Relationship between the Altman Z Score and Stock Prices of Indian Manufacturing Firms

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Abstract

Purpose

This study investigates the relationship between the Altman Z-Score and stock prices of Indian manufacturing firms to evaluate its efficacy as a predictor of financial distress and aid in investment decision-making.

Methodology

The research employed an explanatory design, analyzing financial data of 18 randomly selected listed manufacturing firms in India over five years. Altman Z-Scores were calculated using financial ratios, and their trends were compared with stock price movements. Hypothesis testing was conducted to establish correlations between Z-Scores and stock prices.

Findings

The analysis revealed that the Altman Z-Score effectively predicts corporate financial health. Firms with declining Z-Scores showed signs of financial instability, often entering the distress zone, while firms with stable or improving Z-Scores demonstrated financial resilience. A significant correlation was observed between Z-Scores and stock price trends, underscoring its predictive reliability.

Practical Implications

The Altman Z-Score provides investors and corporate decision-makers with a robust tool for assessing financial health, identifying warning signs of potential distress, and formulating strategic responses. It also supports more informed investment choices based on a company's financial stability.

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Future Research Direction
Further studies can expand the application of the Altman Z-Score to other industries, integrate non-financial variables such as management practices, and compare its predictive accuracy with alternative financial models across diverse economic contexts.

1. Introduction

Good financial health, also known as financial strength is essential for a business to succeed. It is a key component necessary for a business to sustain, grow, and ultimately return capital to owners. In simple terms, financial strength is the ability to generate profits and sufficient cash flow to pay bills and repay debtor investors. A firm with great financial strength reflects well on the financial health of the firm. The financial position of a company is the primary concern of every investor. Financial strength is a clear indicator of the overall progress that the company has made. Understanding where the company stands financially can be simplified by looking into its financial statements.

Understanding the current position of a company's financial health is one of the most essential things to consider in order making the right investment decisions.

When a person takes a loan from a bank, they must list all their assets and liabilities. This information is used by the bank to establish the strength of the person's financial position.

The overall financial position is determined by:

1. The quality of current assets, with a conservative valuation placed upon them.
2. Liabilities, which are also taken into consideration.

By subtracting the total liability value from the total asset value, the bank determines the person's net worth or equity.

The same process is used by investors as well while determining the financial position of a listed company. The only difference would be the additional step of evaluating the financial position in relation to market value.

Understanding the financial health of a company is extremely crucial. Every business owner must have a clear idea about the numbers that drive the business in order to stay ahead of the competition. Smarter decisions are made when one is aware of how those decisions affect the bottom line, which, in this case, is profit.

One may argue that the bottom line is revenue, but those numbers are meaningless if there is no profit attached to them. Therefore, as the decision-maker of the company, it is good to seek advice or second opinions. However, the ultimate responsibility for these decisions lies with the owner and top executives. Hence, knowing the financial health of the business ensures that only informed decisions are made.

Understanding financial health also reveals whether there are any discrepancies in bank account balances and helps ensure that no information or money is missing. Controls need to be established to protect bank accounts and other assets of the company. Bankruptcy, fraud, and money laundering are just a few examples of issues that could arise if one is not aware of the financial health of their company.

To accurately assess the financial health and long-term sustainability of a corporation, various financial metrics must be taken into account. This includes analyzing the balance sheet, the income statement, the cash flow statement, and the financial ratios.

The four main areas of monetary health that ought to be examined are:

1. Liquidity 2. Solvency 3. Profitability 4. Operating efficiency

Liquidity may be key in assessing a company's basic financial health. Liquidity is that the amount of money and easily-convertible-to-cash assets a corporation owns to manage its short-term debt obligations. Before a corporation can prosper within the future, it must first be ready to survive within the short term. The two commonest metrics won't to measure liquidity are the present ratio and therefore the quick ratio.

Related to liquidity is the concept of solvency, which refers to a company's ability to satisfy its debt obligations on an ongoing basis, not just over the short term. The debt-to-equity (D/E) ratio is usually a solid indicator of a company's long-term financial health.

Term sustainability is crucial because it provides a measurement of debt against stockholders' equity. It is, therefore, also a measure of investor interest and confidence in a company.

Operating margin is one of the simplest indicators of efficiency. This metric not only considers a company's basic operational profit margin but also indicates how well the company's management is able to control costs.

While liquidity, basic solvency, and operating efficiency are all essential factors to consider when evaluating a corporation, a company's bottom line is its net profitability. Companies can indeed survive for years without being profitable, operating on the goodwill of creditors and investors. However, to

survive in the long term, a corporation must eventually attain and maintain profitability.

A good measure of profitability is the net margin, which is the ratio of net profits to total revenues. It is crucial to assess this metric to understand the financial health and sustainability of a company. To consider the net margin ratio is important because just profit alone is inadequate to assess the company's financial health. No single metric can identify the general financial and operational health of a corporation. All of these factors together, however, are necessary to urge an entire and holistic view of a company's stability. Business failure has induced many studies of bankruptcy prediction. Fitzpatrick (1932) identified five stages resulting in business failure.

They are namely:

1. Incubation 2. Financial Embarrassment 3. Financial Insolvency 4. Total Insolvency 5. Confirmed Insolvency

Total insolvency arises when the liabilities surpass the physical assets. Finally, confirmed insolvency arises when legal steps are initiated to protect the firm's creditors or liquidation will take place (Poston, Harmon, & Gramlich, 1994).

Karels and Prakash (1987) present a diverse set of definitions to explain business failure. The set includes negative net-worth, non-payment of creditors, bond defaults, inability to pay debts, overdrawn bank accounts, the omission of preferred dividends, receivership, etc.

Aharony, Jones, and Swary (1980) detailed business failure as a symptom of resource misallocation that is unappealing from a social point of view.

The term "business failure," employed by Dun and Bradstreet, describes various unsatisfactory business conditions. Business failures comprise businesses that terminate operations as a result of assignment or bankruptcy. Secondly, it includes those that cease with a loss to creditors after liquidation. Such actions as execution, foreclosure, or attachment are also included. Third, it includes people who voluntarily withdraw or leave unpaid obligations. Fourth, it includes people who are involved in court actions like receivership, reorganization, or arrangement. Finally, it includes those that have a voluntary settlement with the creditors (Altman, 1993).

Altman Z-Score Model

Dr Edward Altman, at the time an Assistant Finance Professor at NYU (1968) sought to create a model that could predict the likelihood of bankruptcy in a firm using existing financial ratios.

The model he created, known as the **Altman Z-Score Model**, was in response to the Great Depression, where he witnessed a sharp increase in defaults within firms. With the creation of his model in 1968, it steadily gained popularity as it was able to accurately predict the probability of a firm's collapse within 2 years.

Altman was able to arrive at the formulation of the model by conducting a study on 66 public manufacturing firms. He used **Multiple Discriminate Analysis (MDA)** on the firms, which had been divided into two groups: 33 firms that were bankrupt and placed in **Group 1**, and the other 33 firms that were healthy and placed in **Group 2**. He placed restrictions on the asset size of the firms, with the limits being $1 million to $25 million. Altman then proceeded to classify 22 potential variables he could use in his formula into five categories: **Liquidity**, **Leverage**, **Profitability**, **Solvency**, and **Activity Ratios**.

He then proceeded to pick five ratios that had the best chance of accurately predicting corporate failure. Because he used MDA and not a univariate analysis, Altman was able to develop a linear combination of the variables to differentiate between the two groups.

After evaluating the ratios by testing its statistical significance, variable correlation, and predictive accuracy, Altman then established the original Z-score Model for public manufacturing firms (Altman, 1968):

Formula:

$$Z = 0.012X1 + 0.014X2 + 0.033X3 + 0.006X4 + 0.999X5$$

The original model required absolute percentage values for all variables except X5. Due to this, Altman modified his model (2000) for more practical use.

Formula:

$$Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5 \qquad (1)$$

The variables chosen for this formula are defined as follows:

X1 = Working capital/Total assets

X2 = Retained earnings/Total assets

X3 = Earnings before interest and taxes/Total assets

X4 = Market value of equity/Book value of total liabilities

X5 = Sales/Total assets, Z = Overall index

These models lead to following decision statics:

Z''>2.6   *SafeZone*
1.1 <Z''<2.6   *GrayZone*
Z''<1.1   *Distress Zone*

2. Literature Review

Qiu, Rudkin, & Dłotko, (2020) Explored the application of topological data based on the five predictors of default as proposed by the Altman Z-Score Model to failing firms in the United States. They undertake the approach of implementing a Topological Data Analysis (TDA) along with the Ball Mapper(BM) to produce at wo-dimension all representation no the financial ratio space to visualize the occurrence of failure amongst various combinations based on firm characteristics.

The paper defined corporate failure with its traditional meaning, wherein a company was considered to have failed when they would either file for bankruptcy or liquidate its assets.

The construction of appoint cloud to map credit default using the Altman Z-Score Model was made, plotting each firm as a point using the BM algorithm. This was done to evaluate the overall effectiveness of credit modeling in predicting a company's likelihood to fail as well as specific regarding which segment is causing the company's failure.

The analysis also sought to create an effective route away from potential failure by using information that is given, rather than speculating and prematurely claiming the casualty of a business. The paper proposed that the placement of firms on the map presented would be an important step to evaluating a firm 's credit worthiness.

Nath, Biswas, Rashid & Biswas, (2020) observed the financial health and forecasting the distress position of the State-Owned Commercial Bank sand making a comparison among Z-Scores of the SOCBs. The Z-score uses working capital to total assets, retained earnings to total assets, earnings before interest and tax to total assets, shareholders equity to total liabilities ratios to estimate the financial health of the banks. The study was analytical and was carried out based on only secondary data. The Annual Reports of the six SOCBs for the period of 2010-2018 were used as secondary data and financially analyzed using the Altman Z-score Model for prediction of bankruptcy. The study found that with only one exception, the financial health of the SOCBs was unsatisfactory. One exception was only Bangladesh Development Bank Limited which fell into the grey zone among the six SOCBs as it secured an average score of 1.52.However, the remaining were found to be in the Distress zone as they secured an average score < 1.10.

Hence, it was said that the financial health of Basic Bank Limited was the worst, and Basic Development Bank Limited was the best among the six banks.

Agarwal & Patni, (2019) suggested that further studies can be extended using alternative modeling techniques, assessing & comparing the outcome of different models by taking multiple samples at the same time.

Tung & Phung, (2019) Applied the Altman Z-score model to verify the risk of bankruptcy of a group of multi-disciplinary companies of several types, mostly small and medium-sized enterprises, With information taken from official financial reports of 180 organizations in the province of Sóc Trăng, the effects of the research confirmed that both non-financial factors, such as the business area, type and size of the enterprise, the degree of education of managers and executives, and other characteristics, as well as financial factors (indicators) such as revenue before tax, net profit/equity ratio, earnings before interest and tax/total assets ratio, and equity/total debt ratio, affect the bankruptcy risk of enterprises.

Nandini, Zachariah, & Rao (2018) evaluated the financial status of ITI Ltd for 22 years using the Altman Z-Score Model, as well as using a 5-year profitability ratio analysis. The different scores were then compared to one another to draw an inference as to the financial health of the firm. The findings ultimately showed a severe lack of awareness on the part of ITI Ltd, and a further increase in debt led to its ultimate failure.

Bachelor (2018) results showed that the modified model proved to provide substantial results in its ability to predict corporate failure. It was found that the modified model better placed the failed organizations in the distress zone than the original model had.

Ajawabreh, Rawashdeh, & Senjelawi (2017) predicated their study upon one main hypothesis: that Altman's Z-score model has the power to predict the financial failure of hospitality companies in Jordan a minimum of one year before it happens. The findings indicated that the Altman Z-score model is unable to predict financial failure a year prior in the hospitality sector in Jordan. The study suggests finding suitable models that can identify impending financial failure in hospitality companies a year in advance.

Venkadasalam (2016) analyzed the financial distress situation of listed Malaysian shipping companies using Altman's Z-EM score model. According to the findings, most Malaysian shipping companies are suffering from the risk of a financial crisis. Ordinary least squares T-tests showed a considerable positive relationship between the financial variables and the company's performance.

Almamy, Aston, & Ngwa (2016) compared two models in predicting failure for each company. It was found that the modified model, also known as the J-UK model, was more accurate in predicting the failure of and non-failed general UK companies before, during, and after the financial crisis present in the UK.

Almamy, Aston, & Ngwa (2016) also found in their study that the Altman Z-score is a viable instrument to judge the financial strength of manufacturing companies listed on the Karachi Stock Exchange. Råscolean, Dobra, & Slusariuc (2012) developed a financial analysis flowchart to calculate and determine the bankruptcy probability for a given rate of failure in the Z-Score model, corresponding to a given interval that is calculated using the ratio of total bankrupt companies to the total number of companies (both bankrupt and healthy). The prediction system based on the model seemed to enrich the existing model by adding more accuracy to its results.

Harrison (2005) concluded that when manufacturing and service companies are tested together, including a variety of asset sizes, the results have no bearing on bankruptcy prediction.

Hanson (2002) calculated three Z-scores for each firm for the overall three-year period prior to bankruptcy. Altman's revised four-variable Z-score bankruptcy prediction model can accurately predict bankrupt firms between 82.10% and 92.30% one year prior to bankruptcy, between 69.20% and 75.00% two years prior to bankruptcy, and between 53.80% and 71.40% three years prior to bankruptcy.

3. Research Methodology

Statement of Problem

We aim to use this paper, tests, and findings to bring out a relationship between Altman's Z-score and stock prices, and to further research into the same.

Objectives of the Study

- To evaluate Altman Z-Score for listed manufacturing firms in India and estimate the predictability of corporate failure using the results.
- To determine the degree of relation between the Altman Z-Score and the stock prices of the company.
- To aid in predicting investment decision-making based on the Altman Z-Scores of the firm.

The research is explanatory in nature. This is because the paper seeks to determine whether an association exists between the Altman Z-Scores of a company as well as the share prices of the same.

The study primarily uses secondary sources of information, which include published studies on the Altman Z-Score Model, financial statements of the selected companies, and NSE records of the stock prices of the selected companies.

The study period: 5 years, using one financial year's data. **Sampling frame**: Publicly listed manufacturing companies.

The method of sampling used is randomized sampling. Randomized sampling is a type of probability sampling method where each sample has an equal probability of being chosen.

For this study, 197 listed manufacturing firms were processed through a randomizer, and the first 17 companies were chosen, though companies were rejected if there was a lack of financial data. The study period is taken from 2018-19 to 2023-24.

Hypothesis formulation

The following hypothesis is tested:

H0 = A relationship between the Altman Z-Score and Stock Prices does not exist.

H1=A relationship between the Altman Z-Score and Stock Prices exists.

Scope of the Study:

- The study will be conducted based on the authorized financial statements of the 18 Indian manufacturing firms that have been selected for this study.
- The study will also make use of the share prices of these companies as per the National Stock Exchange to compare the relationship between their share prices and their Altman Z-Scores.

4. Data Analysis

The paper seeks to analyze the purpose of the study by taking a company's financial data over five years and calculating the variables involved in the tabulation of the Altman Z-Score. The table below displays a summarized value of each variable as well as its Altman Z-Score for that given year. An interpretation on the likelihood or unlikelihood of failure is conducted based on its score trend.

After this, a correlation test is conducted to test the hypothesis, and its summarized results will be interpreted to understand the viability of the H1 or H0 hypothesis.

Table 1: Summarized Altman Z-Score Calculation Analysis

Company	Year	X1	X2	X3	X4	X5	ZScore
Kingfa Science and Technologies	1	0.22	0.12	0.06	1.20	1.24	2.61
	2	0.35	0.09	0.005	1.74	1.27	2.89
	3	0.47	0.06	0.08	3.10	1.25	4.05
	4	0.43	0.02	0.05	3.71	1.05	3.99
	5	0.02	-0.02	0.10	6.36	1.36	5.52
Ganesha Ecosphere Ltd	1	0.36	0.46	0.18	3.16	1.33	4.89
	2	0.29	0.40	0.22	3.46	1.66	5.38
	3	0.06	0.34	0.16	2.34	1.35	1.38
	4	0.01	0.36	0.18	0.56	1.58	1.60
	5	0.02	0.32	1.67	1.67	1.62	1.70
Metalyst Forgings	1	-1.17	-0.75	-0.08	0.03	0.06	-2.67
	2	-1.05	-0.59	-0.07	0.07	0.11	-2.18
	3	-0.96	-0.47	-0.007	0.20	0.10	-1.62
	4	-0.64	-0.19	-0.01	0.05	0.26	-0.78
	5	-0.10	-0.03	0.01	0.08	0.19	0.10
Nilkamal	1	0.34	0.36	0.12	1.85	1.56	4.03
	2	0.44	0.37	0.14	2.50	1.93	4.95
	3	0.38	0.31	0.16	0.33	1.83	3.46
	4	0.38	0.35	0.01	0.37	2.09	3.32
	5	0.33	0.26	0.18	2.73	2.13	5.14
GKW	1	-1.85	0.18	0.009	14.59	0.06	6.87
	2	-3.08	0.09	0.06	19.30	0.10	8.34
	3	-4.75	0.05	0.02	22.47	0.04	7.94
	4	-2.90	0.12	0.05	14.31	0.12	5.57
	5	-2.28	0.18	0.02	15.87	0.10	7.21
Ashima	1	-2.04	0.11	-0.004	1.59	0.95	0.94
	2	-1.90	0.42	0.02	4.61	1.05	1.05
	3	-1.75	0.12	-0.04	0.27	0.89	0.87
	4	-2.80	-0.37	-.007	0.18	0.97	0.93
	5	-2.74	-0.26	-0.05	0.71	0.95	0.91
Rayon Ind Ltd.	1	-3.76	-0.04	-0.001	-0.01	0	-4.56
	2	-3.14	-0.03	-0.001	-0.01	0.08	-3.73
	3	-2.50	-0.02	-0.001	-0.02	0.3	-2.75
	4	-0.99	-0.2	-0.001	-0.01	0.8	-0.41
	5	-0.52	-0.02	-0.001	-0.02	1.04	-0.39

	1	0.20	0.53	0.001	9.19	0.80	7.74
	2	0.15	0.46	0.001	7.46	0.94	6.24
Garware Technic	3	0.08	0.40	0.001	7.04	0.90	5.80
	4	0.15	0.30	0.001	4.00	0.87	3.88
	5	0.21	0.27	0.001	2.82	1.00	3.35
	1	0.13	0.07	0.05	3.02	0.50	2.17
	2	0.07	0.002	0.02	1.77	0.02	1.25
SIL Invest	3	0.52	0.006	0.04	4.61	0.47	4.02
	4	0.26	0.003	0.09	0.45	0.10	0.97
	5	2.13	0.03	0.76	0.52	0.86	6.28
	1	0.23	0.20	0.08	0.13	1.35	2.25
	2	0.26	0.20	0.09	0.15	1.48	2.44
Bhandari Hosiery	3	0.19	0.18	0.08	0.32	1.45	2.37
	4	0.20	0.17	0.07	0.45	1.43	2.42
	5	0.30	0.31	0.10	0.07	1.30	2.47
	1	-1.44	-0.04	-0.003	0.0002	1.38	-0.40
	2	-0.92	-0.02	-0.001	0.0002	0.98	-0.15
Alps Industries	3	-0.76	-0.02	-0.0004	0.002	0.88	-0.06
	4	-0.47	-0.02	-0.0008	0.0008	0.97	0.37
	5	-6.00	-16.79	-0.42	0.85	6.56	-25.01
	1	0.01	0.29	0.03	0.17	1.26	1.88
	2	-0.04	0.28	0.05	0.31	1.15	1.83
Nandan Denim	3	0.09	0.25	0.09	0.7	1.81	2.35
	4	0.05	0.23	0.1	0.91	0.95	2.20
	5	0.17	0.27	0.12	0.10	1.51	2.56
	1	0.07	0	0.23	0.26	1.62	2.61
	2	0.03	0	0.21	0.32	1.64	2.54
NR Aggarwal	3	0.01	0	0.19	0.54	1.74	2.71
	4	-0.003	0	1.18	0.36	1.66	2.47
	5	0.14	0.52	0.15	0.02	1.62	3.03
	1	0.12	0	1.18	2.16	1.52	3.55
	2	0.12	0.04	0.19	2.35	1.74	3.992
Supreme Ind	3	0.12	0.05	0.22	2.66	1.7	4.21
	4	0.11	0.07	0.22	2.38	1.59	3.99
	5	0.32	0.74	0.29	0.01	1.71	4.09
	1	-0.02	-0.88	-0.04	3.83	0.19	1.08
	2	-1.41	-0.96	-0.03	0.32	0.19	-2.76
Alok Industries	3	-1.43	-1.03	-0.72	0.24	0.3	-5.10
	4	-0.23	-0.02	-0.07	0.01	0.27	-0.26
	5	0.02	-2.14	0.08	0.06	0.90	-1.76

MoldTekTech	1	0.43	0.32	0.21	9.77	1.52	9.05
	2	0.46	0.36	0.27	17.95	1.47	14.20
	3	0.44	0.24	0.13	20.68	1.43	15.13
	4	0.34	0.18	0.18	16.43	1.3	12.42
	5	0.42	0.74	0.25	0.06	1.02	3.42
Rupa and Company	1	0.38	0.46	0.12	6.28	0.98	6.24
	2	0.36	0.42	0.16	6.65	1.13	6.67
	3	0.37	0.42	0.17	11.12	1.29	9.56
	4	0.38	0.45	0.18	18.08	0.16	12.69
	5	0.42	0.55	0.18	0.01	0.91	2.78

Ganesha Ecosphere Ltd shows an upward trend in its score, from being in the distress zone till FY 2018-2019 to jumping to well within the safe zone for the past two years. The company has significantly improved its profitability, but it has expanded its shareholding in the past year by 8.1%. As a result, its net income is now split between a greater number of shares, affecting the EPS.

Nilkamal Ltd remains well within the safe limit. The Z-scores haven't changed drastically in any direction, so we can conclude that it isn't going to be filing for bankruptcy any time soon.

GKW Ltd has Z-scores within the safe limit for all the years under review. It doesn't exhibit any pattern as such, but the minute changes in the Z-score can be accounted for by the normal business environment fluctuations.

Bhandari Hosiery's scores lie in the gray zone. They have maintained their scores consistently enough to be considered stable for sufficient financial health. The Z-score of Nandan Industries has reduced over the years, and the company is moving towards the gray zone. The decrease in variable X4 is the variable contributing the most towards this downward trend in the Z-score, as the share price has reduced significantly over the years.

The company is safe at the moment, but if the downward trend continues, then it may enter the distress zone in a few years. N. R. Aggarwal has continued to stay in the non-distress zone over the years. Even though the share prices are constantly fluctuating, the company has managed to keep its overall Z-score high and in the safe zone.

Supreme Industries. Alok Industries was on the verge of bankruptcy in the year 2018 when Reliance saved the company by acquiring it. It has shown improvement in the Z-score after that. The losses have reduced, the current assets have increased, liabilities have decreased and share prices have increased. If the company continues to exhibit this upward trend, it is unlikely that it's going to be in a position of bankrupt any time soon.

The Z-scores of Mold Tek Technologies are extremely high, and the company is extremely safe at the moment. However, due to the constant fall in the share prices, variable X4 is reducing at a steady rate. It is strongly advised that the company take actions as soon as possible to stop this fall in share prices and maintain its Z-score in the safe zone.

Rupa and Company has shown high but declining Z-scores over the past 5 years. It is not likely to face insolvency issues any time soon. The company is suffering from decreasing sales, operating income, and share prices, all contributing towards the overall downward trend in scores. The company did have extremely high share prices in 2022-23 and 2021-22, but then the prices fell after that, leading to the lowering of Z-scores as well.

These companies have unfortunately shown either a declining trend in the Altman Z-scores or they have maintained extremely low scores that lie in the distress zone in the zones of discrimination.

Companies Likely to Fail

The companies in this list are those that have displayed either a downward trend in terms of their Altman Z-scores or have shown inconsistency throughout the financial years considered. They maintain scores in the unsafe zone or low gray zone.

A quick look at the Z-score of Kingfa Science and Technology Ltd shows us a downward trend. In FY 2021-2022, the EBIT and share price have significantly reduced, thus bringing down the factors of X3 and X4 and making the Z-score lower than previous years. In FY 2022-2023, the factor X4 has significantly gone down from the previous year. Market capitalization has decreased owing to the total decrease in the share price of the company, from Rs 673 to Rs 504.725. Long-term investors who are willing to take the gamble of share prices rising in the future might find this a good investment presently.

Metalyst Forgings Ltd shows a downward trend and remains in the distress zone all five FYs. Except for FY 2020-2021, its Z-scores are negative. The reasons being: current liabilities being significantly more than the current assets leading to negative working capital, negative retained earnings, and EBIT throughout the years, and lastly, the net sales are consistently declining.

Ashima Ltd.'s scores have constantly remained in the distress zone, exhibiting a somewhat downward trend. It has had negative working capital throughout, declining retained earnings, consistently negative EBIT, and very low share prices. Keeping this in mind, it doesn't seem like a very profitable and stable investment at the moment.

Raj Rayon Ind Ltd. and Alps Industries have seen a consistent downward trend in its score, ignoring warning signs of failure throughout the years recorded. With its operating income, retained earnings, and EBIT in the negatives, the X1, X2, and X3 variables have all gone well into the negatives, resulting in its poor score.

Table 2: Hypothesis Testing

Kingfa Science and Technology						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
815.04	258.45	-0.422(0.479)	1137.93(0.073)	86.473(0.479)	-0.96	5
Ganesha Ecosphere LTD						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
423.37	191.17	0.074(0.906)	401.306(0.135)	8.506(0.906)	-0.326	5
Matalyst Forgings						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
7.998	5.36	0.555(0.31)	4.368(0.717)	3.090(0.331)	0.77	5
Nikalmal						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
1686.4	456.58	0.491(0.401)	755.79(0.495)	232.65(0.40)	-0.12	5
GKW						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
644.01	123.26	0. 682(0.204)	394.16(0.092)	38.90(0.204)	0.288	5
Ashima						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
13.87	5.7	0.07(0.91)	13.69(0.026)	0.006(0.91)	-0.327	5

SRF Limited						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
1169.54	865.607	-0.84(0.075)	4731.79(0.03)	1292.53(0.075)	0.609	5

Raj Rayon India LTD						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
16.22	7.557	-0.128(0.83)	15.57(0.048)	508(0.837)	-0.311	5

Garware Technic						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
2017.5	1014.421	0.534(0.35)	1443.84(0.126)	69.38(0.354)	0.047	5

SIL Invest						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
226.91	74.34	0.441(0.457)	265.32(0.67)	196.73(0.45)	-0.74	5

Bhandari Hoisery						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
3.11	2.14	0.906(0.034)	1.965(0.04)	1.82(0.034)	0.761	5

Alps Industries						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
2.23	0.882	0.496(0.496)	2.047(0.019)	0.39(0.989)	-0.006	5

Nandan Denim						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
21.321	11.96	0.03(0.961)	18.64(0.741)	1.158(0.961)	-0.332	5

Supreme India						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
1557.53	503.88	-0.639(0.246)	3821.46(0.095)	591.04(0.246)	0.21	5
Alok Industries						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
14.17	10.05	0.866(0.058)	22.210(0.009)	4.114(0.058)	0.666	5
Mold Tek Tech						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
59.85	22.49	-0.942(0.016)	110.86(0.002)	4.556(0.016)	0.851	5
Rupa and Company						
Mean	Deviation	Correlation	Alpha Constant	Beta Value	Adjusted R Square	N
316.93	95.21	-0.723(0.167)	469.447(0.014)	18.554(0.167)	0.364	5

5. Interpretation

Interpretations for hypothesis testing will be made according to the values tabulated in Table 2. Following the study conducted, general findings have been made that indicate the positive impact of using the Altman Z-Score model as a predictor of financial failure. Amongst the 18 samples taken, all of them have had their scores corresponding to their financial positions during a given time period. With regards to firms like Raj Rayon and Metalyst Forgings, their low scores reaching into the negatives in the prior years served as a warning sign of sorts, the ignorance of which has led both firms to file for bankruptcy. On the other hand, firms like Rupa and Company, Supreme LTD, as well as Mold Tek Tech, have seen positive booms in their Altman Z-Scores, corresponding with the firm's financial stability and overall soundness.

This study finds that, at least with regards to manufacturing firms, the Altman Z-Score Model is a reliable predictor of financial failure, indicating a firm's financial soundness through its zones of discrimination, serving as a futuristic model for firms to analyze their financial position during a given financial year.

6. Conclusion

This study confirms the Altman Z-Score as a valuable and reliable tool for predicting the financial health and potential distress of Indian manufacturing firms. The findings highlight a significant relationship between Z-Scores and stock price movements, validating its use for both investors and corporate stakeholders. Firms with declining Z-Scores were prone to financial instability, while those with stable or increasing scores exhibited resilience and growth potential. By leveraging the Z-Score, businesses and investors can make informed decisions, mitigate risks, and ensure sustainable financial management.

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