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Financial performance of Navratna companies of India: application to Altman Z Score model

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Abstract
The majority of the company finds itself in trouble as it exceeds its liability. The government's organised PSUs have made a stronger contribution to economic health today, while others have become bankrupt due to very low resource utilisation, low liquidity and bad management decisions. So it's time to investigate the financial performance of government organised PSUs to protect them from bankruptcy. This research study examined the financial performance of seven Indian Navratna companies listed on the Bombay stock exchange and National stock exchange. The purpose of this study is to investigate whether these companies can fail in the future. The Altman Z score model was used to accomplish the purpose of this analysis. The Altman Z score model is a collection of financial ratios used to forecast business bankruptcies. The research also used the ANOVA test to analyse the significant relationship between the variables over the period from 2011 to 2020. HPCL, NMDC and CCI are in the safe zone whereas BEL, OIL and NBCC are in the grey zone as per Z score model result. Only one company namely PGCIL is in distress zone and the management of this company need to take significant decision to protect this company from bankruptcy. All the variables are highly correlated according to the findings of the Anova test. This analysis would be advantageous for business managers taking big financial decisions, and it will also be useful to investors as they choose to put their money into Navaratnas companies.

Keywords: altman Z score, navratna, PSUs, financial performance, bankruptcy

Introduction

Public enterprises which are run and controlled by the government of India are classified in Maharatna, Navratna and Miniratna category based on their profitability, net worth and turnover. These companies are contributing continuously to the growth of the Indian economy. In the last several years, some of the public enterprises were become bankrupt because of poor management decisions regarding the financial performance of an enterprise. It is now important to safeguard businesses that will go bankrupt in the coming years. It is necessary to analyse financial results and make sound and profitable financial decisions for these companies in order to protect them. There are many models that could be used to anticipate the bankruptcy of a company. Altman Z score model is one of them which is developed by an American Altman Edward in 1968. The Z score model consists of a number of variables such as working capital, earnings, EBIT, capitalization of the market, profits and total assets (Altman, 1968) [3]. Navratna companies of India are government-run public sector entities that make an impressive contribution to the development of the Indian economy. In order to obtain the status of Navratna companies, the Government of India has laid down certain regulations to become Navratna companies as a company must be listed on the stock exchange, with an annual revenue of more than 250 billion, net worth more than 150 billion and net profit after tax of more than 50 billion over the last few years. Currently, there are 14 PSU earn the status of Navratna companies of India. Nearly all of the firms are financially sustainable, however, a number of these have incurred losses every year and have subsequently faced bankruptcy and will likely continue to do so in the future, for the time being, dependent on government funding. Nowadays due to pandemic Corona conditions, the government does not have sufficient funds to safeguard these companies, so to protect these company this analysis is needed. The most widespread and most used predictive model for manufacturing units is Altman Z score model (Siekelova *et al*., 2019) [22]. This model is highly acknowledged for failures of manufacturing units and predicting the survivals of companies since 1968 (Chien Ko *et al*., 2017) [5]. The Z score model is also successful to analyse the significant relationship between financial distress and earning management (Agrawal & Chatterjee, 2015) [2]. The Z score model is using corporate income and balance sheet to predict financial distress and failure of a company before two years (Agarwal, 2018) [1]. The Z score model has high predictive power in terms of its capability to detect bad-performing companies before two years (Bandyopadhyay, 2006; Kumar & Anand, 2013; Nanayakkara & Azeez, 2015) [4, 13].

Review of Literature

(Gerantonis *et al*., 2009) [8] examined all listed companies in the Athens stock exchange in Greece to predict business bankruptcy in advance during the period from 2002 to 2008 by using Z score model. The results showed that the Altman Z score was effective in forecasting business failure and that the model's output was useful for management in making financial performance decisions. (Ray, 2011) [21] used Z score model for assessing corporate financial distress of Car manufacturing companies of India during the period of 6 years starting from 2004 to 2010. The results revealed that the global recession affected the z score of car firms after 2008. (Venkataramana *et al*., 2012) [25] analysed financial performance of Cement companies in India and founded that liquidity, working capital and solvency position of Cement companies in India were not satisfactory as per Z

score model. (Chouhan *et al*., 2014) [7] studied 10 BSE listed companies to predicting financial stability. In the analysis, Altman Z score ratios were used. The research established that during the investigation time HDFC Bank and BHEL were in distress zone. (Gowri, 2014) [9] took a sample of automobile companies of India and used Z score model to assess financial health during the year 2004 to 2012 and founded that all companies are in safe zone. (Kivuvo & Olweny, 2014) [12] took a sample of 30 saving and credit cooperative organisation from 2008 to 2013 and analysed financial performance using the Altman Z Score model. The result of the study indicates that 6 organisations were in the bankruptcy zone out of 30 organisations during the research period. (Pradhan, 2014) [18] analysed financial performance of three public sector banks namely OBC, PNB and SBI by using the Z score model and BPNN model for a period of 2001 to 2013. The author predicted the future financial performance of banks based on a past result of Z score of banks by using BPNN model and founded that OBC bank was performing well than other banks. (Thai *et al*., 2014) analysed 30 companies from which 15 were financial distressed and 15 were non-financial distress companies of Malaysia to predict financial distress by using Z score model for 5 years. The study was also used discriminant analysis to find out a significant relationship between the variables and founded that working capital to total asset ratio is most significant amongst all variables. (Tyagi, 2014) [24] used Z score model to study the financial soundness of Indian Logistic Companies during the period of a global recession. The study founded that the Z score model is precise for predicting financial performance during the global recession period. (Rahayu *et al*., 2016) [19] investigated Telecommunication companies of Indonesia during the period of 2012 to 2014 to find out financial distress. The study founded that three companies were in financial distress as per the Z score model. (Rajasekar *et al*., 2014) [20] analysed financial distress of all Navratna companies of India by using the Z score model and founded that 8 companies were financially strong during the research period. (Maccarthy, 2017) [14] used M score and Z score model to identify fraud in finance and failure in corporations from 1996 to 2000. The study concludes that the financial statement of a corporation manipulated to hide the debt of the corporation and corporate failure can be determined by using the Z score model. (Chitta *et al*., 2019) [6] analysed financial soundness of Maharatna companies of India by using Altman Z score model from 2014 to 2018. The study founded that CIL and BPCL were in a safe zone, GAIL and IOCL were in a grey zone whereas ONGC, SAIL, NTPC and BHEL were in distress zone during the research period.

Methodology

1. Sample of the Study

The study is descriptive in nature to predict the financial performance of Navratna companies of India. Seven Navratna companies of India were selected for this study which is listed on the Bombay stock exchange as well as on the National stock exchange.

2. Period of the Research Study and Data Sources

The research was conducted over a ten-year period, from 2010 to 2020. The analysis relied on secondary data, which was gathered from the Money Control website and the company's annual reports.

3. Objectives of the Study

- To examine the financial performance of selected Navratna companies.
- To predict the chances of bankruptcy of selected Navratna companies by Z score model.

4. Hypothesis of the study

- H_0^1: The WC/TA ratio does not vary significantly between samples.
- H_0^2: The RE/TA ratio does not vary significantly between samples.
- H_0^3: The EBIT/TA ratio does not vary significantly between samples.
- H_0^4: The MCap/TL ratio does not vary significantly between samples.
- H_0^5: The TS/TA ratio does not vary significantly between samples.
- H_0^6: The Z score result does not vary significantly between samples.

5. Methodology of the Study

The Altman Z score was employed to forecast the bankruptcy of the Navratna companies. The Z score model is based on financial ratio and mathematical measurement that is used to forecast the probabilities of bankrupt for the upcoming two years. Originally this model was established by Edward Altman in 1968 (Altman, 1968) [3]. The weightage and formula of Z score model are mentioned below:

Table 1: Altman Z score Model

Factor	Weightage	Ratio	Code and Formula
T1	1.2	Working Capital to Total Assets	WC / TA
T2	1.4	Retained Earnings to Total Assets	RE / TA
T3	3.3	EBIT to Total Assets	EBIT / TA
T4	0.6	Market Capitalisation to Total Liabilities	MCap / TL
T5	1.0	Total Sales to Total Assets	TS / TA

Table 2

Z Score	Zone	Probability of Bankruptcy
Z > 2.99	Safe	Low
1.81< Z > 2.99	Grey	Average
Z < 1.81	Distress	High

The formula of Z score model is mentioned below:

$$Z = 1.2(T_1) + 1.4(T_2) + 3.3(T_3) + 0.6(T_4) + 1(T_5)$$

The result of Z score model is classified in three zones namely safe, grey and distress zone. If the Z score value of a company has higher than 2.99 then this company is financially safe. If the Z score value of a company has between 1.81 to 2.99 then this company is in the grey zone and the probability of bankruptcy is average. If the value of Z score is less than 1.81 then this company is in the distress zone and the probability of bankruptcy is high.

Result and Discussion

Table 3: Working Capital to Total Assets

Year	BEL	HPCL	PGCIL	OIL	NMDC	NBCC	CCI
2020	0.24	-0.17	-0.04	0.10	0.15	0.12	0.15
2019	0.26	-0.13	-0.06	0.07	0.16	0.09	0.22
2018	0.24	-0.12	-0.09	0.08	0.19	0.21	0.20
2017	0.31	-0.16	-0.09	0.19	0.21	0.22	0.19
2016	0.39	0.01	-0.09	0.31	0.49	0.25	0.07
2015	0.45	0.06	-0.09	0.29	0.64	0.26	0.30
2014	0.42	0.06	-0.07	0.14	0.72	0.24	0.32
2013	0.38	-0.07	-0.08	0.50	0.72	0.24	0.39
2012	0.32	-0.08	-0.06	0.55	0.79	0.17	0.42
2011	0.33	-0.08	-0.01	0.50	0.82	0.11	0.41
Mean	0.33	-0.07	-0.07	0.27	0.49	0.19	0.27
SD	0.07	0.09	0.03	0.19	0.28	0.07	0.12

Table 3 provides the result of working capital to total assets ratio of Navratna companies, which reveal short term financial soundness of a company. Positive ratio indicating that company has enough money for short term outflows and negative ratio reflecting company is struggling in short term requirement. Most of the companies have positive value of WC to TA ratio except HPCL and PGCIL. The WC to TA ratio of HPCL and PGCIL showing companies difficulties in short term obligations.

Table 4 depicts the result of retained earnings to total assets of Navratna companies. Higher ratio suggesting that company has enough funds for reinvestment back into the business. All the companies have positive and increasing trend in this ratio. NMDC and CCI have highest ratio then other companies which are best for the companies. NBCC has lowest ratio in retained earnings suggesting that company is using borrowed funds for their expenses.

Table 4: Retained Earnings to Total Assets

Year	BEL	HPCL	PGCIL	OIL	NMDC	NBCC	CCI
2020	0.40	0.24	0.23	0.54	0.87	0.17	0.84
2019	0.43	0.26	0.22	0.56	0.86	0.17	0.80
2018	0.41	0.26	0.23	0.62	0.84	0.21	0.85
2017	0.42	0.25	0.23	0.62	0.86	0.23	0.87
2016	0.47	0.26	0.21	0.62	0.89	0.25	0.86
2015	0.51	0.23	0.21	0.58	0.93	0.25	0.86
2014	0.48	0.19	0.21	0.58	0.94	0.24	0.84
2013	0.43	0.18	0.19	0.74	0.88	0.22	0.85
2012	0.37	0.18	0.21	0.77	0.90	0.19	0.84
2011	0.37	0.20	0.22	0.72	0.89	0.17	0.84
Mean	0.43	0.22	0.22	0.64	0.89	0.21	0.85
SD	0.05	0.03	0.01	0.08	0.03	0.03	0.02

EBIT is a measurement of profitability which shows company's profit from its operations. Table 5 providing result of EBIT to Total assets of Navratna companies, which reflects how company exploiting its total assets to earn maximum profit. The result showed that all the Navratna companies have positive trend in EBIT to total assets ratio where NMDC secured highest result and PGCIL showing lowest result among all companies.

Table 5: EBIT to Total Assets

Year	BEL	HPCL	PGCIL	OIL	NMDC	NBCC	CCI
2020	0.10	0.02	0.05	0.06	0.20	0.03	0.12
2019	0.13	0.09	0.05	0.05	0.24	0.07	0.13
2018	0.11	0.11	0.05	0.06	0.21	0.07	0.13
2017	0.12	0.11	0.05	0.03	0.17	0.07	0.12
2016	0.10	0.08	0.04	0.06	0.14	0.08	0.14
2015	0.10	0.06	0.04	0.10	0.29	0.08	0.15
2014	0.08	0.03	0.05	0.13	0.31	0.08	0.16
2013	0.08	0.02	0.05	0.21	0.31	0.08	0.17
2012	0.07	0.02	0.05	0.22	0.41	0.08	0.18
2011	0.09	0.04	0.05	0.20	0.46	0.07	0.18
Mean	0.10	0.06	0.05	0.11	0.27	0.07	0.15
SD	0.02	0.04	0.00	0.07	0.10	0.02	0.02

Table 6 reveals the result of market capitalisation to total liabilities of Navratna companies of India which reflect company's market value and its ability to pay liability and high ratio reflects investors' confidence in financial strength of a company. The result showing mixed variation in all the Navratna companies. NMDC earn maximum result 59.66 in the year of 2011 where NBCC earn lowest result in the year of 2011.

Table 6: Market Capitalisation to Total Liabilities

Year	BEL	HPCL	PGCIL	OIL	NMDC	NBCC	CCI
2020	1.38	0.51	0.44	0.49	6.79	0.47	13.44
2019	1.46	0.76	0.55	1.02	8.33	0.89	14.28
2018	3.49	1.11	0.64	1.01	8.82	1.47	9.10
2017	3.62	0.78	0.71	1.10	13.23	0.21	7.25
2016	0.30	0.22	0.54	0.66	12.01	0.19	7.14
2015	0.12	0.21	0.66	0.93	24.12	0.22	9.36
2014	0.04	0.07	0.52	1.02	37.14	0.04	5.58
2013	0.04	0.05	0.58	2.57	16.12	0.04	2.96
2012	0.04	0.05	0.75	1.25	28.49	0.03	2.95
2011	0.05	0.08	0.87	1.12	59.66	0.03	4.33
Mean	1.05	0.38	0.63	1.12	21.47	0.36	7.64
SD	1.43	0.38	0.13	0.56	16.65	0.47	3.98

Table 7 describes the result of total sales to total assets of Z score model for Navratna companies during the year 2011 to 2020 which reflect company's effectiveness of sales from its total assets. Low ratio suggesting that company will need to use maximum source to generate maximum sales. Most of the company showing uptrend in terms of total sales to total assets ratio.

Table 7: Total Sales to Total Assets

Year	BEL	HPCL	PGCIL	OIL	NMDC	NBCC	CCI
2020	0.54	2.36	0.14	0.28	0.38	0.67	0.56
2019	0.59	2.65	0.14	0.29	0.41	0.87	0.55
2018	0.56	2.53	0.14	0.24	0.41	0.77	0.58
2017	0.50	2.38	0.13	0.21	0.34	0.96	0.56
2016	0.40	2.55	0.12	0.25	0.19	1.06	0.63
2015	0.45	3.06	0.11	0.27	0.36	0.98	0.64
2014	0.43	2.88	0.11	0.28	0.38	0.97	0.62
2013	0.42	2.71	0.11	0.40	0.35	0.86	0.61
2012	0.39	2.51	0.11	0.43	0.42	0.95	0.62
2011	0.42	2.20	0.11	0.39	0.54	0.96	0.67
Mean	0.47	2.58	0.12	0.30	0.38	0.91	0.60
SD	0.07	0.25	0.01	0.08	0.09	0.11	0.04

Table 8 provides the final result of Altman Z score model of selected seven Navratna companies which is listed on stock exchange for the period from 2011 to 2020. Average mean value of last ten year z score model of NMDC has highest value whereas PGCIL has lowest score among the all companies. Only three companies namely NMDC, CCI and HPCL have a more than 2.99 Z score which is 15.99, 7.18 and 3.23 respectively. These three companies are financially safe as per Z score model. OIL, BEL and NBCC have a Z score value between 1.81 to 2.99 which is 2.57, 2.43 and 1.88 respectively. The results of these companies are showing that these companies are in grey zone. Only one company namely PGCIL has Z score value 0.87 which is less than 1.81 and falls under the category of distress zone. The result of PGCIL also suggesting that the financial performance of this company is not well and management need to take some significant decision to protect this company from bankrupt.

Table 8: Result of Altman Z Score Model

Year	BEL	HPCL	PGCIL	OIL	NMDC	NBCC	CCI
2020	2.57	2.86	0.84	1.65	6.50	1.44	10.39
2019	2.82	3.60	0.85	1.95	7.60	1.97	10.93
2018	3.85	3.75	0.90	2.01	7.79	2.42	7.90
2017	4.03	3.38	0.93	2.08	10.29	1.92	6.75
2016	2.05	3.32	0.77	2.08	9.69	2.07	6.66
2015	2.10	3.78	0.82	2.32	17.83	2.06	8.31
2014	1.89	3.36	0.77	2.28	25.86	1.90	6.06
2013	1.76	2.96	0.81	4.27	13.13	1.74	4.59
2012	1.56	2.75	0.96	3.66	21.06	1.68	4.67
2011	1.66	2.55	1.09	3.35	40.09	1.57	5.54
Mean	2.43	3.23	0.87	2.57	15.99	1.88	7.18
SD	0.89	0.43	0.10	0.87	10.62	0.28	2.20

Table 9 reveals Anova result of WC to TA ratio, RE to TA ratio, EBIT to TA ratio, MC to TA ratio, and TS to TA ratio at 95% confidence level. The P Value of all the ratio was 0.0000 which is less then significant value 0.05 reflecting significant difference between selected samples in all the variables. Hence, the null hypothesis is rejected interpreting significant difference among the samples in all the variables.

Table 7 also providing the result of Anova test of Z score value for the Navratna companies. As per the result, probability value is 0.0000 which is less than 5% and F value (16.385) is higher than F critical value (2.246), so null hypothesis is accepted interpreting there is no significant difference in Z score result of Navratna companies.

Table 9: Result of ANOVA Test

	Particulars	SS	df	MS	F	P-value
WC to TA	Between Groups	2.555	6	0.426	20.199	0.0000
	Within Groups	1.328	63	0.021		
	Total	3.884	69			
RE to TA	Between Groups	5.329	6	0.888	507.550	0.0000
	Within Groups	0.110	63	0.002		
	Total	5.439	69			
EBIT to TA	Between Groups	0.361	6	0.060	22.794	0.0000
	Within Groups	0.166	63	0.003		
	Total	0.527	69			
MC to TA	Between Groups	3700.523	6	616.754	14.597	0.0000
	Within Groups	2661.817	63	42.251		
	Total	6362.340	69			
TS to TA	Between Groups	42.111	6	7.019	503.487	0.0000
	Within Groups	0.878	63	0.014		
	Total	42.989	69			
Altman Z Score	Between Groups	1677.931	6	279.655	16.385	0.0000
	Within Groups	1075.270	63	17.068		
	Total	2753.201	69			

The Z score value of HPCL, NMDC and CCI is more than 2.99 so these companies are in the safe zone and the probability of bankruptcy is very low. The Z score value of BEL, OIL and NBCC is more than 1.81 and less than 2.99 so these companies are in a grey zone and the probability of bankruptcy is average but management needs to utilize maximum resources for increasing Z score value for the safe zone. The Z score value of PGCIL is less than 1.81 so this company is in a distress zone and the probability of bankruptcy is very high. The management needs to take very strict action to increase the profitability of the PGCIL.

Conclusion

Excellent financial performance is a major necessity for a company's growth. Currently, businesses are bankrupt due to inadequate use of capital and inaccurate management's financial decisions. The Altman Z score model is ideally suited for this and is the most widely used model to forecast a company's bankruptcy before two years from its previous financial results. The findings of the Z score model is important because it allows management to make critical decisions before two years. This research study investigated seven Navratna companies of India which are listed on the stock exchange for a period from 2011 to 2020. NMDC has the highest mean of Z score value whereas PGCIL has the lowest mean of Z score value. According to the findings, only PGCIL is in a distress zone, which is potentially dangerous for the company; the probability of bankruptcy is high for this company, and management must take immediate steps to protect it from bankruptcy.

Limitations, Research Implications and Scope for Future Research

This study was limited to only seven Navratna companies out of fourteen Navratna companies and study period is limited to only ten years starting from 2011 to 2020. Maharatna companies and Miniratna companies which are government organised PSUs are excluded in this research study. So the result of this study cannot be applied to all government organised PSUs. Further study can be done with all Mahratna, Navratna and Miniratna companies. This research study included only Altman Z score model to predict financial bankruptcy so result of this study is limited to only for this model. Further study can be done with other financial model to predict financial bankruptcy.

This study will prove to be a major support to the management of companies with regard to the financial decisions they must make, as well as to investors. The findings produced by this study will be helpful to the various institutions such as banks and investing intuitions that will be lending money to companies in the coming years.

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