



INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, ECONOMICS AND MANAGEMENT

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- Kelkar V. (2009): Towards a New Natural Gas Policy, Economic and Political Weekly, Viewed on February 17, 2011 <http://epw.in/epw/user/viewabstract.jsp>

AN EMPIRICAL EVALUATION OF FINANCIAL HEALTH OF FERTILIZER INDUSTRY IN INDIA

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ABSTRACT

Over the past four decades, a sizeable international literature on financial distress prediction has developed. Amidst multidimensional studies prevailing in the literature, this paper tries to analyze the financial health of fertilizer sector in India and test whether Altman's Z score model can foresee correctly the corporate financial distress of the fertilizer sector in Indian context for the study period, 2000-01 to 2006-07. The Z score from the analysis shows that it is less than 1.81 in all the years implying that this sector has increased its debts and will be facing insolvency in near future unless regulatory measures are taken to tackle the adverse situation. The study demonstrates that individual ratio within the multiple discriminate framework has depicted miserable picture signifying inefficiencies within the firms that may endanger financial health of Indian fertilizer companies.

KEYWORDS

Corporate distress, Altman, Bankruptcy, fertilizer, industry.
JEL Classification: G33, C49.

INTRODUCTION

The financial crisis has already thrown many financially strong companies out of business all over the world. All these have happened because they were not able to face the challenges and the unexpected changes in the economy. Financial distress for a company is the ultimate declaration of its inability to sustain current operations given its current debt obligations. Basically, all firms must have some debt loads to expand operation or just to survive. Good economic planning often requires a firm to finance some of its operation with debt. The degrees to which a firm has debt in excess of assets or is unable to pay its debt as it comes due are the two most common factors in corporate financial distress.

Distress prediction model will assist a manager to keep track of a company's performance over a number of years and help in identifying important trends. The model may not specifically dictate the manager what is wrong but it should encourage them to identify problems and take effective action to minimize the incidence of failure. A predictive model may warn an auditor of company's vulnerability and help to protect them against charges of 'negligence of duties in not disclosing the possibility of corporate failure [Jones, F.L (1987)]. In addition, lender may adopt predictive model to aid in assessing a company defaulting on its loan. Regulatory agencies are concerned whether a monitored company is in danger of failure. A company may be made exempted from anti trust prohibitions and permitted to merge under Failing Company Doctrine if it can be demonstrated that it is in danger of insolvency or failure.

Research on financial distress has been carried out for many years in many countries, especially in industrially developed countries. Altman (1997) studied the financial ratios of public companies which indicate corporate financial distress in the United States. Almeida and Philippon (2000) analyzed risk adjusted cost of financial distress of public companies in the United States which have issued corporate bonds and have difficulties to pay coupon and its bond. Fitzpatrick (2004) conducted empirical research on the dynamic of financial distress of public companies in the United States whereas Gennaiola and Rossi (2006) explored the optimal solution of financial distress in Sweden. Outtecheva (2007) analysed probability of financial distress risk and the way of avenues to avoid financial distress in NYSE.

On the other hand, a very few studies have been conducted in developing countries. Chang (2008) studied the corporate governance characteristics of financially distressed firms in Taiwan. Hui and Jhao (2008) explored the dynamics of financial distress of 193 companies which have experienced financial distress in China during 2000- 2006. Zulkarnian (2006) analyzed the corporate financial distress among Malaysian listed firms during Asian financial crisis. Ugurlu and Hakan (2006) conducted a research to predict corporate financial distress for the manufacturing companies listed in Istanbul stock exchange for the period, 1996-2003. Chiung-Ying Lee and Chia-Hua Chang (2010) analyzed the financial health of public companies listed in Taiwanese stock exchange using Logistic Regression model of early warning prediction.

There are also a number of careful research studies using data from United States firms that provide various methods to identify failing firms. After the establishment of Altman's Z score model, abundant studies have done further research on the z score model, including Deakin (1972), Taffler (1983), Goudie (1987), Agarwal and Taffler (2007), Sandin and Porporato (2007). Many studies also have been done relevant to the Ohlson model, including Lau (1987), Muller, Steyn-Bruwer, and Hamman (2009).

Despite several attempts to predict bankruptcy, four decades after Altman (1968)'s seminal study, financial distress prediction research has not reached an unambiguous conclusion. Lack of harmony in the study of financial distress prediction is partially attributable to the nature of the explanatory variables, as studied for four decades. A number of researchers have attempted to discriminate between financial characteristics of successful firms and those facing failure. The objective has been to develop a model that uses financial ratios to predict which firms have greatest likelihood of becoming insolvent in the near future. Altman is perhaps the best known of these researchers who uses multiple discriminate analysis (MDA) which is also used in this study.

In the midst of limited literature regarding the financial distress of public companies in the developing countries like India, using Altman's Z Score model, this paper is therefore devoted to study the dynamics of financial distress of public companies of Indian fertilizer industry listed in Bombay Stock Exchange.

OBJECTIVES OF THE STUDY

The study investigates the overall financial performance of fertilizer industry in India and also predicts the financial health and viability of the industry. In order to fulfill the objective, we empirically try to reexamine the most commonly referred method in credit risk measurement research, Altman's Z-score model, by using recent bankruptcy data from 2000-01 to 2006-07.

RECENT FERTILIZER POLICY PREVAILING IN INDIA

The Indian fertilizer sector has been under strict government control for most of the period since independence. A price and distribution control system was considered to be necessary not only to ensure fair prices and equal distribution all over the country but also to provide incentives for more intensive use of fertilizers. A control system of licensing and approval of collaboration aimed at standardizing technology and capacity of plants. The goal of government intervention was to improve agricultural productivity and thus the basic supply of food. Oil crisis in mid-seventies led to steep increase in cost of import or production resulting in fall in consumption of fertilizer. Based on the recommendation of the Marathe committee's report, Retention Pricing Scheme was introduced for Nitrogenous fertilizer in November, 1977, for complex fertilizer in 1979, for single super phosphate in May 1982, for Ammonium Chloride in 1985.

Under RPS, cost of production was decided on the basis of norms. It provided reasonable return on net worth to the producing companies and induces efficiency at the same time. RPS era was highly controlled but witnessed spectacular increase in indigenous capacity built up and fertilizer consumption till 1990s. In the wake up of economic liberalization in 1991 and rising subsidy bill, the Government explored to alternatives of RPS. Phosphatic and Potassic fertilizers were decontrolled w.e.f August, 1992. Immediate impact was steep decline in the consumption of the said fertilizers. Concession scheme on Phosphatic and Potassic fertilizers was introduced in October, 1992 and has been operative for these fertilizers. In July 1991, price decontrol of low analysis nitrogenous fertilizers has been introduced.

August 1991 saw Dual Pricing Policy which adopts 30% price increases of fertilizer for big farmers, no price increase for small and marginal farmers. In August 1992, Partial Decontrol of prices, distribution and movement of phosphatic and potassic fertilizer, recontrol of low analysis nitrogenous fertilizers, 10% price reduction for urea fertilizer 1992 until March 1993 have been initiated.

For Urea, RPS Continued till March, 2003 and from April, 2003, New Pricing Scheme (NPS) has come into force which is a modification of RPS. Unit specific retention price scheme replaced with group based concession scheme and the present NPS is valid till March, 2010.

Therefore, during post liberalization era, fertilizer industry has been highly controlled but reforms have taken place in both up stream and down stream sectors. Inputs decontrolled resulting in abnormal increase in the prices of raw materials. Cost plus approach with stringent regulations and procedures have not induced any investment in the sectors. So, the health of the existing fertilizer industry has been adversely affected. Capacity of fertilizer remained stagnant and there is a surge in demand for fertilizer in recent years. Country resorted to high imports to meet increasing demand.

A survey of the literature shows that the majority of international failure prediction studies employ MDA (Altman 1984; Charitou et al. 2004). No exclusive conclusion was found in a review of international applications of default prediction studies. The application of financial distress measurement literature flows into the international application of credit risk measurement to verify the robustness of such measures and techniques in different countries. Applying research on indicative variables and statistical methodologies internationally, Altman and Narayanan (1997) tried to identify financially stressed companies, but they concluded that no statistical method was consistently dominant.

Precious contribution supported by empirical evidence in this regard mostly from manufacturing companies in the United States and the other developed countries has been found to exist, but in view of the review of literature, it is explicitly evident that very little research work has been conducted so far on analyzing the financial distress of industrial sectors in India. The above mentioned pertinent research gaps in Indian context after a thorough and careful review of literature have guided me to undertake the study of assessing financial health of individual fertilizer industry in India which is based on Altman's Z score model.

METHODOLOGY

Sources of Data:

In order to test the financial health of India's fertilizer ware companies, Altman's Z score model has been used in this study which is based on secondary data. The data from the published sources is the basis for analysis. The required accounting information for Z score analysis is obtained from CMIE Prowess Database. The financial data used are annual and cover a period of 2000-01 to 2006-07 comprising of 46 publicly traded companies listed in Bombay Stock Exchange. Some credit financial analysts were concerned that since the original model requires stock price data, it was only applicable to publicly traded companies.

Econometric model:

Individual financial ratio to predict the financial performance of an enterprise may only provide caution when it is too late to take a corrective action. Further, a single ratio does not convey much of the sense. There is no internationally accepted standard for financial ratios against which the result can be compared. Edwin Altman, therefore, combines a number of accounting ratios (liquidity, leverage, activity and profitability) to form an index of the probability, which was effective indicator of corporate performance in predicting bankruptcy. The Z score is a set of financial ratios in a multivariate context, based on a multiple discriminated model for the firms, where a single measure is unlikely to predict the complexity of their decision making.

The Z scores, developed by Professor Edward I. Altman, is perhaps the most widely recognized and applied model for predicting financial distress (Bemmann, 2005). Altman developed this intuitively appealing scoring method at a time when traditional ratio analysis was losing favour with academics (Altman, 1968). Altman Z scores model requires a firm to have a publicly traded equity and be a manufacturer. Altman (1968) collected data from 33 bankruptcies and 33 non-bankruptcies, during the period 1946-1965, to find discriminating variables for bankruptcy prediction. In his seminal paper, Altman evaluated 22 potentially significant variables of the 66 firms by using multiple discriminant analysis to build the discriminant function with five variables. This model was later modified to Altman model (1993) that uses the same variables multiplied by different factors.

Components of the Altman Z Score:

The Z Score calculation is based entirely on numbers from the company's financial reports. It utilizes seven pieces of data taken from the corporation's balance sheet and income statement. Five ratios are then extrapolated from these data points (shown in table-1).

TABLE-1: DETAILS OF DATA POINT

Data Point	Where Found in Financials	Formula to Calculate
1. Earnings before Interest & Tax (EBIT)	Income Statement	Gross Earnings - Interest - Income Tax Expense
2. Total Assets	Balance Sheet (Total Assets)	Total Current Assets + Net Fixed Assets
3. Net Sales	Income Statement (Net Revenues or Sales)	(This number in the Financials reflects deduction of returns, allowances and discounts)
4. Market (or Book) Value of Equity	Book Value found on Balance Sheet (Stockholders Equity)	Total Market Value (public Cos.) or Book Value (private Cos.) of all shares of stock
5. Total Liabilities	Balance Sheet	Total Current Liabilities + Long Term Debt
6. Working Capital	Balance Sheet	Total Current Assets - Total Current Liabilities
7. Retained Earnings	Balance Sheet (Stockholders Equity)	(Portion of net income retained by the corporation rather than distributed to owners/shareholders)

The independent variables of five ratios are measured in ratio scale. The operational definition of dependent and independent variables are presented in table-2.

TABLE-2: OPERATION OF INDEPENDENT AND DEPENDENT VARIABLES

Conceptual definition	Operational definition	Expectation	Scale
X1 = Working Capital/Total Assets	Measures liquidity, a company's ability to pay its short-term obligations. The lower the value the higher the chance of bankruptcy.	Relationship with probability of failure	Ratio
X2 = Retained Earnings/Total Assets	Measures age and leverage. A low ratio indicates that growth may not be sustainable as it is financed by debt.	Relationship with probability of failure	Ratio
X3 = EBIT*/Total Assets	A version of Return on Assets (ROA), measures productivity – the earning power of the company's assets. An increasing ratio indicates the company is earning and increasing profit on each dollar of investment.	Relationship with probability of failure	Ratio
*Earnings Before Interest and Tax			
X4 = Market Value of Equity/Total Liabilities	Measures solvency – how much the company's market value would decline before liabilities exceed assets.	Relationship with probability of failure	Ratio
X5 = Net Sales/Total Assets	Measures how efficiently the company uses assets to generate sales. Low ratio reflects failure to grow market share.	Relationship with probability of failure	Ratio

The discriminant function is as follows:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$$

Where $X_1 \equiv$ Working capital/total assets (WC/TA),

$X_2 \equiv$ Retained earnings/total assets(RE/TA),

$X_3 \equiv$ EBIT/total assets (EBIT/TA),

$X_4 \equiv$ Market value of equity/book value of liability (MVE/TL),

and $X_5 \equiv$ Sales/total assets(S/TA).

Z= Overall index of Bankruptcy.

When using this model, Altman concluded that:

Z score < 1.81 = High probability of bankruptcy,

Z score > 3 = Low probability of bankruptcy

Z score= In between 1.81 and 3.0= Indeterminate.

A score of Z less than 2.675 indicates that a firm has a 95% chance of becoming bankrupt within one year. However, Altman result shows that in practice, scores between 1.81 to 2.99 should be thought of as a grey area. Firms, with Z scores within this range, are considered uncertain about credit risk and considered marginal cases to be watched with attention. Firms with Z scores below 1.81 indicate failed firm, Z score above 2.99 indicates non-bankruptcy. Altman shows that bankrupt firms have very peculiar financial profiles one year before bankruptcy. These different financial profiles are the key intuition behind Z score model.

Eidlemann (1995) defines each of the above ratios as follows:

X_1 is a liquidity ratio, the purpose of which is to measure the liquidity of the assets 'in relation to firm's size'. It is the measure of net liquid asset of a concern to the total capitalization which measures the firm's ability to meet its maturing short-term obligations.

X_2 is an indicator of the 'cumulative profitability' of the firm over time which indicates the efficiency of the management in manufacturing, sales, administration and other activities.

X_3 is a measure of firm's productivity which is crucial for the long-term survival of the company. It is a measure of productivity of an asset employed in an enterprise. The ultimate existence of an enterprise is based on earning power. It measures how effectively a firm is using its resources. It measures the management's overall effectiveness as shown by the returns generated on sales and investment.

X_4 defines how the market views the company. The assumption is that with information being transmitted to the market on a constant basis, the market is able to determine the worth of the company. This is then compared to firm's debt. It is reciprocal of familiar debt equity ratio. Equity is measured by the combined market value of all shares, while debt includes both current and long term liabilities. This measure shows how much of an asset can decline in value before liabilities exceed the assets and the concern becomes insolvent. It measures the extent to which the firm has been financed by debt. Creditors look to the equity to provide the margin of safety, but by raising funds through debt, owners gain the benefit of maintaining control of the firm with limited investment.

X_5 is defined as a 'measure of management ability to compete'. The capital turnover ratio is the standard financial measure for illustrating the sales generating capacity of the assets.

ANALYTICAL RESULTS

The five financial ratios mentioned above have been utilized as yardsticks in the equation for evaluating the financial health of India's fertilizer companies for the period 2000-01 to 2006-07.

Proportion of working capital in the total assets also gives investors an idea of the company's underlying operational efficiency. Money that is tied up in inventory or money that customers still owe to the company cannot be used to pay off any of the company's obligations. So, if a company is not operating in the most efficient manner (i.e. slow collection), it will show up as an increase in the working capital. This can be seen by comparing the working capital from one period to another; slow collection may signal an underlying problem in the company's operations. The better a company manages its working capital, the less the company needs to borrow. Even companies with cash surpluses need to manage working capital to ensure that those surpluses are invested in ways that will generate suitable returns for investors.

In the study, the content of working capital in the total assets (X_1) has been increased from 33.81% in 2000-01 to 15.24% in 2006-07 with fluctuations which indicates the declining use of working capital over the years. The declining usage of working capital is unfavourable for efficient running of the companies and it affects the financial health of the companies. Low level of working capital may enhance the risk of liquidity. Lower the working capital, greater the risk and also higher the profitability of the firm. A declining working capital ratio over a longer time period could also be a red flag that warrants further analysis. The declining usage of working capital in the industry may have several indications. Declining usage of working capital may cause shortage of liquid funds which may be the hindrance in necessary purchasing and accumulation of inventories causing more chances of stock out. On the other hand, it implies lesser number of debtors which may cause lower incidences of bad debts which may result into overall efficiency in the organizations.

TABLE-3: ANALYSIS OF RESULTS BY USING ALTMAN'S MODEL: 2000-01 TO 2006-07

Ratios/Years	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Net working capital (Rs crores)	15148	13001	10680	7986	4878	7732	11132
Total assets(Rs crores)	44796	43874	43817	44809	46298	50719	53083
X1	33.81%	29.63%	13.63%	24.34%	10.54%	11.33%	15.24%
Retained earning (Rs crores)	-1405	-4906	-6915	-9322	-10296	-10797	-11387
Total assets(Rs crores)	44796	43874	43817	44809	46298	50719	53083
X2	-3.14%	-11.18%	-15.78%	-20.80%	-22.24%	-21.29%	-21.45%
Earning before interest & tax(Rs crores)	2544	2165	1531	2610	3004	2260	3144
Total assets(Rs crores)	44796	43874	43817	44809	46298	50719	53083
X3	5.68%	4.93%	3.49%	5.82%	6.49%	4.46%	5.92%
Market value of equity (Rs crores)	6220	6451	6348	6887	6788	6806	6353
Book value of total liability(Rs crores)	22086	21039	21513	21258	20016	22287	24950
X4	28.16%	30.66%	29.51%	32.40%	33.91%	30.54%	25.46%
Sales(Rs crores)	33312	33012	33118	35696	42663	48674	50678
Total assets(Rs crores)	44796	43874	43817	44809	46298	50719	53083
X5	74.36%	75.24%	75.58%	79.66%	92.15%	95.96%	95.47%
0.012*X1	0.406	0.356	0.164	0.292	0.127	0.136	0.183
0.014*X2	-0.044	-0.157	-0.221	-0.291	-0.311	-0.298	-0.300
0.033*X3	0.187	0.163	0.115	0.192	0.214	0.147	0.195
0.006*X4	0.169	0.184	0.177	0.194	0.203	0.183	0.153
0.010*X5	0.744	0.752	0.756	0.797	0.922	0.960	0.955
Z scores	1.462	1.298	0.991	1.184	1.155	1.128	1.186

Source: Author's own estimate

The retained earnings to total assets ratio (X_2) measures the company's ability to accumulate earnings using its total assets. Retained earnings to total assets ratio indicates the extent to which assets have been paid for by company profits. Retained earnings to total assets ratio near 1:1 (100%) indicates that growth has been financed through profits, not increased debt. A low ratio indicates that growth may not be sustainable as it is financed from increasing debt, instead of reinvesting profits. Increasing retained earnings to total assets ratio is usually a positive sign, showing the company is more able to continually retain more earnings.

In our study, the content of retained earning to total assets was recorded as -3.14% in 2000-01 and during the next couple of years, the ratio gradually decreases sharply to -21.45% in 2006-07 which means that companies failed to generate adequate reserve for future prospect of the business. This means that firms within fertilizer industry may have compelled to pay off major portion of assets out of increased debt instead of reinvesting profit.

The ratio of a company's earnings before interest and taxes (EBIT) against its total net assets (X_3) is considered an indicator of how effectively a company is using its assets to generate earnings before contractual obligations must be paid.

The greater a company's earnings in proportion to its assets (and the greater the coefficient from this calculation), the more effectively that company is said to be using its assets.

This is a pure measure of the efficiency of a company in generating returns from its assets, without being affected by management financing decisions. Return on Assets gives investors a reliable picture of management's ability to pull profits from the assets and projects into which it chooses to invest. The overall efficiency of an enterprise can be judged through the ratio of EBIT/Total asset. The operating efficiency ultimately leads to its success. The ratio of EBIT to total assets ranges from 3.49% to 5.92% which is a good sign for the company.

Market Value of Equity to Total Liabilities (X_4) ratio shows how much business's assets can decline in value before it becomes insolvent. Those businesses with ratios above 200 percent are safest. The result shows that India's fertilizer sector did not maintain the above standard during the study period. The market value of equity was less than that of debt. In the study, the ratio of market value of total equity to book value of debenture was 28.16% in 2000-01 which decreased to 25.46% in 2006-07. It means that book value of debenture ranges from 71.86% to 74.54% during the study period. Decrease in this ratio has an indication that the firm's sale price are relatively low and that its cost is relatively high. The proportion in which interest bearing funds (debt) and interest free funds (equity) employed had a direct impact on its financial performance. The sector will have the chance of facing interest burden in near future. Therefore, a reasonable change in the financial structure is needed to protect the company from adverse financial performance.

Net Sales to Total Assets ratio (X_5) indicates the effectiveness with which a firm's management uses its assets to generate sales. A relatively high ratio tends to reflect intensive use of assets. It is a measure of how efficiently management is using the assets at its disposal to promote sales. A high ratio indicates that the company is using its assets efficiently to increase sales, while a low ratio indicates the opposite. The financial performance and profitability centred on sales revenue. The ratio of sales volume to total assets, though ideally expected to be 2:1, during the study period clearly showed that this sector had not been successful in achieving the standard ratio through sales but ratio gradually improves. Poor ratio of turnover indicates that companies failed to fully utilize the assets which will have an adverse impact on the financial performance of the company.

Present analysis reveals that fertilizer industry under our study was just on the range of collapse zone. In our study, Z values for all the seven years were less than 1.81 (Z scores < 1.81 = High probability of bankruptcy). This indicates that overall financial performance of India's fertilizer sector was very unviable and may lead to corporate bankruptcy in near future unless regulatory measures are undertaken immediately.

The poor financial health of this sector may be probably due to the reasons that the sector failed to achieve the sales target due to underutilization of available capacity, which contributed for the deterioration of financial health of the sector. Excess debt (as reflected in X_3 factor) was a serious concern as it carries with high interest burden which has affected the financial health of the sector.

In the light of the above financial problems faced by the sector concerned, it is suggested that capital structure of India's fertilizer sector has to be changed in such a way to have ideal debt equity ratio and hence re-scheduling of debt is an urgent necessity. The sector should take necessary step to fully utilize the available capacity and therefore, fixed asset are to be purchased only when the company can utilize its capacity fully. The company must fix up achievable sales target and steps should be taken to achieve it. Managerial incompetence should be taken care of, if any. For this, decentralization in decision making process should be introduced which gives the employees the initiative and responsibility to adapt their behaviour and decisions according to changes in working environment.

Research shortcomings:

The MDA methodology violates the assumption of normality for independent variables. The bankruptcies studied in USA by Altman were for the period between 1946-1965. Hence, it is not clear whether past experience will always be transferable to future situations given the dynamic environment in which the business operates. Consequently, there is a question whether Altman's model is as useful now as it was when developed. Moreover, the study concentrates on a single specific industry where data on a relatively small sample of failed and non-failed companies was available. Consequently, there is some risk that the results have been affected by the sample size.

SUMMARY&CONCLUSIONS

The premises underlying this paper (also all empirical works on corporate failure prediction) is that corporate failure is a process commencing with poor management decisions and that the trajectory of this process can be tracked using accounting ratios. This study tries to examine the combined effect of various financial ratios with the help of Multiple Discriminate Analysis (MDA). In this study, it has been examined whether Zscore model developed by Altman, can predict bankruptcy. It is found from the analysis that individual ratio within the multiple discriminate framework has depicted dismal dull picture and indicate inefficiencies within the firms that may endanger financial health of Indian fertilizer companies. It is also apparent that this model is useful in identifying financially troubled companies that may be bankrupt. This empirical evidence will provide a warning signal to both internal and external users of financial statement in planning, controlling and decision making. The warning signs and Z score model have the ability to assist management for predicting corporate problems early enough to avoid financial difficulties.

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