inaccuracies in computation.

For example in the first year following four ratios were deleted. These were having smallest tolerance.

Table: 3.5 Ratios deleted in first year

<table>
<thead>
<tr>
<th>Ratios</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secured creditors/total assets</td>
<td>.111</td>
</tr>
<tr>
<td>Cash flow from operation / (loan funds + share capital)</td>
<td>.142</td>
</tr>
<tr>
<td>Net sales / total assets</td>
<td>.286</td>
</tr>
<tr>
<td>Net sales / current assets</td>
<td>.295</td>
</tr>
</tbody>
</table>
LIQUIDITY RATIOS

(a) Liquid Assets to Current Debt Ratios
1) Current Assets to Current Liabilities (CA/CL)
2) Quick Assets to Current Liabilities (QA/CL)
3) Cash to Current Liabilities (cash/CL)
4) Cash to current Assets (Cash/CA)

(b) Liquid Assets to Fixed Assets Ratios
5) Current Assets to fixed Assets (CA/FA)
6) Quick Assets to Fixed Assets (QA/FA)
7) Cash to Fixed Assets (Cash/FA)
8) Working Capital to Fixed Assets (WCTA)

(c) Liquid Assets to Total Assets Ratios
9) Current Assets to Total Assets (CA/TA)
10) Quick Assets to Total Assets (QA/TA)
11) Cash to Total Assets (Cash/TA)
12) Working Capital to Total Assets (WCTA)

(d) Ratio to loans & Advances to total Assets and investment to total Assets.
13) Loans & Advances to Total Assets (L&A/TA)
14) Investment to Total Assets (L/TA)

FINANCIAL RATIOS

ACTIVITY / TURNOVER RATIOS
15. Inventory Turnover (NS/Inv.)
16. Debtors Turnover (NS/Des)
17. Creditors Turnover (Purchase/Crs.)
18. Capital Employed Turnover (NS/CE)
19. Working Capital Turnover (NS/WC)
20. Total Assets Turnover (NS/TA)
21. Fixed Assets Turnover (NS/CA)
22. Current Assets Turnover (NS/CA)
23. Quick Assets Turnover (NS/QA)

PROFITABILITY RATIOS

(A) Cash Flow Ratios
36. Cash Flow from Operations to Net Sales (CFO/NS)
37. Cash Flow from Operations to Fixed Assets (CFO/FA)
38. Cash Flow from Operations to net worth (CFO/NW)
39. Cash Flow from Operations to Paid up Share Capital (CFO/Sh/ Cap.)
40. Cash Flow from Operations to (Loan Funds + Share Capital) (CFO/LF+Sh.Cap.)
41. Cash Flow from Operations to Total Debt (CFO/TD)
42. Cash Flow from Operations to Long Term Debt (CFO/LTD)
43. Cash Flow from Operations to Interest (CFO/Int.)
44. Cash Flow from Operations to Working Capital (CFO/WC)

(B) Income Ratios
45. Net Income to Net Sales (NI/NS)
46. Net Income to Fixed Assets (NI/FA)
47. Net Income to Net Worth (ROE) (NI/NW)
48. Net Income to paid up Share Capital (NI/Sh.Cap.)
49. Net Income to Total Debt (NI/TD)
50. Net Income To Working Capital (NI/WC)
51. Earning before Interest & Taxes to Net Sales (EBIT/NS)
52. Earnings before Interest & Taxes to Fixed Assets.
53. Earning before Interest & Taxes to Capital Employed (ROCE)
Macro Economic Variables:

As the years of sickness was not same for all the sick units included in the sample, so there was a possibility that macro-economic variables might have impacted the corporate performance. Therefore, a few macro-economic variables have also been included to study their effect along with the financial variable. Six macro-economic variables have been taken for this purpose from the year 1995 to 2005. The percentage change in the macro-economic variables in relation to preceding year has been taken in the model building. The macro-economic variables included in the study are:

i) Annual percentage change in gross domestic product at factor cost;
ii) Annual percentage change in index of industrial production;
iii) Annual percentage change in bank credit, inter bank call money rate;
iv) Annual percentage change in yield on Government of India 91 days Treasury bills;
v) Annual percentage change in whole sale price index for manufacturing goods;
vi) Annual percentage change in balance of trade

3.3.5 Analytical Tools Used

3.3.5.1 Univariate Analysis:

Student t-test has been applied for testing the statistical significance of the difference between the mean values of the financial ratios of the sick units and the healthy units. The analysis has been done using SPSS statistical software.

The student t test has been applied to measure whether the difference between the mean values of the financial ratios of the sick units and healthy units is statistically significant and to test the individual discriminating power of the financial ratios between the state of financial health of the sick units and healthy units. The t values of each ratio was computed by the following formula

\[ T = \frac{X_{g11} - X_{g21}}{S} \times \sqrt{\frac{n_1 n_2}{n_1 + n_2}} \]
Where

\( X_{g11} \) = mean of \( i^{th} \) variable of group 1

\( X_{g21} \) = mean of \( i^{th} \) variable of group 2

\( n_1 \) = number of observations in group 1

\( n_2 \) = number of observations in group 2

The value of \( S \) was calculated as follows;

\[
S = \sqrt{\frac{\sum (X_{g11} - X_{g11})^2 + \sum (X_{g21} - X_{g21})^2}{n_1 + n_2 - 2}}
\]

Where

\( (X_{g11} - X_{g11})^2 \) = squares of deviation of the original scores \( (i^{th} \) variable) from mean of the \( i^{th} \) variable of group 1

\( (X_{g21} - X_{g21})^2 \) = squares of deviation of the original scores \( (i^{th} \) variable) from mean of the \( 1^{th} \) variable of group 2

If the calculated value of \( t \) is greater than the table value the difference between the ratios of group means is considered significant and the hypothesis is rejected and vice versa.

3.3.5.2 Multivariate Analysis

The two-group linear discriminant analysis\(^5\) had been used in the present study for developing a predictive model of corporate sickness. The predictive model has been developed for each of the five years prior to sickness.

In the present study linear – discriminant analysis model has been established for each of the five years. The co-efficients or weights are estimated so that groups differ as much as possible on the values of the discriminant function. This occurs when the ratio of between group sum of squares to within sum of squares for the discriminant score is at a maximum.

This test is appropriate because one of the objectives of discriminant analysis is to identify and to utilize those variables, which best discriminate between group and
which are most similar within group. The discriminant analysis has been used in a variety of disciplines since its first application in the 1930's by Fisher. Most recently this method has been applied in various empirical studies successfully in financial problems such as consumer credit evaluation and investment classification, classification of high and low price earning ratio firms, classification of firms into standard investment categories, prediction of rate of return etc. It has also been used for prediction of Bankruptcy in recent years by Altman (1968), Deakin (1972), Blum (1974) and Ginoglu and Agorastos (2002).

After careful analysis of the nature of problem and objective of the study, discriminant analysis has been chosen as an appropriate statistical technique to classify the units into one of the group – sick group and healthy group. The financial ratios and macro – economic variables have been used as discriminant variables.

The analysis is two group linear – discriminant analysis. The analysis computes the discriminant coefficients of a set of variables, which do best discriminate between sick units and healthy units. When these coefficients were applied to actual ratios, a basis for classifications into one of the mutually exclusive grouping exists. The cut off point or discriminatory point for classifying individual cases in the two groups have been calculated. Then discriminating score for each company has been compared with the group centroids. If it was less than group centroids, company was classified into group one and if it was more than group centroids, it was classified in group two.

3.3.6 Accuracy of Discriminant Analysis Model

The predictive accuracy of the discriminant function has been examined by comparing the classification of observations based on their discriminant function score with their actual classification. The proportion of cases correctly classified indicated the accuracy of the procedure and indirectly confirmed the degree of group separation.

A classification boundary between two groups $D_{cnt}$ can be found as being midway between the means of the function for each of two groups. To classify an individual company, if $D_1 > D_{cnt}$ the individual company belongs to sick companies and vice versa. For this purpose the following classification matrix was prepared:
Actual Membership | Predicted Membership
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group one</td>
</tr>
<tr>
<td>$G_1$</td>
<td>$C_{11}$</td>
</tr>
<tr>
<td>$G_2$</td>
<td>$C_{21}$</td>
</tr>
</tbody>
</table>

It can be stated as follows:

- Substitute the centroid of each group in the discriminant function and find the respective group scores.

- For any new case compute the discriminant score and assign the case to that group whose score is closure.

### 3.4 Limitations of the Study

The following are the limitations of the study:

1. The sample size is small. Therefore the limitation of small sample size also affects the findings of the present study.

2. Only Profit and Loss Account & Balance Sheet provided by the entrepreneurs of these small scale industrial units have been analyzed and interpreted. The researcher did not have any access to the internal records of the day-to-day workings of these units.

3. Only financial variables have been taken in the first part of the analysis. The macro economic variables have been included along with the financial variables in the second part of the analysis. Non-financial measures such as operational and technical parameters have not been included in the study.

4. The effect of price level adjustments on the predictive ability of financial ratios has not been studied.

### 3.5 Plan of Study

The first chapter of study is introductory. It covers the concept and meaning of small scale industries, development of small scale industries in India. It also focuses on development of small scale industries in Punjab. The concept and meaning of Industrial sickness is given in the second chapter. It also covers causes and symptoms.
of Industrial sickness in small scale Industries in India and Punjab. Review of literature, need of study, objectives and research design are given in third chapter. The fourth chapter deals with an analysis of industrial sickness on the basis of entrepreneur's opinion. In this chapter an attempt has been made to study the relationship between various factors and industrial sickness. Univariate and multivariate analysis has been carried out in the fifth chapter. It deals with empirical testing wide variety of financial ratios of sample units of small scale industries. In the last chapter the findings of the study and suggestions have been given.