

Altman's Z-model an approach to predict the financial distress of selected companies of Tata Group in India

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Abstract

In India Z Altman's model has very less applicability and untouched in the research area, as this model has highly successful and have more than 85 percent of success rate there is a need to utilize this model for the Indian companies. The present study is about Z Altman's Score Model applied on four selected Tata Group companies, listed in the NSE for a study period of 2020-2022. Where the study concludes that, among the four selected companies

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Tata Chemicals which are reported as high financial healthiness with Z score of 2.94 which indicates that the company has strong financial standards and support and there is absolutely no scope for bankruptcy in the near future. Thereafter, Tata Steel company reported Z score of 1.86 which also indicates the company is financially doing well but there is a chance of being bankrupted. So, the company should be cautious about its existing operations and strategies. Thereafter, Tata Power company reported Z score of 1.35 which indicates it is in a very tough position where there is a need to take immediate actions to make sure the company to get it out of that situation as soon as possible. Finally, Tata Motors company reported Z score of 1.69 which indicates that it is in dangerous zone in terms of financial position there should be a huge chance of being bankrupt. So, the company should focus on rebuilding its financial structure in order to overcome the instability and financial distress. Thus, the present study concludes that, among the four companies which are selected among the Tata group three were in the safer position and the only one company was in the danger position due to pandemic affect.

Subject Classification: 91B05, 91G80.

Keywords: Zaltman's' model, Tata group, Financial distress, Bankruptcy.

1. Introduction

Financial distress is used to measure a situation of the companies facing the problem of repayment of their dues within a specified period of time, slowly that problem leads to bankruptcy in the long run. Financial distress used to measure the unnecessary struggle reveal by the corporate business units in meeting of financial obligations timely. The volume of financial distress supports the company initially to find out the financial un-healthiness and to take immediate measurements to address it. For every company the financial distress is high then that any company leads to lower credit rating which affects its fund rating capacity at economical rates. This also leads to rise in pressure on the payment of existing debts. In these some models are used for predicting financial distress in corporate sector these includes univariate model i.e., [1] and the another model is Multiple discriminate analysis model which includes, [2]. There are so many elements which are effected financial position of the company and leads to distress such as changes in technology, problems in management. In the company internal Frauds and Scams, lack of Investment, Inability to proper utilisation of Funds, if the situation continues for a long run which ultimately results in cost more than the expenditure of the company, it might be leads to not repayment of their dues and high chance to face the bankruptcy. These models are prescribed to calculate the financial distress

of the company [3]. It will predict the situations before and it helps to the companies to liquidate before getting high pressure.

Sharma and Patra [4] explained how the companies are facing the problems mainly in developed countries and reasons for not able to survive in the market. It also pointed out the some of the major reasons for companies which are suffering from financial Distress and Bankruptcy. Isayas [5] investigated the selected insurance companies from the time period 2008 to 2019 by using various statistical tools by exclusive study on having negative impact on financial distressed insurance companies. Further it is focused on risk management in order to pretend the financial distress situation of the companies, the model suggests that the companies should improve their fundamental routes of financial sources mainly using comprehensive data. This journal is prepared based on study on large data which includes companies defaulted in payments and which are under high financial distress by considering the external environment issues and suggested re-capitalise options before the situation getting worse. Besides, the inadequate cash flows in the firm is one of the reasons for the financial crisis [6].

2. Conceptual Framework

Corporate bankruptcy is one of the severe phenomenon's which shows negative financial and social impact on stakeholders such as customers, creditors, investors, employees, [7]. The bankruptcy is not an overnight event nor gradual process, it shows some early signs to predict soon. There are over 25 multidisciplinary approaches are in existence to predict the bankruptcy since 1932 included theoretical, statistical and machine learning approaches. In each approach variety of input variables are used popularly Z atman's approach is based on the accounting literature extracted from the figures from balance sheet. The bankruptcy model prediction was started since 1930 with financial ratios and continued in 1960s single use factor ratio for comparison. In 1966 Beaver developed univariate analysis, thereafter, in 1968 Altman's used first time the discriminate analysis in bankruptcy prediction. Thereafter, neural networks in 1999 [8], [9], further genetic algorithms used in 2002 with machine learning which is sub-field of Artificial intelligence. In 2017 [10] compared five machine learning models with traditional statistical models and revealed that high accuracy of machine learning models in bankruptcy prediction. Described the issues of companies in different sectors which are facing severe financial issues taking a huge sample size, he proposed

various models to measure the financial distress by taking the aspects like accounting, finance, Fundamental and technical analysis which are relevant to predict the financial position and even suggested the models to forecast growing companies. The earlier causes for bankruptcy are categorized into seven major factors such as accidental events, market issues, financial threats, managerial and information concerns, macro-economic issues, cost and production structure and strategic failures. [11] observed that high cost of misclassification in z-score model as compared to DEA and ANN models.

3. Review of literature

Bankruptcy prediction is emerged as one of the most well researched topics in the finance and strategic management literature which should be developed well [12]. Pongsat [13] defined bankruptcy as the inability of an entity to continue its operations due to high debt obligations. In general bankruptcy occurs in two main situations where company's operating cash flows are inadequate to meet current obligations and net worth is negative (external liabilities are higher than assets) and Muthukumar and Sekar [14] examined the financial distress of automobile sector in India through adoption of Altman Z score and Springate models for the period 2003 to 2012. The model outcome found that none of the selected companies are in a distressed state. Hillegeist et al. [2] done a comparison of market based approach with some accounting based approaches and revealed that information under market-based approach provides is highly reliable to enhance the prediction of default probability of an entity than accounting-based approach. [15] forecasted the default probability rate of Iranian companies through applying of MDA and Genetic Programming (GP) techniques and found that GP has high accuracy of default prediction than MDA. Charitou, Neophytou and Charalambous [16] attempted to develop a bankruptcy prediction models for UK industrial firms by adopting Neural Networks and Logistic Regression techniques and revealed that neural network model has highest accuracy rate for all three years prior to insolvency. The variables to measure the financial distress are broadly classified into three major groups such as financial variables of the firm, economic environment and financial markets aspects. Philippe [17] research studies observed more than 190 earlier research works done and revealed that 93 percentage of studies uses financial ratios as variables, where 28 percentage used statistical tools (descriptive statistical, factor analysis, logarithm), 14 percentage used variation variables, 13 percentage

used non-financial variables, six percentage used market variables and five percentage used financial market variables. This indicates financial ratios are wide used parameters of bankruptcy prediction which are also used in the present study. Lin and Pan [18] study revealed that Z score along with other model GAANFIS produces more reliable and accurate result. [19] found that non-parametric procedures such as Linear Goal Programming (LGP) and LOGIT models have advantage than the MDA

Model description: Altman's z-score model

Altman's Z-score Model is an Important and successful prediction model of financial distress of a company which is a tool that helps to calculate the possibility of a company's bankruptcy. It was developed in late 1960s and introduced by Edward Altman and this model is based on combination of different financial ratios in order to calculate the Z score model.

The Z-score is calculated using the following formula:

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

Where:

X_1 = Working Capital / Total Assets

X_2 = Retained Earnings / Total Assets

X_3 = Earnings Before Interest and Taxes (EBIT) / Total Assets

X_4 = Market Value of Equity / Total Liabilities

X_5 = Sales / Total Assets

The Z-score resulted will indicate the probability of company to be Bankrupted. The Z score below to 1.8 represents that the company have very high chance to be Bankrupted, while the Z score in between 1.8 to 2.7 will give the indication as an emergency situation, as there is a possibility for the company to be in a Financial Distressed situation within few coming operating years, If the score is in between 2.7 to 2.99 it is also an indication or reminder to a company to be cautious and revise the existing business strategies, If the score is above 3.0 it indicates that the company is financially good. The Altman's Model was been used in the analysis of a company, because it is very easy and simple and easy to calculate the formula and give us a report on company's financial health. However, it is also criticized for being too simple and also neglecting other factors i.e., External and fundamental factors of a company which are the other causes

that affect a company's financial health. This model is an important useful tool for predicting a company's financial position and possibility of bankruptcy. In order to understand more appropriate about the company financial analysis, one should also take the other alternative methods conjunction to the Z score model for better understanding

Research Problem:

The financial distress is an emerging topic in the world in the early prediction of corporate failures. The financial distress indicates how corporate sector is facing the pressure in repayment of debt timely. This continuation of financial distress leads to bankruptcy. This affect the stakeholders of the company very negatively their investments and capital. Therefore, financial distress prediction models gain significance in business world. Z Altman's models in one of the multivariate model popularly used to predict the financial bankruptcy two years early. Thus, present study investigated the validity and reliability of Z Altman's model in the context of Indian companies with reference to Mahandra group of companies.

Objectives of the Study

- To predict financial distress of the four selected Tata group of companies for the period of 2020-2022

1.3 Sample Size

In the present study four companies from the Mahindra group are selected randomly such as Tata power, Tata Chemicals, Tata Steel and Tata Motors. The applied sample selection technique is purpose sampling.

1.4 Research Methodology

The present study is purely based on the secondary data collected from the company annual reports. The selected parameters are five ratios mentioned in the Z Altman's model. The study period is 2020-2022. The applied techniques are financial ratios and percentage. The ratios comprises of Working Capital / Total Assets, Retained Earnings / Total Assets, Earnings Before Interest and Taxes (EBIT) / Total Assets, $D = \text{Market Value of Equity} / \text{Total Liabilities}$, $E = \text{Sales} / \text{Total Assets}$

Model Values Description:

Z score	Indication
1.8 and less	Severe financial distress and change for bankruptcy immediately
Between 1.8-2.7	Alarming situation and change for bankruptcy in two years
Between 2.7 to 2.99	Caution period need to take reforms
3 and above	Financially healthy

Source: As Atman's Z model [20]

Data Analysis and Interpretation

Table 1
Z score calculation of Tata Power company for the study period of 2020-2022

Year 2021-2022		Numerator (Rs Cr)	TA or TL (Rs Cr)	Ratios (x)	$1.2x_1 + 1.4x_2 + 3.3x_3 + 0.6x_4 + 1.0x_5$	Avg.Z -score
X_1	Working Capital / Total Assets	8,422.08	47,153.40	0.179	0.21	2.08
X_2	Retained Earnings / Total Assets	10,560.24	47,153.40	0.224	0.31	
X_3	EBIT / Total Assets	4,486.12	47,153.40	0.095	0.31	
X_4	MV of Equity/ Total Liabilities	78,429.61	47,153.40	1.663	1.00	
X_5	Sales / Total Assets	11,107.93	47,153.40	0.236	0.24	
Year 2020-2021						
X_1	Working Capital / Total Assets	5,302.79	42,868.95	0.124	-0.15	1.20
X_2	Retained Earnings / Total Assets	16,559.00	42,868.95	0.386	0.54	
X_3	EBIT / Total Assets	2,553.07	42,868.95	0.060	0.20	
X_4	MV of Equity/ Total Liabilities	33,662.90	42,868.95	0.785	0.47	
X_5	Sales / Total Assets	6,180.59	42,868.95	0.144	0.14	

Contd...

Year 2019-2020						
X ₁	Working Capital / Total Assets	5,698.92	37,616.48	0.152	-0.18	0.78
X ₂	Retained Earnings / Total Assets	13,491.47	37,616.48	0.359	0.50	
X ₃	EBIT / Total Assets	1,417.26	37,616.48	0.038	0.13	
X ₄	MV of Equity / Total Liabilities	8,154.89	37,616.48	0.210	0.13	
X ₅	Sales / Total Assets	7,726.39	37,616.48	0.205	0.21	
Overall Z score						1.35
Source: Computed by researcher						

Table 01: The result obtained from above method shows that, Tata Power company of Tata Groups, in 2019-20 the variables X₁ was 0.152, X₂ was 0.359, X₃ is 0.038, X₄ was 0.210 and X₅ was 0.205. These ratios were incorporated in the formulation of Z score model, then the following result abstracted for the respective ratios as -0.18, 0.50, 0.13, 0.13 and 0.21. From that, the overall Z-Score obtained for the year 2019-20 was 1.35. The result shown that, Tata Power company, in 2020-21, the X₁ was 0.124, X₂ was 0.386, X₃ was 0.060, X₄ was 0.785 and X₅ was 0.144. These ratios were incorporated in the Z score model and then the following result evidenced for all the respective ratios as -0.15, 0.54, 0.20, 0.47 and 0.14. Thus, the overall Z-Score for the year 2019-20 is 1.20. Finally, in 2021-22, Tata Power company of Tata Groups, X₁ was 0.179, X₂ ratio was 0.224, X₃ was 0.095, X₄ was 1.663 and X₅ was 0.236. These ratios were incorporated in the Z score model, from that the following result abstracted for all the respective ratios as 0.21, 0.31, 0.31, 1.00 and 0.24. Therefore, the overall Z-Score for the year 2019-20 was 1.35.

Table 2
Z score calculation of Tata Chemicals company for the study period of 2020-2022

Year 2021-22		Numerator (Rs Cr)	TA or TL (Rs Cr)	Ratios (x)	$1.2x_1 + 1.4x_2 + 3.3x_3 + 0.6x_4 + 1.0x_5$	Avg.Z-score
X ₁	Working Capital / Total Assets	1,715.82	17,017.10	0.101	0.12	2.67

Contd...

X_2	Retained Earnings / Total Assets	15,087.50	17,017.10	0.887	1.24	
X_3	EBIT / Total Assets	1,039.05	17,017.10	0.061	0.20	
X_4	MV of Equity / Total Liabilities	25,149.54	17,017.10	1.478	0.89	
X_5	Sales / Total Assets	3,720.93	17,017.10	0.219	0.22	
Year 2020-21						
X_1	Working Capital / Total Assets	1,837.04	14,665.28	0.125	0.15	2.56
X_2	Retained Earnings / Total Assets	13,002.35	14,665.28	0.887	1.24	
X_3	EBIT / Total Assets	654.07	14,665.28	0.045	0.15	
X_4	MV of Equity / Total Liabilities	19,848.06	14,665.28	1.353	0.81	
X_5	Sales / Total Assets	2,998.88	14,665.28	0.204	0.20	
Year 2019-20						
X_1	Working Capital / Total Assets	2,128.99	13,395.75	0.159	0.19	3.61
X_2	Retained Earnings / Total Assets	11,722.50	13,395.75	0.875	1.23	
X_3	EBIT / Total Assets	7,008.50	13,395.75	0.523	1.73	
X_4	MV of Equity / Total Liabilities	5,567.70	13,395.75	0.416	0.25	
X_5	Sales / Total Assets	2,920.29	13,395.75	0.218	0.22	
Overall Z score						2.94
Source: Computed by researcher						

Table 02: The result obtained from above method shows that, Tata Power company of Tata Groups, in 2019-20 X_1 was 0.159, X_2 was 0.875, X_3 is 0.0523, X_4 was 0.416 and X_5 was 0.218. These ratios were incorporated in the formulation of Z score model, then the following result abstracted for the respective ratios as 0.19, 1.23, 1.73, 0.25 and 0.22. From that, the overall Z-Score obtained for the year 2019-20 was 2.94. The result shown that, Tata Power company, in 2020-21, the X_1 was 0.125, X_2 was 0.887, X_3 was 0.045, X_4 was 1.353 and X_5 was 0.204. These ratios were incorporated in the Z score model and then the following result evidenced for all the respective ratios as 0.15, 1.24, 0.15, 0.81 and 0.20. Thus, the overall Z-Score for the year 2019-20 is 2.56. Finally, in 2021-22, Tata Power company of Tata Groups, X_1 was 0.101, X_2 was 0.887, X_3 was 0.061, X_4 was 1.478 and X_5 as 0.219. These ratios

Table 03: The result obtained from above method shows that, Tata Power company of Tata Groups, in 2019-20 X_1 was 0.072, X_2 was 0.488, X_3 is 0.062, X_4 was 0.474 and X_5 was 0.402. These ratios were incorporated in the formulation of Z score model, then the following result abstracted for the respective ratios as -0.09, 0.68, 0.20, 0.28 and 0.40. From that, the overall Z-Score obtained for the year 2019-20 was 1.86. The result shown that, Tata Power company, in 2020-21, the X_1 was 0.004, X_2 was 0.516, X_3 was 0.129, X_4 was 0.407 and X_5 was 0.466. These ratios were incorporated in the Z score model and then the following result evidenced for all the respective ratios as -0.01, 0.72, 0.42, 0.24 and 0.47. Thus, the overall Z-Score for the year 2019-20 is 1.85. Finally, in 2021-22, Tata Power company of Tata Groups, X_1 was 0.101, X_2 was 0.516, X_3 0.129, X_4 was 0.407 and X_5 was 0.466. These ratios were incorporated in the Z score model, from that the following result abstracted for all the respective ratios as -0.01, 0.72, 0.42, 0.24 and 0.47. Therefore, the overall Z-Score for the year 2019-20 was 2.25.

Table 04: The result obtained from above method shows that, Tata Power company of Tata Groups, in 2019-20, X_1 Ratio was -0.196, X_2 was 0.268, X_3 is -0.083, X_4 was 0.408 and X_5 was 0.702. These ratios were incorporated in the formulation of Z score model, then the following result abstracted for the respective ratios as -0.23, 0.38, -0.28, 0.25 and 0.70. From that, the overall Z-Score obtained for the year 2019-20 was 1.60. The result shown that, Tata Power company, in 2020-21, the X_1 was -0.160, X_2 ratio was 0.281, X_3 was -0.004, X_4 was 1.776 and X_5 was 0.464. These ratios were incorporated in the Z score model and then the following result evidenced for all the respective ratios as -0.19, 0.39, -0.01, 1.07 and 0.46. Thus, the overall Z-Score for the year 2019-20 is 1.72. Finally, in 2021-22, Tata Power company of Tata Groups, X_1 was -0.178, X_2 was 0.300, X_3 was 0.012, X_4 was 2.599 and X_5 was 0.740. These ratios were incorporated in the Z score model, from that the following result abstracted for all the respective ratios as -0.21, 0.42, 0.04, 1.56 and 0.74. Therefore, the overall Z-Score for the year 2019-20 was 2.55.

Table 4
Z score calculation of Tata Motors company for the study period of 2020-2022

Year 2021-22		Numerator (Rs Cr)	TA or TL (Rs Cr)	Ratios (x)	$1.2 x + 1.4 x_2 + 3.3 x_3 + 0.6 x_4 + 1.0 x_5$	Avg. Z-score
X ₁	Working Capital / Total Assets	-11,373.20	63,899.87	-0.178	-0.21	2.55
X ₂	Retained Earnings / Total Assets	19,171.88	63,899.87	0.300	0.42	
X ₃	EBIT / Total Assets	793.02	63,899.87	0.012	0.04	
X ₄	MV of Equity/ Total Liabilities	166090.03	63,899.87	2.599	1.56	
X ₅	Sales / Total Assets	47,263.68	63,899.87	0.740	0.74	
Year 2020-21						
X ₁	Working Capital / Total Assets	-10,396.96	65,059.66	-0.160	-0.19	1.72
X ₂	Retained Earnings / Total Assets	18,290.16	65,059.66	0.281	0.39	
X ₃	EBIT / Total Assets	-273.97	65,059.66	-0.004	-0.01	
X ₄	MV of Equity/ Total Liabilities	115553.51	65,059.66	1.776	1.07	
X ₅	Sales / Total Assets	30,175.03	65,059.66	0.464	0.46	
Year 2019-20						
X ₁	Working Capital / Total Assets	-12,242.06	62,589.87	-0.196	-0.23	0.81
X ₂	Retained Earnings / Total Assets	16,800.61	62,589.87	0.268	0.38	
X ₃	EBIT / Total Assets	-5,223.41	62,589.87	-0.083	-0.28	
X ₄	MV of Equity/ Total Liabilities	25560.07	62,589.87	0.408	0.25	
X ₅	Sales / Total Assets	43,928.17	62,589.87	0.702	0.70	
Overall Z score Source: Computed by researcher						1.69

Conclusion

The underperformance of defaulted business strategies, which will destroy the company's Financial boundaries, if the same situation continues further still in the long operating run it will affect the financial stability of the company, which can be simply called as financial distress situation in financial language. By studying various methods to predict the financial distress of a company, there is a chance to forecast the future and can take the review and further needs to change all the existing business strategies and make them better in order to save the company being bankrupted To know about the company's financial position, there are many financial distress predication models where, one of the important and successful model to predict the financial distress is Z Altman's model which is very popular across the world. However, In India this model has very less applicability and untouched in the research area, as this model has highly successful and have more than 85 percent of success rate there is a need to utilize this model for the Indian companies. The present study is about Z Alman's Score Model applied on four selected Tata Group companies, listed in the NSE for a study period of 2020-2022. Where the study concludes that, among the four selected companies Tata Chemicals which are reported as high financial healthiness with Z score of 2.94 which indicates that the company has strong financial standards and support and there is absolutely no scope for bankruptcy in the near future. Thereafter, Tata Steel company reported Z score of 1.86 which also indicates the company is financially doing well but there is a chance of being bankrupted during emergency situations. So the company should be cautious about its existing operations and strategies. Thereafter, Tata Power company reported Z score of 1.35 which indicates it is in a very tough position where there is a need to take immediate actions to make sure the company to get it out of that situation as soon as possible, However, this is particularly attributable inclusion of 2019-20 year i.e. pandemic period. Finally, Tata Motors company reported Z score of 1.69 which indicates that it is in dangerous zone in terms of financial position there should be a huge chance of being bankrupt. So the company should focus on rebuilding its financial structure in order to overcome the instability and financial distress. Thus, the present study concludes that, among the four companies which are selected among the Tata group three were in the safer position and the only one company was in the danger position. The study also observed that, in three years of study period out of four companies except chemical, rest of three companies Z score was lowest during pandemic period which is evidence that, uncertainty in business operations causes the financial distress situations.

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