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EXAMINATION OF FINANCIAL DISTRESS IN INDIAN SUGAR SECTOR – APPLICATION OF OHLSON'S 'O' SCORE MODEL

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Abstract
Financial distress is an indicator of probable bankruptcy and insolvency. A company in distress passes through various stages of decline in financial health before bankruptcy sets in. Bankruptcy or insolvency not only leads to erosion of net worth of the company but also adversely affects all the corporate stakeholders viz investors, lenders, employees , creditors , government and society in general. It becomes very crucial to identify distress signals well in advance so that so that remedial steps can be taken for company turnaround. Indian sugar sector have been facing distress in recent times. The profitability of companies in sugar sector is greatly affected by climatic conditions, price trends in international markets, oil prices, government policies w.r.t cane and sugar pricing. This paper purports to examine the extent of financial distress in Indian sugar sector. Identification of distress will enable the companies to review the business operations and policies and develop strategies to combat financial distress. 58 listed companies in sugar sector were studied for the period 2011-12 to 2013-14. Ohlson (1980) model for bankruptcy prediction using logistic regression was applied to the selected companies to identify distress and probability of bankruptcy. The results of the study indicates widespread financial distress in sugar sector.

Key Words: Financial Distress, Bankruptcy, Sugar Sector, Ohlson's 'O' Score.

1. INTRODUCTION

Financial distress in companies indicates a situation where the company is not able to meet its contractual obligations due to dismal financial performance. Such distress is seen through gradual reduction in sales and other income, low margins of profit, underutilization of assets and a challenging working capital. This leads to delay in payment to banks, suppliers, employees and government. Sustenance and survival of a distressed company becomes difficult. However a financially distressed company can turnaround itself through remedial measures taken at appropriate times. This is possible if the distress signals are identified in advance by the company's management. When financial distress cannot be mitigated, bankruptcy or insolvency sets in. (Avenhuis, 2013).

It is generally accepted that financial statements contains relevant information which can help a stakeholder identify signals of financial decay in a company. Such identification will help all the stake holders to protect their interest with minimum losses. There are many distress prediction models developed by researchers which can be applied albeit with caution (Grice and Dugan, 2001). The most commonly used models are:

1. Altman (1968) 'z' Score model using Multivariant Discriminant Analysis
2. Ohlson (1980) 'o' score model using Logit Analysis
3. Zmijewski (1984) model using Probit Analysis
4. Shumway (2001) model using Discrete Hazard Analysis.
5. Hillegeist (2004) model using the Black Scholes Probability theory.

FINANCIAL DISTRESS IN INDIA

The important indicators of financial distress leading to bankruptcies are debt default, negative net worth, negative operating margins. The stressed advances of scheduled banks have shown an increasing trend over the last few years. Of the broad sectors, 44.8% of the total advances have been made to industry sector. 17.9% of the total advances to industry sector has been classified as stressed (Financial Stability report of RBI, June 2015). Industrial sickness in India has resulted in loss of employment to millions of people. (Murty and Misra, 2004). It becomes imperative to adopt mechanisms which can serve as early warning system for companies to take remedial measures. Applying prediction models using information from financial statements can indicate distress on companies. Analysing the financial information of a business on a regular basis can provide valuable insight about the state of affairs of the business. (Bhunia and Sarkar, 2011). This study aims to investigate the extent of distress in Indian sugar sector.

SUGAR SECTOR IN INDIA

India is the second largest producer of sugar in the world contributing to around 14% of global sugar production. Sugar is a critical agro based industry in India providing sustenance to around 50 million sugar cane farmers. This industry provides employment to more than 20 lakh skilled and semi- skilled workers. The industry comprises of public sector units, private

sector units and cooperative societies. The profitability of this sector is highly cyclical in nature. Climatic conditions, price trends in international markets, oil prices, government policies w.r.t cane and sugar pricing affects the performance of the sector.

Over a period of time sugar sector has witnessed crisis due to increase in cane prices proportionately more than sugar prices. (CRISIL Opinion, 2014). Surplus production and fall in international prices have also contributed to low performance and consequent decline in the financial health of companies in sugar industry.

Hence there is a need to examine the extent of financial distress in Indian sugar sector so that the stakeholders can take appropriate measures to mitigate and minimize the adverse effects of financial crisis.

2. LITERATURE REVIEW

Research on corporate distress have always attracted and challenged researchers and practioners alike. Extensive literature is available on study of corporate distress. The earliest study can be traced back to 1930's. In 1966 Beaver developed a model for predicting bankruptcy using univariate analysis. Later Altman in 1968 developed the very popular 'z' score bankruptcy prediction model using Multi variate Discriminant Analysis (Avenhuis, 2013). Some of the recent important studies in this subject are discussed below:

Kane et al (2006) have examined the usefulness of financial reporting data to predict the probability of a firm recovering from financial distress. Marc Le Clere (2006) studied the relationship between different sets of financial variables used in financial distress. Abad et al (2007) identified the unique features of failed companies and the syndromes leading to such failures. Wang and Li (2007) used a rough set model was used to construct a distress prediction model of Chinese companies. Smith and Liou (2007) in their study tested the applicability one model across all sectors and whether ratios indicating financial distress differ sector wise was investigated. Sharpe and Stadnik (2007) tried to identify Australian general insurers experiencing financial distress: The relationship between indirect financial distress cost borne by a companies under distress and corporate governance was studied by Hui and Jing-Jing (2008). Coyne et al (2008) analysed financial ratios of 13 bankrupt health care systems and 7 solvent health care systems. Salehi and Bizhan (2009) studied financial distress of companies listed in Tehran SE. Wang and Campbell (2010) applied Altman's z-score model to predict financial distress in publicly listed Chinese companies. Julien le Maux and Morin (2011) tried to analyse whether Lehman'Bros. Downfall could have been predicted. Hodgkin and Marchesini (2011) studied companies which has defaulted on loan payments. Zaki (2011) developed distress prediction models for commercial and Islamic banks in UAE. The Malaysian companies were reviewed by Ong et al (2011). Polemis and Gounopoulos (2012) tried to identify financial characteristics of companies in financial distress. Dave (2012) in his study tries to establish relationship between financial management and profitability. The extensive literature accepts the usefulness of financial ratios in predicting financial distress.

There has been some studies conducted in the area of financial distress in Indian companies. Bhunia and Sarkar (2011) analysed financial ratios of companies in pharma sector. Arun and Kasilingam (2011) applied Altman (1968) 'z' score model to IT companies in India. The financial health of Indian automobile sector was studied by Sarbapriya Ray (2012) by applying Altman 'z' score model. Bardia (2012) examined the long term solvency of Indian steel companies using Altman 'z' score model. Reddy and Reddy (2012) investigated distress in Indian sugar sector by applying the 'z' score model.

As seen from the discussion above there has been numerous studies conducted on financial distress using different statistical techniques. However most of the studies in Indian context has been done using Altman 'z' score model.

Wu et al. (2010) in Avenhius, 2014 tested Altman (1968), Ohlson (1980), Zmijewski (1984), Hillegiest (2004) for their applicability in US firms for the period 1980-2006. The study revealed that Ohlson (1980) model has the highest discriminating ability. Avenhius (2013) also reviewed Altman (1968), Ohlson (1980) and Zmijewski (1984) models and observed that accuracy rate of Ohlson's model is highest and logit regression as the statistical tool gives the best explanatory variables for distress prediction. Kumar and Kumar (2011) compared the predictive accuracy of Altman 'z' score model and Ohlson's 'o' score model when applied to Indian companies. Ohlson's 'o' score model was found to be most accurate since it used logistic regression. This paper applies Ohlson's 'o' score model to companies in sugar sector in India.

3. RESEARCH OBJECTIVE

In view of the critical nature of sugar sector in India, the objective of this paper is to examine financial distress in sugar sector in India using Ohlson (1980) 'o' score model.

4. RESEARCH METHODOLOGY

1. **Data:** The data comprises of 58 listed companies in sugar sector. The period of study is 2011-12 to 2013-14 (3 years). Refer Annexure for list of companies.
2. **Data Source:** The financial data for these companies have been extracted from Capitaline database.
3. **Statistical model used**: For examining the financial health of selected companies, Ohlson (1980) 'o' score model has been used. Ohlson (1980) used logit regression.to develop bankruptcy prediction model from a sample of 105 bankrupt and 2058 non- bankrupt companies in US.

Model specification

$$Y = -1.3 - 0.4Y1 + 6.0Y2 - 1.4Y3 + 0.1Y4 - 2.5Y5 - 1.8Y6 + 0.3Y7 - 1.7Y8 - 0.5Y9$$

Where Y1 = log (Total Assets/GNP price level index)
Y2 = Total Liabilities/Total Assets
Y3 = Working capital /Total Assets
Y4 = Current Liabilities / Current Assets
Y5 = 1 if Total liabilities > Total Assets else Y5 = 0
Y6 = Net Income/Total Assets
Y7 = Funds from operations/ Total Liabilities
Y8 = 1 if Net Income for 2 preceding years is negative else Y8= 0
Y9 = measure of change in Net Income

5. INTERPRETATION OF VARIABLES

Independent Variables

Y1 – Size of the company. Smaller companies tend to have greater probability of failure. GNP price level index has been determined using 2011-12 as base year.

Y2 – The ratio of total liabilities to total assets indicates the extent to which the liabilities of the company are covered by its assets. It also reflects the leverage of the company. A high total liabilities to assets ratio indicates higher risks for the company.

Y3 – The ratio of working capital to total assets explains working capital adequacy and short term solvency and liquidity of the company. A high ratio would indicate high levels of liquidity.

Y4 – The ratio of current liabilities to current assets reflects the extent of current asset coverage available to meet the current liabilities of the company. This ratio is also a measure of short term solvency. A high current liability to current ratio would indicate a poor solvency condition.

Y5 –Dummy variable for correction of extreme leverage. This value is used for discontinuity correction for the ratio total liabilities to total assets. A value of 1 would mean a very high probability of bankruptcy (Ohlson, 1980).

Y6- Net Income to Total assets describes the overall profitability of the company. It also measures the return on its total investment in asset terms.

Y7 – Funds from operations to total liabilities indicates the operating profit coverage for total liabilities. A high ratio reflects adequacy of operating profits to meet the liabilities. This ratio is a measure of operating performance of the company.

Y8 – Dummy variable for correction of continuing profits. A value of 1 indicates high probability of bankruptcy.

Y9 – Change in income over the preceding period calculated as $\frac{N1 - N0}{|N1| + |N0|}$

Where N1 is Net income for current year and N0 is Net income for previous year. The change in net income is measured by this ratio. The denominator acts as a level indicator. (Ohlson, 1980). A positive ratio is an indicator of improved profitability. A negative ratio signifies distress.

All the above variables are indicators of different aspects of a business. These variables reflect profitability, leverage, efficiency in asset utilization and liquidity of a company.

Dependent Variable

The value of dependent variable Y is the 'o' score. Since Ohlson has used logistic regression to determine the coefficients of independent variables, 'o' score is the log odds of the company being financially distressed.

Hence Y ('o' score) = log (p/1-p)

This can be converted to probability as under:

Probability of failure = $\frac{\exp(\text{'o'score})}{1+\exp(\text{'o'score})}$

Ohlson (1980) gave the cut off at 50%.

P(Y) > 0.50 indicates failed, P(Y) < 0.50 indicates non- failed

6. OBSERVATIONS AND CONCLUSION

The nine predictor variables as defined by Ohlson (1980) in his model, the 'o' score and probability of bankruptcy was calculated for the 58 companies selected for the study. The values calculated are shown in Table 1.

Table 1,Ohlson (1980) 'o' score determinants

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y score	P(Y)
2014	0.25	0.88	0.23	0.73	0	-0.04	0.06	0	-0.53	2.77	0.89
2013	0.33	0.83	0.26	0.67	0	0.00	0.11	0	0.14	2.16	0.84
2012	0.32	0.83	0.25	0.63	0	0.00	0.10	0	0.00	2.28	0.87

As seen from Table 1, the companies in sugar sector exhibit very high degrees of financial distress. Table 2 below summarizes the observations and the indicators.

Table - 2Financial Distress Indicators

Sr. No	Observation	Indicator
1	Widespread financial distress	All companies have a probability score of more than 0.5
2	Adverse Long term solvency	Very high total liabilities in relation to total assets.
3	Low operating profitability	Very low operating profits in relation to total liabilities
4	Poor efficiency in utilization of assets	Very low net income in relation to total assets.
5	Continuous reduction in profitability	Decreasing net income from 2011-12 to 2013-14.

From the above observations, it can be concluded that not only the profitability of companies in sugar sector is decreasing continuously, but the efficiency in operations and long term solvency is also adversely affected.

7. RECOMMENDATIONS

Immediate steps will have to be taken to ensure profitability and survival of the companies. One very important step in this direction would be to rationalize pricing policy of sugar and cane sugar. The possibility of export of surplus sugar needs to be explored.

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Annexure

Sr. No	Name of the Company	Sr. No	Name of the Company
1	Bannari Amman Sugars Ltd	31	Indian Sucrose Ltd
2	Dalmia Bharat Sugar & Industries Ltd	32	Piccadily Sugar & Allied Inds Ltd
3	EID Parry (India) Ltd	33	Riga Sugar Company Ltd
4	Bajaj Hindusthan Sugar Ltd	34	Prudential Sugar Corporation Ltd
5	Kothari Sugars & Chemicals Ltd	35	Piccadily Agro Industries Ltd
6	Oudh Sugar Mills Ltd	36	Ugar Sugar Works Ltd
7	Upper Ganges Sugar & Industries Ltd	37	Oswal Overseas Ltd
8	Sakthi Sugars Ltd	38	Sir Shadi Lal Enterprises Ltd
9	Kesar Enterprises Ltd	39	Dollex Industries Ltd
10	Dharani Sugars & Chemicals Ltd	40	Dhampure Speciality Sugars Ltd
11	Vishnu Sugar Mills Ltd	41	KCP Sugar & Industries Corporation Ltd
12	Rajshree Sugars & Chemicals Ltd	42	Jeypore Sugar Company Ltd
13	Simbhaoli Sugars Ltd	43	Naraingarh Sugar Mills Ltd
14	Belapur Industries Ltd	44	Gayatri Sugars Ltd
15	Thiru Arooran Sugars Ltd	45	Harinagar Sugar Mills Ltd
16	Sri Chamundeswari Sugars Ltd	46	Davangere Sugar Company Ltd
17	Balrampur Chini Mills Ltd	47	United Provinces Sugar Co Ltd
18	DCM Shriram Industries Ltd	48	Triveni Engineering and Industries Ltd
19	Mawana Sugars Ltd	49	Parrys Sugar Industries Ltd
20	Empee Sugars & Chemicals Ltd	50	Dhampur Sugar Mills Ltd
21	Khaitan (India) Ltd	51	Rana Sugars Ltd
22	Ponni Sugars (Erode) Ltd	52	Rajasthan State Ganganagar Sugar Mills Ltd
23	Shree Changdeo Sugar Mills Ltd	53	Natural Sugar & Allied Industries Ltd
24	Shakumbari Sugar & Allied Industries Ltd	54	Trident Sugars Ltd
25	Kanoria Sugar & General Mfg. Co. Ltd	55	Mahatma Sugar & Power Ltd
26	Shree Renuka Sugars Ltd	56	Nava Bharat Sugar & Biofuels Ltd
27	Uttam Sugar Mills Ltd	57	Godavari Biorefineries Ltd
28	Rai Bahadur Narain Singh Sugar Mills Ltd	58	Chadha Sugars & Industries Pvt Ltd
29	Wahid Sandhar Sugars Ltd		
30	Silkroad Sugar Pvt Ltd		