CHAPTER FOUR

REVIEW OF LITERATURE AND THE PLAN OF WORK

4.1 Introduction

In the previous two chapters, we made an attempt to narrate the economic theory explaining the phenomenon of sickness in industrial companies and give a general overview of the growing incidence of industrial sickness in India. The aim was to assess the actual magnitude and economic impact of sickness in Indian manufacturing industries. Incidence of industrial sickness is no doubt a global phenomenon. But then, can a country like ours accept such a situation? Our modest view is that while developed country’s economy has the resilience to absorb the economic imbalance brought about by the closure of industrial units, the problem of industrial sickness has adverse repercussion on the economy of a country like ours as it can neither afford unemployment nor loss of production by keeping the capital assets idle. Creative destruction, on the whole, is no doubt a healthy organic process that helps to put resources to their most efficient and pragmatic use, but at the same time, social cost of a firm getting bankrupt is also huge, particularly, in a developing country due to loss of productive assets and employment. What is the alternative? A proper course of action should be to prevent an industrial company from falling sick and take remedial measures including implementation of appropriate and need based revival plan at correct time so as to ensure complete turnaround. Technological adoption is the process by which it can survive. This process is less capital intensive; it does not warrant manpower retrenchment thus restoring employment and can be implemented on the concept of going concern method which does not entail loss of production. In fact, if economically productive assets continue to contribute to the society’s supply of goods and services above and beyond their opportunity costs, the process of reorganization shall be beneficial to the society against the cost of bankruptcy to the firm and to the society. Moral obligation of management of a firm thus become imperative so much so that it does let the creative destruction take its course in forcing the business to adopt and change without causing it to fail outright. Management, creditors and other stake holders should also adopt a pragmatic view and
seek ways in which creative destruction can be contained within firms, rather than causing their outright collapse. In order to operationalise the process, one needs to know some kind of signal or symptom which when identified and detected, may be the starting point for initiating remedial measures for its turnaround.

The modest goal of our study is to take up such an exercise with respect to the Indian manufacturing industries. Before taking up such an exercise, one needs to review the literature on the subject in order to identify the research gap. Once research gap is identified, research issues can be set and plan of work can be finalised. We have performed these exercises in this section.

4.2 Review of Literature

Major studies on industrial sickness or corporate bankruptcy, the term used in developed countries have been made in foreign countries. Some studies have also been made in India. We shall first discuss the studies made in foreign countries and then, the studies made in India.

4.2.1 Studies Made in Developed Countries

Beaver (1967) was among the first to use financial ratios to predict corporate failure. Using a paired sample analysis, with size and industry type used as bases for pairing, Beaver found the evidence of differences in the ratios of failed and non-failed firms. To test the predictive power of ratios, Beaver used a dichotomous classification technique, and found the cash flow to total debt ratio to be the best predictor of failure five years preceding the failure.

Altman, Edward I (1968) was the first person to use stepwise multiple discriminate analyses (MDA) to develop a prediction model. He attempted to assess the quality of ratio analysis as an analytical device in predicting bankruptcy of firms ranging in size from $0.7 million to $25.9 million in assets. A group of 33 manufacturing firms declaring
bankruptcy under Chapter XI during the period 1946-1965 was paired with a stratified sample of 33 manufacturing firms not declaring bankruptcy. From an initial list of 22 variables, Altman selected the following ratios for a discriminant function: working capital/total assets, retained earnings/total assets, earnings before interest and taxes/total assets, market value of equity/book value of total debt, and sales/total assets. The final discriminant function was found to be as under:

$$Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5$$

where

- $X_1$ = working capital/total assets
- $X_2$ = retained earnings/total assets
- $X_3$ = earnings before interest and taxes/total assets
- $X_4$ = market value of equity/book value of total liabilities
- $X_5$ = sales/total assets, and
- $Z$ = overall index

$Z$ is the overall discriminant score. $X_1$ through $X_5$ are explanatory variables. Numerical value assigned to each of the above variables is its discriminant coefficient. Variables $X_1$ through $X_4$ are all significant at the 0.001 level, indicating extremely significant difference in these variables among groups. Variable $X_5$ does not show a significant difference among groups and the reason for its inclusion in the variable profile is not apparent as yet. On a strictly univariate level, all the ratios indicate higher values for the non-bankrupt firms. Also, all the discriminant coefficients display positive signs, which is what one would expect. Therefore, the greater a firm’s bankruptcy potential, the lower is its discriminant score.

The $Z$ score was further refined and a new model – ZETA model was developed by Altman, Haldeman and Narayanan (1977) using the same statistical analysis (MDA). Altman model is the most popular and widely used. It is still being studied in the classroom and applied in a variety of situations by practitioners.
Edmister (1972) employed a zero – one regression technique to develop a model. He analysed 19 financial ratios, including most of those found to be important in previous failure prediction studies. He employed an arbitrary stepwise procedure in which a variable was not permitted to enter the regression equation if its simple correlation coefficient with an included variable was greater than 0.31. Rather than allowing the independent variables to enter in their raw ratio form, he transformed each ratio into qualitative, zero-one variables based upon arbitrary cut-off points. For example, if the ratio of annual fund flow (defined as net profit before taxes plus depreciation) to current liabilities was less than 0.05, the ratio was assigned a value of one, otherwise it was assigned a value of zero.

Blum (1974) constructed a model, based upon accounting and financial market data, to be used as a defense in antitrust cases under the ‘Failing Company Doctrine’. Defining failure as ‘entrance into a bankruptcy proceeding or an explicit agreement with creditors which reduced the debts of the company,’ Blum assembled a sample of 115 industrial firms which failed during the years 1954-1968 (with liabilities greater than $1 million) and a paired sample of 115 non-failing firms similar with respect to industry, annual sales, number of employees, and fiscal year. Data up to eight years prior to failure were collected when available; however, five years of data prior to failure were found optimal. Based upon validation sample test, Blum concluded that his model had an accuracy of ninety three to 95 per cent when failure occurred within one year of the statement date. The accuracy declined to 80 per cent for prediction two years prior to failure and 70 per cent for prediction three years prior to failure.

Wilcox’s (1976) research focused on application of the Gambler’s Ruin Model (GRM) to predict business risk. The main concern of his model was with predicting when net liquidation value (NLV) will be negative, which foreshows bankruptcy. He showed that other things remaining same, the smaller the NLV, the smaller the adjusted cash flow, and larger the variation in the adjusted cash flow, greater the chances of failure.

36 NLV is the net of liquidity inflow and outflow rate. Liquidity inflow is the income net of dividend payout. Liquidity outflow is the difference between book value of assets and liquidation value of assets, which Wilcox referred as ‘adjusted cash flow’.
Ohlson (1980), and Zavgreen (1983) and Zmijewski (1984) developed logit-regression framework and probit analysis model to quantify the likelihood of bankruptcy.

Frydman, Altman, and Kao (1985) used the technique of Recursive Partitioning Analysis (RPA) for classification of distressed firms.

Coats and Fant (1992) applied neural network (NN) artificial intelligence system for assessing financial health of companies.

Other research works made in the subsequent years for classifying and predicting corporate distress are based on either of the above methods.

Notwithstanding a number of models developed so far and their success, models other than the Altman model have not been implemented by practitioners in any meaningful way.

4.2.2 Studies Made in India

We shall now discuss the major works done in India to deal with the issue of industrial sickness. Whatever studies have been made in India were on issues concerning growing incidence of industrial sickness; causes of such growing sickness; role of various institutions on the phenomenon of sickness and suggestions as to what role the government and individual institutions should play to combat the problem of industrial sickness. Prior to enactment of SICA in 1985 and commencement of operation of the BIFR since 1987, the Indian Institute of Management, Calcutta (IIMC) compiled in 1979 the experiences of various person connected with banks, institutions dealing with industrial financing and suggested some measures to handle and check growing industrial sickness in India. Based on the observations of various people, IIMC published a book in 1980. Kaberi V. S (1980) broadly dealt with preventive and curative measures of industrial sickness. Bidani S. N. and P.K. Mitra (1983) also did almost the same work.

Both of these papers did not make any attempt to develop a model for predicting sickness in Indian scenario, though they have stressed the importance of financial ratios as a tool to predict sickness.

Gupta L. C. (1983) was the first researcher in India who used 56 ratios and sought to determine the best set of ratios to predict failure. These were categorised as profitability ratios and balance sheet ratios as given below.

**Profitability Ratios**
- EBDIT/Net Sales
- OCF/Sales (Operating Cash Flow/Sales)
- EBDIT/(Total Assets + Accumulated Depreciation)
- OCF/Total Assets
- EBDIT/(Interest + 0.25 Debt)

**Balance Sheet Ratios**
- Net Worth/Total Debt
- All Outside Liabilities/Tangible Assets

After BIFR started its operation as a principal agency to deal with the issues of industrial sickness in India, IIMC (1988) brought out a special issue on industrial sickness in India based on the various papers placed at the national workshop on sick industries’ syndrome in India, dealing with the need of identification of industrial sickness at the incipient stage and restructuring of sick units for early revival. Khandwalla Pradip. N. (1989) dealt with corporate sickness, sickness prevention by various stakeholders, elements of turnaround management, the design of turnaround strategies and the role of financial institutions in detecting sickness early and in facilitating quick turnarounds.

bankruptcy reorganisation procedures in India under SICA and the BIFR; whether
definition given by SICA is appropriate in terms of success of restructuring measures
taken by institutions financing such companies; comparison of performance of the BIFR
companies and healthy companies from the same industry groups and finally suggesting
an entirely new approach to bankruptcy by reducing the discretionary powers of BIFR
and replacing procedures by more market driven systems. In the report, analysis was
made on the performance of the BIFR registered companies and healthy companies in
textile and engineering sectors in terms of certain financial ratios and it was concluded
that interest and wage cost are both statistically significant determinants of industrial
sickness in these two sectors and increases in such costs raise a firm's probability of
being sick. The report, however, did not make any attempt to suggest whether these two
costs can classify the major industry groups at macro level into bad and good performing
groups. Neither did it conclude that these ratios have significant predictive powers to
indicate sickness in all other industries at micro level. The above studies have dealt with
company level data and have not linked with industry group data at the macro level. They
have also not made any attempt to develop a realistic and more effective model for
predicting industrial sickness in India, which can specify the probability of any company
becoming sick on the basis of certain financial parameters, much before it reaches the
terminal stage of sickness.

Studies made in India at macro level on the basis of ASI data were on finding
productivity trends in Indian manufacturing sectors. In this connection, studies made by
(2004) and Golder, Renganathan and Banga (2004) studied on efficiency of firms at
macro level.

Interindustry group variation in terms of labour productivity, ICOR, investment ratio, rate
of profit, etc., has been studied by Balakrishnan and Suresh Babu (2003) on the basis of
the ASI data. They have, however, not made any attempt to see whether these
productivity ratios would reflect the same result if they are applied at company level data
in the same industry group.
4.3 The Research Gap

After having reviewed the relevant literature, we find that studies so far made in foreign countries on corporate bankruptcy appear to have laid stress on developing models which help classifying the companies into either 'healthy' or 'sick' group on the basis of certain financial ratios used as explanatory variables. These models have been employed to predict whether a company would remain in the same group in future or not. The weaknesses of these models are that they may not provide any signal as regards future financial health of a company. It appears that the earlier researchers have not made any attempt to find out whether the same ratios possess equal discriminatory power to classify industries to which these companies belong at the macro level. The basis of selection of these ratios also appears to remain unanswered. Further, no study appears to have been made to link the aggregate level ratios with disaggregate level ratios with a view to find out their correlation and identify which ratios at disaggregate level have significant predictive power to indicate sickness well in advance.

As regards studies made in India, Balakrishnan and Suresh Babu (2003) has shown inter-industry group variation in terms of certain macro economic indicators, but the study has not been extended to show whether these productivity ratios would show the same kind of group variation if they are applied at company level data.

Summing up the outcome of review of the literature on the subject, we find that no exercise appears to have so far been made to empirically analyse both macro and micro level data and develop certain financial parameters which can capture the state of affairs both at the macro level and the micro level. In other words, no attempt appears to have so far been made to develop a predictive model based on financial parameters in the context of macro level data (the ASI data in the Indian context) which have a proper mapping with certain ratios that one may cull from the balance sheets and profit and loss accounts of the companies.

This research gap gives us the background as also the motivation for our research. We have thus set our research issues keeping in mind this research gap.
4.4 Research Issues

- Selection of certain financial parameters and derivation of these parameters from a few broad macro economic indicators which an economist normally uses for macro level analysis.

- Empirical analysis of the ASI data at all India level to study the performance of major industry groups in terms of these derived financial parameters. Objective is to study the behaviour of performance of major Indian manufacturing industries over a period of time and to find out whether these select financial parameters can segregate the Indian manufacturing industries at NIC two digit level into two groups—‘good performing’ and ‘bad performing’.

- Derivation and recomputation of micro ratios from the macro ratios used for empirical analyses of the ASI time series (macro level) data. These corresponding micro ratios are based on financial indicators which are normally used by financial analysts for company level analyses.

- Selection of one hundred companies from the industries pre-classified as good and bad performer and empirical analyses of balance sheets and profit and loss accounts of these one hundred companies on the basis of the PROWESS database in terms of the corresponding financial ratios. Objective is to test whether the observations found at macro level are valid at micro level.

- Finding out which financial ratios at disaggregate level have strong association with the aggregate level ratios which showed significant power to segregate the ‘good performing’ industry groups from ‘bad performing’ industry groups.

- Making attempts to develop various econometric models and check which ratios might give early warning signal for impending sickness.

- Validation of the models to be developed by us.
4.5 Chapter Plan

Followed by this chapter in which we have reviewed the literature and located the research issue that we propose to study, there are six chapters.

In Chapter Five, we have dealt with the database. The empirical work that we propose to perform needs two sets of data – a set at the industry level and the other at the company level. For the industry level data, we refer to the published data of Government of India under the Annual Survey of Industries (ASI) and for the company level data, we refer to the PROWESS database compiled by the CMIE. We have given an overview of both the ASI data and the PROWESS data; their strength, weakness and varied uses; coverage; reference period; National Industrial Classification 1970 and 1987. We develop definitional parity with respect to various indicators of performance for the data at macro and at the micro level with a view to get a micro level data corresponding to the macro level information on industry groups. Finally, we have described how we have normalised the data set from the ASI and the PROWESS database in order to operationalise the data for empirical analysis.

In Chapter Six, we have considered first the issue of selecting the major industry groups on which the empirical exercise would be performed. The proposed financial parameters for analysing the performance of industries at the macro level have then been introduced. To find a proper mapping between the ASI categories of information and the information we need for deriving the proposed financial ratios for the selected set of industries, an extensive discussion on certain conceptual issues and the methods of translating them in the language of empirical tools was necessary. This has been done in this Chapter.

In Chapter Seven, we show how the performance of the selected major industry groups in Indian manufacturing sector over the period of eighteen years (1981-1998) has been empirically analysed. The empirical analyses are performed in terms of the select set of financial parameters to find out which of the industry groups performed well and which of them did not perform well during the reference time period. Various statistical analyses, namely, rank analysis, scatter plot, convergence and divergence analysis and cluster analysis are carried out in this chapter. The major thrust area in this chapter is to
find out whether the selected macro ratios can capture the heterogeneity or homogeneity in performance of the industry (NIC two digit level) groups and classify the Indian manufacturing industries in two groups, namely, ‘bad performing’ group and ‘good performing’ group.

In Chapter Eight, we first try to translate the macro financial indicators into micro or firm level indicators of sickness. Such indicators may then be utilised to construct an indicator of sickness at the company level. In this chapter, we prepare a panel data of the balance sheets and profit and loss accounts of one hundred companies chosen from the PROWESS database. The companies are selected from the set of ‘good performing’ group of industries and the ‘bad performing’ group of industries by utilising the widely used concept of ‘net worth’ of a company. We then analyse the performance of one hundred companies selected in the panel data with a view to find out whether the financial indicators that we used for macro level analyses would maintain the power of differentiability with respect to the panel data pertaining to one hundred companies—the companies that have already been differentiated as ‘good’ or ‘bad’ performers in terms of the widely used tool of differentiation, namely, the ‘net worth’ of a company. The technique of cluster analysis (K-means method) is utilised for differentiating the healthy companies from the sick companies.

In Chapter Nine, we first try to find the ratios that can be readily derived even by a layman from the balance sheet and profit and loss account items of a company. After deriving the corresponding (crude) ratios, we make an attempt to develop a model that can be utilised for predicting company level sickness straight from the balance sheet and the profit and loss account of a company. Various statistical tools, namely, multiple (ordinary) regression analysis, discriminant analysis and binary logistic regression are used to develop the discriminant model and the predictive model. In this Chapter, we also check the validation of the models developed by us.

In Chapter Ten, we give the summary and conclusions.
References

Chapter Four


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Chapter Four


