Measuring Financial Distress of Public Sector Enterprises Using Z-Score Model

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Abstract

In a financial distressed situation. Company is unable to pay off its liabilities on time and incur losses. Prediction of financial distress may guide such companies to take correctives steps and avoid bankruptcy. Hence, this study analysis financial distress of selected eight manufacturing, loss making public sector enterprises listed in Bombay Stock Exchange, for the study period beginning from 2011-12 to 2016-17 by using secondary data published in their annual reports. Altman Z-score model is used to analyze data and ANOVA single factor is used for testing hypotheses. The result revealed that 4 companies were financially distressed, 3 companies were in grey zone and only 1 company was financially healthy.

*Key words**:** Financial Distress, Altman's Z-score model, Central Public Sector Enterprises (CPSEs), Solvent Company, Public Sector Enterprises (PSEs)*

1. INTRODUCTION

The public enterprises are owned and managed by central or state government, or by local authority. The main objective of public sector enterprises is to maximize social welfare and ensure balanced economic development. Hence, the role of PSEs is very important for the developing country like India. But after LPG reforms, disinvestment and conversion of public sector enterprises into private sector enterprises took place because of increase in number of loss making CPSEs. Hence, when CPSEs were unable to pay off its debts and incurred losses, it indicated that they were financially distressed. So, a prediction of financial distress before one or two years can guide the company towards taking corrective steps and avoid bankruptcy. Thus, in this study the researchers have attempted to analyze financial distress of selected public sector enterprises of India by using Z-score model.

2. LITERATURE REVIEW

Sajjan (2016): Prof. Rohini Sajjan applied Z-score model to understand the likelihood of bankruptcy of selected firms for past 5 years from 2011 to 2015 which were listed in BSE & NSE. Companies were selected from manufacturing & non-manufacturing sectors. The study revealed that none of the companies completely belonged to safe zone except for few years. Most of the firms were in distress zone which clearly indicated that these firms may go bankrupt in near future.

Vijay priya and K K Sthamma (2016*):* The aim of their study was to evaluate the financial efficiency and performance of SAIL, NTPC & ONGC by using Altman's Z-score. The study covered three CPSEs and it was based on secondary data sources collected from Annual Reports, Balance Sheets and P&L accounts for the study period from 1997 to 2015. The study concluded mixed performance of companies, SAIL was in safe zone but ONGC and NTPC were in bankruptcy. The study was limited up to 3 CPSE and no objective forecast was done based on their previous performance.

Bhushan Pardeshi and Hansraj Thorat (2015): This paper attempted to analyze the financial performance, financial health and efficiency of selected five CPSEs by using the Altman's Z-score. The objectives were to study the financial performance and examine the efficiency of the selected CPSEs, and evaluate the financial health and viability of the selected CPSEs. The study covered samples of 5 manufacturing CPSEs listed on the PSU index of the Bombay Stock Exchange. Data were collected from their financial statements submitted to the Department of Public Enterprise of Government of India for the three years during 2010-2013. The results showed that ONGC, BHEL and RCF were in gray zone where the solvency level is medium while SAIL and NTPC were in distress.

Mahama (2015): In this research paper, the author applied Altman's Z-Score model to the financial statements of ten companies listed on the Ghana Stock Exchange (GSE) to determine their level of financial soundness. The data used in the study were drawn from the website of ARG covering the period from 2007 to 2013. The study found six companies being financially sound and not in danger of financial distress, two companies were in financial distress and remaining two were in the state of deterioration and most likely to face financial distress.

Sarbapriya Ray (2011): In this research paper, the author attempted to investigate the financial health of automobile industry in India and tested if Altman's Z-score model can correctly foresee the corporate financial distress of the automobile industry in Indian context for the study period from 2003-04 to 2009-10.

3 OBJECTIVE OF THE STUDY

The purpose of this study is to measure financial distress of selected public sector enterprises of India using Z-Score Model.

4 FORMULATION OF HYPOTHESIS

H_0: There is no significant difference in Altman's Z-score of selected public sector enterprises.

H_1: There is a significant difference in Altman's Z-score of selected public sector enterprises.

5 RESEARCH METHODOLOGY

The said research work is analytical in nature & is based on secondary data only collected from the annual reports of selected CPSEs' websites. The researchers have selected by using purposive sampling technique, 8 manufacturing public sector enterprises which were listed on the recognized stock exchange i.e. BSE and which were loss making CPSEs as per the Loksabha's starred question NO.*27 for reply on loss making CPSEs on 19.07.2016. Some of the CPSEs were included in the list of top 10 major loss making CPSEs during 2015-16 as per Public Enterprises Survey 2015-2016 : Vol.-I also.

Following are the CPSEs selected for the study.

1. BEML (Bharat Earth Movers Ltd.)
2. Bharat Heavy Electricals Limited (BHEL)
3. Chennai Petroleum Corporation Limited (CPCL)
4. Hindustan Organic Chemicals Limited (HOCL)
5. Mangalore Refinery and Petrochemicals Limited (MRPL)
6. Steel Authority of India Limited (SAIL)
7. Scooters India Limited (SIL)
8. National Fertilizers Limited (NFL)

6 ALTMAN'S Z-SCORE MODEL

Edward Altman has developed Z-score model by using multiple discriminate analysis in 1968 to predict financial distress of manufacturing, private and non-manufacturing companies within two years. The model covers both the problems: financial problems and operating problems. The model uses five ratios symbolically X_1, X_2, X_3 X_4 and X_5. The ratios X_1, X_2 and X_4 are for financial problems and X_3 and X_5 are for operating problems. The ratios are follows:

If public firms,

$$Z=1.2X_1 +1.4X_2+3.3X_3+0.6X_4+0.999X_5$$

If private firms,

$$Z=0.171X_1+0.847X_2+3.107X_3+0.42X_4+0.998X_5$$

If Non-manufacturing firms,

$$Z=6.56X_1+3.26X_2+6.72X_3+1.05X_4$$

Where,

(1) X_1= Working Capital/Total Assets (Stands for liquidity measure)

(2) X_2= Retained Earning/Total Assets (Stands for measure of reinvested earnings)

(3) X_3= Earnings before interest and taxes/Total Assets (Stands for profitability measure)

(4) X_4= Market value of equity /Total Liability (Stands for leverage measure)

(5) X_5= Sales/Total Assets (Stands for sales generating ability)

Z = Overall index of corporate financial distress.

Altman defines 3 zones of discrimination

Safe zone: Z > 2.99, Grey zone: 1.8 < Z < 2.99 & Distress zone: Z < 1.8

7 DATA ANALYSIS & FINDINGS

7.1 Sample calculation of Z-Score of BEML

Table No.1: Z-Score of BEML for the year 2016-17

CALCULATION			
	Amount	**Factor**	**Result**
EBIT / Total assets	0.031015536	3.3	0.10
Net sales / Total assets	0.597437062	0.999	0.60
Market value of equity / Total liabilities	0.405932998	0.6	0.24
Working capital / Total assets	0.215147063	1.2	0.26
Retained earnings / Total assets	0	1.4	0.00
RESULTS AND INTERPRETATION			
Results	**Z-Score**	**1.20**	
Interpretation	**Z-Score above 3.0**	Company is financial sound	
	Z-Score between 2.7 and 2.99	Company needs to exercise caution	
	Z-Score between 1.8 and 2.7	Likely to go bankrupt within 2 years	
	Z-Score below 1.8	Likelihood of bankruptcy is very high	

The above table shows Z-Score of BEML for the year 2016-17 and it reveals that Z-Score of the company is 1.20 which is below 1.8 so likelihood of bankruptcy is very high and company is financially distressed with low range. The similar calculation has been carried out for rest of the companies which are as follows:

7.2. Calculated Z-Score of the selected CPSEs of India

Table No.2: Calculated Z-Score of the selected CPSEs of India

Calculated Z-Score				
Name of the selected CPSEs	**Year**	**Z-Score Value**	**Zone**	**Range**
BEML	2016-17	1.20	Distress	Low
	2015-16	2.32	Grey	Medium
	2014-15	1.95	Grey	Medium
	2013-14	1.83	Grey	Medium
	2012-13	1.63	Distress	Low
	2011-12	1.87	Grey	Medium
BHEL	2016-17	0.98	Distress	Low
	2015-16	1.50	Distress	Low
	2014-15	1.74	Distress	Low
	2013-14	1.87	Grey	Medium
	2012-13	2.17	Grey	Medium
	2011-12	2.14	Grey	Medium
CPCL	2016-17	2.79	Grey	Medium
	2015-16	2.90	Grey	Medium
	2014-15	3.55	Safe	High
	2013-14	3.59	Safe	High
	2012-13	2.76	Grey	Medium
	2011-12	3.08	Safe	High
HOCL	2016-17	-5.06	Distress	Low
	2015-16	-9.65	Distress	Low
	2014-15	-6.68	Distress	Low
	2013-14	-4.13	Distress	Low
	2012-13	-1.53	Distress	Low
	2011-12	0.00	Distress	Low
MRPL	2016-17	2.32	Grey	Medium
	2015-16	1.23	Distress	Low
	2014-15	1.46	Distress	Low
	2013-14	2.07	Grey	Medium
	2012-13	2.61	Grey	Medium
	2011-12	2.51	Grey	Medium

SAIL	2016-17	0.07	Distress	Low
	2015-16	0.60	Distress	Low
	2014-15	1.13	Distress	Low
	2013-14	1.28	Distress	Low
	2012-13	1.43	Distress	Low
	2011-12	1.73	Distress	Low
SIL	2016-17	1.45	Distress	Low
	2015-16	3.20	Safe	High
	2014-15	3.45	Safe	High
	2013-14	3.54	Safe	High
	2012-13	4.11	Safe	High
	2011-12	0.48	Distress	Low
NFL	2016-17	0.55	Distress	Low
	2015-16	0.50	Distress	Low
	2014-15	0.35	Distress	Low
	2013-14	0.29	Distress	Low
	2012-13	0.31	Distress	Low
	2011-12	0.77	Distress	Low

(Source: Calculated from the annual reports of selected CPSEs)

INTERPRETATION

From the above table, it can be observed that the Z-Score of **BEML** was below 1.80 for the year 2011-12 and 2016-17 i.e. in distress zone besides this Z-Score of BEML was found in grey zone with medium range i.e. Z-Score was $1.8 < Z < 2.99$ for rest of the years. Z-Score of **BHEL** and **MRPL** experienced mixed zones of Z-Score**.** It indicated that both the enterprises performed well in initial three years period i.e. Z-Score was between 1.81 & 2.99 but later, the enterprises performed badly as Z-Score was less than 1.81 except in the 2016-17 for MRPL. So, the companies need to analyze weak zones and take necessary steps to avoid bankruptcy.

Z-Score of the **CPCL** indicated that the company was in safe zone and grey zones with high and medium range of solvency because its Z-Score was more than 1.81. Hence, Company was financial sound. Besides this, from the above table, it is very clear that out of eight CPSEs three CPSEs namely **HOCL, SIL & NFL** were found in distressed zone because their Z-Scores were less than 1.81 with low range of solvency. These three CPSEs were unable to meet their current financial obligations. So, a great care is needed to come out from the financial distress situation by improving working capital, reducing debts & increasing in profit. So, it is mandatory to take corrective steps to avoid bankruptcy because likelihood of bankruptcy is very high.

Z-Score of **SIL** indicated that the company was in distress for the initial year but later on company became financially healthy for the 4 years but in the year 2016-17, it couldn't maintain its position and entered into distress zone again. So, the company needs to exercise caution to avoid bankruptcy.

7.3. Average Z-Sore of the selected CPSEs

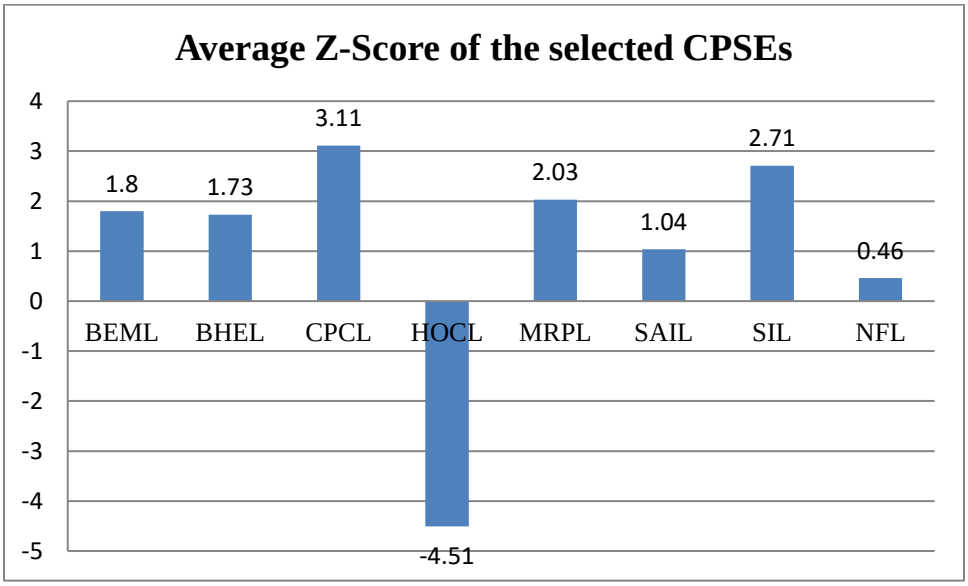
Table no.3: Average Z-Score of the selected CPSEs for the study period from 2011-12 to 2016-17

Name of the CPSEs	Average Z-Score	Zone	Range
BEML	1.8	Grey	Medium
BHEL	1.73	Distress	Low
CPCL	3.11	Safe	High
HOCL	-4.51	Distress	Low
MRPL	2.03	Grey	Medium
SAIL	1.04	Distress	Low
SIL	2.71	Grey	Medium
NFL	0.46	Distress	Low

(Source: Calculated from the annual reports of the selected CPSEs)

Above table shows average Z-Score of the selected CPSEs for the study period from 2011-12 to 2016-17. From the above table, it is clear that average Z-Score of four companies namely BHEL, HOCL, SAIL & NFL is less than 1.81, so these companies are the most financially distressed CPSEs. Hence, it is mandatory for them to take corrective actions to avoid bankruptcy in near future. Besides this, Z-Score of the companies like BEML, MRPL and SIL is in grey zone i.e. $1.8 < Z < 2.99$, so these companies need to exercise caution to avoid bankruptcy and only one CPSE namely CPCL was found financially sound and in safe zone with high range of solvency i.e. Z-Score > 3.

Chart no.1: Average Z-Score of the selected CPSEs for the study period from 2011-12 to 2016-17



Above chart indicates the average Z-Score of the selected CPSEs for the study period from 2011-12 to 2016-17. From the above chart, it is clear that HOCL was the most financially distressed company while BHEL, SAIL and NFL were in distress zone and CPCL was the soundest CPSEs.

7.4. HYPOTHESIS TESTING

ANOVA: Single Factor Analysis for hypothesis testing of Z-Score model

H_0: There is no significant difference in Altman's Z-Score of selected public sector enterprises.

H_1: There is a significant difference in Altman's Z-Score of selected public sector enterprises.

Table No.4: ANOVA: Single Factor Analysis for Hypothesis Testing of Z score Model

ANOVA						
Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Between Groups	241.3627	7	34.48	17.9618	0.00	2.249024
Within Groups	76.78607	40	1.9197			
Total	318.1488	47				

INFERENCE

Above table shows the analysis of variance of Z-Score. F-value is 17.9618 and P-value is 0. As P-value is less than 0.05, we cannot accept null hypothesis and it means that there is a significant difference in Altman's Z-Score of the selected CPSEs.

8. SUGGESTIONS

8.1. As HOCL, SAIL and NFL are the most financially distressed public sector enterprises; it is mandatory for them to take precautionary measures to increase profit and sales, decrease liability, maintain working capital and retained earning properly to avoid bankruptcy.

8.2. As CPSEs like BEML, MRPL & SIL are in grey zone, they need to exercise caution by taking great care towards maintenance of working capital and EBIT in order to avoid short term financial distress.

9. LIMITATIONS OF THE STUDY

Firstly, the study is based on secondary data, taken from published annual reports of the selected CPSEs. The reliability of the findings is contingent upon the accuracy of data published in these annual reports. Secondly, the study considered only eight, listed, loss making and manufacturing public sector enterprises. Besides this, the time period covered is of six years only and researchers have used only Altman's Z-Score Model to predict the financial distress and other tools have been ignored. Lastly, the data have been collected using purposive sampling method.

10.CONCLUSION

Financial distress is the most difficult situation because companies have short term losses and an increase in debts. Hence, prediction of the financial distress can provide useful information to the company for taking corrective steps towards improvement of financial situation. CPSEs are the backbones of India. Hence, the researchers have selected eight listed CPSEs to analyze financial distress. The results of the Z-Score revealed that HOCL was the most financially distressed CPSEs, so it is mandatory for it to take precautionary steps to increase its profit and sales, decrease liability, maintain working capital and retained earning properly in order to avoid bankruptcy. Besides this, BHEL, SAIL and NFL were also in distress zone and CPCL was the soundest CPSEs while CPSEs like BEML, MRPL & SIL were in grey zone with medium range of solvency. It is true that the government fund can help in removing financial distress of the selected CPSEs but prediction of financial distress through Z-Score can help them in identifying their weak areas wherein they can take corrective steps to avoid bankruptcy.

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