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Using the Altman Z-Score Model to Forecast the Financial Distress of a Subset of NIFTY 50 Companies in the Indian Stock Market

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Abstract

The financial stability of a company has a significant impact on the growth of a country and the well-being of society. Financially sound companies safeguard stakeholders' funds and utilize them for the benefit of society and the nation. This study aims to assess the financial distress status of selected NIFTY 50 companies in the Indian Stock Market. Out of the 50 NIFTY 50 companies, only those outside the finance industry were chosen for analysis. The researcher utilized the financial statements of these companies as secondary data for the period 2022-23. This research paper is descriptive and analytical in nature. The Altman Z-Score model was used by the researcher to measure the financial distress of the companies, revealing that out of the 39 selected companies, 9 are in a state of bankruptcy.

Keywords: Financial distress, NIFTY 50 Companies, Altman Z-Score.

Introduction

The financial stability of a company greatly impacts its operations. Financial instability jeopardizes a company's survival and leads to its demise. The corporate sector suffered significant consequences from the financial crisis of 2008 and the subsequent recession. Despite increasing debt, business profitability sharply declined. Corporate failure is a prevalent issue in both emerging and developed economies. By taking preventive measures, a company facing bankruptcy may mitigate the severe consequences of a complete collapse. In light of the 2008 global financial crisis and the failures of major American and European organizations, stakeholders now have an even greater need to assess the financial health of their organizations. Businesses must be capable of meeting their debt obligations to sustain operations and expansion. Liquidity refers to the ability to sell an asset at its fair market value to meet ongoing cash flow requirements or unexpected financial demands. Liquidity risk entails the possibility that a company may not have the necessary cash or liquid assets to fulfill its financial commitments.

Financial Distress

Financial distress occurs when a company's obligations exceed its assets. This situation is often caused by undercapitalization, insufficient cash reserves, inefficient resource utilization, poor management practices, declining sales, and unfavorable market conditions. Despite experiencing deadweight losses, a financially distressed company may still have insufficient cash flow but is not yet insolvent. Various disciplines and perspectives, such as political philosophy, legal theory, management, economics, accounting, and finance, have been employed to explore the diverse aspects of financial distress. Continuous losses lead to a significant increase in liabilities and a decrease in asset values, ultimately resulting in financial distress and potential collapse.

Literature Review

In a study conducted by Toly A in 2019, titled "The Effect of Financial Ratio (Altman Z-Score) on Financial Distress Prediction in the Manufacturing Sector in Indonesia 2016-2018," the potential for financial distress in publicly traded industrial businesses in Indonesia was investigated. The manufacturing sector was chosen due to its significant contribution to the Indonesian economy. The Altman Z-Score model was utilized to forecast bankruptcy. The study calculated the four ratios necessary to determine the Z-Score for a total of 139 companies, covering the years 2016 and 2017. The researcher concluded that all four ratios used in the Altman Z-Score model had a positive impact on the financial distress of the companies.

Another study by Panigrahi in 2019 examined the validity of Altman's Z-Score model. The researcher analyzed financial data from companies over a five-year period, ranging from 2012 to 2017. The study found that the average Z-Score was 5.9, indicating that the pharmaceutical industry was in a safe zone.

In a research conducted by Ningsih S in 2018, titled "Analysis Method of Altman Z-Score Modifications to Predict Financial Distress in the Automotive and Components Subsector of Publicly Listed Companies," the financial distress of automotive sector companies from 2012 to 2016 was examined. The study included a sample of 64 companies, and it was discovered that several of these companies were experiencing financial distress, as identified using the Altman Z-Score model.

(Subagyo A, 2017) The aim of this study was to investigate the relationship between the five financial metrics in the Altman Z-Score model. The data analysis in this study employed a basic methodology known as simple regression and multiple regression. The sample, consisting of randomly selected companies from the Stock Exchange's list for the calendar year 2014, included up to 26 companies. The research's conclusions resulted in the development of a model that considers two variables impacting the Altman Z-Score ratio. The first model had minimal impact on the variable financial ratios in the Altman Z-Score, while models with greater influence showed more significant impact.

(Rulandari N, 2017) conducted a study titled "Financial Ratio (Altman Z-Score) with Statistical Modeling" to investigate the communication of data and analytical conclusions through multiple regression and descriptive analysis. The researcher selected companies listed on the National Stock Exchange for the year 2014, and the financial statements of these

companies were analyzed to calculate the Z-Score value.

(Edward A, 2017) conducted research on "Financial Distress Prediction in an International Context." The objective of this study was to predict financial distress in an international setting.

Context

"A Review and Empirical Analysis of Altman's Z-Score Model" - The researcher measured the performance of the Z-Score model for thirty-one European and three non-European countries. Non-financial private companies were selected as samples, and the researcher concluded that the Z-Score model performs well compared to other models in predicting financial distress of companies.

In a study conducted by MacCarthy in 2017 titled "Using Altman Z-Score and Beneish M-Score Models to Detect Financial Fraud and Corporate Failure: A Case Study of Enron Corporation," the aim was to determine whether the Altman Z-Score model and Beneish M model could predict financial fraud and corporate failure in European corporations. The researcher collected data from a US database spanning from 1996 to 2000. The study concluded that stakeholders should use both the Altman Z-Score model and Beneish M model, as the combination of the two models provides more accurate results for assessing financial distress, rather than relying on a single model.

Thai S conducted a research in 2014 titled "A Revisited of Altman Z-Score Model for Companies Listed in Bursa Malaysia." The study included a sample size of 30 companies, with 15 facing financial distress and 15 not facing financial distress. The researcher analyzed data for five years and examined all five ratios of the Altman Z-Score model. The study concluded that the working capital to total assets ratio was the most significant variable.

Research Problem

It is crucial to detect financial distress in its early stages in order to facilitate the implementation of appropriate steps and strategies to overcome it. If a company goes bankrupt, the costs associated with the bankruptcy are borne by all stakeholders. Therefore, early identification of financial distress is beneficial for the well-being of all company stakeholders. When a company is unable to generate sufficient cash flows to meet its obligations, it gradually falls into financial distress. This research aims to assess the position of selected companies, determining whether they are in a safe financial position or nearing the distress zone.

Research Objective

The objective of this research is to evaluate the financial distress status or financial health of the selected companies using the Altman Z-Score Model.

Research Methodology

The following table presents the research methodology employed by the researcher. Table 1 displays the research methodology utilized.

Table 1.

Particulars	Research Methodology Used
Research Type	This study is descriptive and analytical in nature.
Sampling Unit	Selected NIFTY 50 companies
Sample Size	The researcher has selected 39 companies out of the 50 companies in the NIFTY 50.
Sample Selection	Companies from sectors other than finance were chosen from the NIFTY 50.
Data Used	The researcher utilized secondary data.
Source of Data	Financial statements of the companies
Period of Study	The researcher used financial data for the year 2022-23.

Review of Altman Z score Model

The Altman Z-Score model was originally developed by Edward I. Altman in 1968. The original sample consisted of 66 corporations, with 33 companies in each group, covering the period from 1946 to 1965. The researcher utilized secondary data, such as income statements and balance sheets of the companies. Out of the 22 financial ratios used by Altman, five standard ratios were identified and analyzed. These ratios are as follows:

Table 2 shows the formulas for the ratios used in the Altman Z-Score Model.

Table 2.

Sr. No.	Ratio	Formula
1.	Working Capital to Total Assets Ratio	Working Capital / Total Assets
2.	Retained Earnings to Total Assets Ratio	Retained Earnings / Total Assets
3.	EBIT to Total Assets Ratio	EBIT / Total Assets
4.	Market value of Equity to Total Liabilities Ratio	Market Value of Equity / Total Liabilities
5.	Sales to Total Assets Ratio	Sales / Total Assets

Importance and Interpretations of the above Five Ratios

- **R1:** Working Capital to Total Assets Ratio: This ratio assesses the net liquid assets of companies or firms in relation to

their total capitalization. It helps determine the financial health and liquidity position of the company.

- **R2:** Retained Earnings to Total Assets Ratio: Retention of earnings is crucial for a company's business expansion. This ratio also indicates the firm's leverage, as a higher retention ratio compared to total assets indicates less reliance on debt for capital financing.
- **R3:** EBIT to Total Assets Ratio: This ratio measures the actual productivity of a company's assets, independent of tax and leverage factors. It provides insights into the company's operational efficiency and profitability.
- **R4:** Market Value of Equity to Total Liabilities Ratio: This ratio determines how much a company's assets would need to decline in value before its liabilities (current and non-current) exceed its assets, leading to insolvency. It indicates the company's ability to withstand financial losses.
- **R5:** Sales to Total Assets Ratio: This ratio defines the sales-generating capacity of a company's assets. It helps evaluate the company's efficiency in utilizing its assets to generate revenue.

Table 3 shows the ratios of selected companies from the NIFTY 50

Table 3.

Sr.	Name of the Company	R1	R2	R3	R4	R5
1	Adani Enterprises Ltd.	0.059	0.213	0.051	0.323	1.23
2	Adani Port and Special Economic Zone Ltd.	0.026	0.348	0.008	0.044	0.056
3	Apollo Hospital	0.21	0.580	0.082	0.181	0.58
4	Asian Paints	0.356	0.665	0.213	0.545	1.26
5	Bajaj Auto Ltd.	0.166	0.826	0.157	0.235	1.038
6	Bharti Airtel Ltd.	-1.14	0.2672	-0.0078	0.028	0.247
7	Bharat Petroleum Corp. Ltd.	-1.119	0.315	0.079	0.0088	2.49
8	Britannia Industries Ltd.	-0.036	0.339	0.306	0.272	1.85
9	Cipla Ltd.	-0.36	0.876	0.105	0.340	0.54
10	Coal India Ltd	0.134	0.454	0.506	0.263	0.05
11	Divi's Laboratories Ltd.	0.535	0.874	0.276	6.77	0.74
12	Dr. Reddy's Laboratories Ltd.	0.502	0.745	0.090	0.139	0.62
13	Eicher Motors Ltd.	0.183	0.753	0.147	0.305	0.75
14	Grasim Industries Ltd.	0.040	0.772	0.047	0.097	0.36
15	HCL Technologies Ltd.	0.334	0.787	0.248	0.314	0.75
16	Hero MotoCorp Ltd.	0.232	0.723	0.149	0.111	1.33
17	Hindalco Industries Ltd.	0.106	0.546	0.086	0.028	0.72
18	Hindustan Unilever Ltd.	0.053	0.695	0.168	0.341	0.74
19	Infosys Ltd.	0.276	0.670	0.286	0.252	1.08
20	ITC Ltd.	0.545	0.783	0.264	0.361	0.77
21	JSW Steel Ltd.	0.008	0.388	0.156	0.022	0.8
22	Larsen & Toubro Ltd.	0.488	0.711	0.257	1.07	1.33
23	Mahindra & Mahindra Ltd.	0.105	0.568	0.095	0.066	0.91
24	Maruti Suzuki India Ltd.	-0.003	0.734	0.062	0.158	1.23
25	Nestle India Ltd.	0.045	0.263	0.370	0.350	1.97
26	NTPC Ltd.	-0.009	0.33	0.05	0.008	0.33
27	Oil And Natural Gas Corporation Ltd.	-0.002	0.684	0.121	0.022	0.34
28	Power Grid Corporation of India Ltd.	-0.04	0.279	0.066	0.010	0.16
29	Reliance Industries Ltd.	0.024	0.528	0.05	0.051	0.48
30	Sun Pharmaceutical Industries Ltd.	-0.009	0.59	0.052	0.179	-0.24
31	Tata Consumer Products Ltd.	0.168	0.818	0.082	0.323	0.57
32	Tata Motors Ltd.	-0.177	0.300	-0.026	0.040	0.73
33	Tata Steel Ltd.	-0.1008	0.559	0.199	0.01	0.64
34	Tata Consultancy Services Ltd.	0.464	0.633	0.410	0.326	1.39
35	Tech Mahindra Ltd.	0.295	0.724	0.179	0.150	1.02
36	Titan	0.338	0.461	0.118	0.137	1.51
37	UltraTech Cement Ltd.	-0.002	0.606	0.087	0.077	8.76
38	UPL Ltd.	0.072	0.409	0.064	0.056	0.94
39	Wipro Ltd.	0.355	0.662	0.189	0.09	0.82

(Source: www.moneycontrol.com)

Calculation of Z-Score: The formula to calculate the value of Z-Score is as follows:

$Z = 1.2R_1 + 1.4R_2 + 3.3R_3 + 0.6R_4 + .999R_5$

Measurement of Financial Health: According to Altman, the following guidelines can be used to determine whether a firm is financially sound or bankrupt.

Table 4 shows the Guidelines for Z-Score Values:

Table 4.

Situation	Z-Score	Zones	Result
1	Below 1.8	Bankruptcy Zone	Failure is certain
2	1.8 to 3	Healthy Zone	May or may not fail
3	Above 3	Too Healthy	Will not fail

Table 5 shows the Z-Score Value and Interpretation for Selected Companies of NIFTY 50:

Table 5.

Sr.	Name of the Company	Z-Score	Interpretations
1	Adani Enterprises Ltd.	1.96	Healthy Zone
2	Adani Port and Special Economic Zone Ltd.	0.63	Bankruptcy Zone
3	Apollo Hospital	2.03	Healthy Zone
4	Asian Paints	3.65	Too Healthy
5	Bajaj Auto Ltd.	3.04	Too Healthy
6	Bharti Airtel Ltd.	-0.76	Bankruptcy Zone
7	Bharat Petroleum Corp. Ltd.	3.04	Too Healthy
8	Britannia Industries Ltd.	3.43	Too Healthy
9	Cipla Ltd.	1.88	Healthy Zone
10	Coal India Ltd	2.67	Healthy Zone
11	Divi's Laboratories Ltd.	7.57	Too Healthy
12	Dr. Reddy's Laboratories Ltd.	2.64	Healthy Zone
13	Eicher Motors Ltd.	2.69	Healthy Zone
14	Grasim Industries Ltd.	1.71	Bankruptcy Zone

15	HCL Technologies Ltd.	3.25	Too Healthy
16	Hero MotoCorp Ltd.	3.17	Too Healthy
17	Hindalco Industries Ltd.	1.91	Healthy Zone
18	Hindustan Unilever Ltd.	2.53	Healthy Zone
19	Infosys Ltd.	3.44	Too Healthy
20	ITC Ltd.	3.60	Too Healthy
21	JSW Steel Ltd.	1.87	Healthy Zone
22	Larsen & Toubro Ltd.	4.39	Too Healthy
23	Mahindra & Mahindra Ltd.	2.18	Healthy Zone
24	Maruti Suzuki India Ltd.	2.54	Healthy Zone
25	Nestle India Ltd.	3.81	Too Healthy
26	NTPC Ltd.	0.97	Bankruptcy Zone
27	Oil And Natural Gas Corporation Ltd.	1.71	Bankruptcy Zone
28	Power Grid Corporation of India Ltd.	0.72	Bankruptcy Zone
29	Reliance Industries Ltd.	1.45	Bankruptcy Zone
30	Sun Pharmaceutical Industries Ltd.	0.87	Bankruptcy Zone
31	Tata Consumer Products Ltd.	2.38	Healthy Zone
32	Tata Motors Ltd.	0.86	Bankruptcy Zone
33	Tata Steel Ltd.	1.97	Healthy Zone
34	Tata Consultancy Services Ltd.	4.36	Too Healthy
35	Tech Mahindra Ltd.	3.06	Too Healthy
36	Titan	3.01	Too Healthy
37	UltraTech Cement Ltd.	9.85	Too Healthy
38	UPL Ltd.	1.84	Healthy Zone
39	Wipro Ltd.	2.85	Healthy Zone

Analysis and Interpretation:

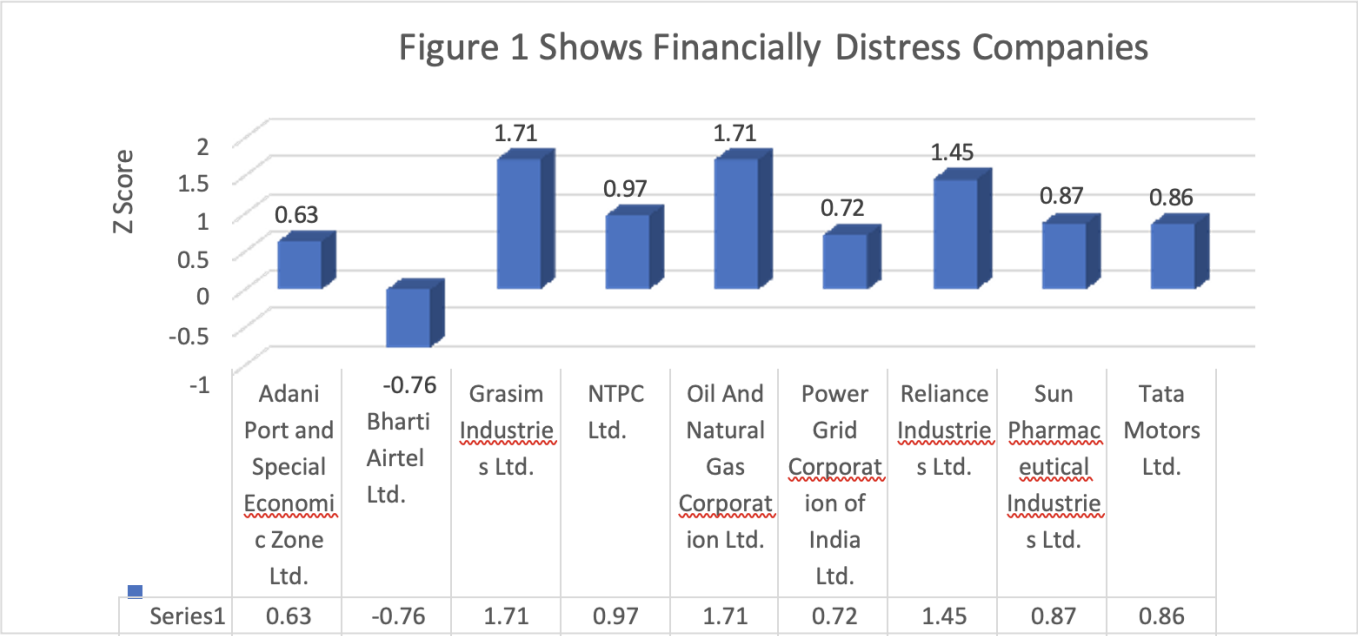

Figure 1.

- Based on the analysis above, the researcher concluded that out of the selected 39 companies of NIFTY 50, 15 companies belong to the "Too Healthy" Zone. These companies have no worries about bankruptcy, and the stakeholders' money is safe.
- Among the selected 39 companies of NIFTY 50, 15 companies belong to the "Healthy Zone." This indicates that these companies need to improve their financial health. If they improve their financial condition, they will not fail. However, if they do not improve their financial condition, there is a possibility of bankruptcy within two years.
- Among the selected 39 companies of NIFTY 50, 15 companies belong to the bankruptcy zone. The financial statements of these companies are not favorable. The companies in this bankruptcy zone are shown in Figure 1.

Limitations of the Study: The main limitation of this study is that it is solely based on the Altman Z-Score model. The financial distress status is determined solely by this model, and other models or tools could provide stronger concluding statements.

The data utilized in this study is purely secondary data, so any discrepancies in the data may affect the reliability of the findings.

The research analyzed data for the period of 2022-23, so the time period can be a limitation of the study.

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