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Measuring the Effectiveness of Altman Z Score on Indian Companies

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Abstract: ***The Altman Z Score is used to measure a company's financial performance, estimate the likelihood of financial distress and predict its bankruptcy. The following study focuses on predicting bankruptcy of the selected Indian companies two years prior to the occurring of the event. Four companies have been selected to check the accuracy and efficiency of the model. As per the model, bankruptcy could be predicted two years prior to the happening on the event in India. In conclusion, the Altman Z score can be applied to other Indian companies to predict bankruptcy and measure its financial health.***

Keywords: Altman Z Score, Financial Health, Bankruptcy, Indian Companies

1. Introduction

Financial Health of the firm is one of the most crucial aspects for the stakeholders. They all wish to know whether the organisation will do better in future in order to keep their interest intact with the organisation. There are two main parties which are interested in the company's performance and growth. They are the internal users of information and external users of information. Internal users comprise of shareholders, officers, managers, employees and internal auditors. Whereas banks, customers, creditors and suppliers are the external users of information (Shariq, 2016).

The main reason to measure financial health is to prove that the organization is profitable and not in imminent danger of bankruptcy. There are many techniques to accurately evaluate the financial health and long-term sustainability of a company. One of the most common ways to measure is to use financial ratios which use factors like debt, assets, sales, net profit, etc to determine the current state of the organisation. Apart from that Discriminant analysis, Boritz and Kennedy's [1995] model, Logit analysis, Probit analysis, and neural networks are some of the popular methods for model development in the early stages of bankruptcy (Gissel, Giacomino, & Akers, 2007).

The Altman's Z Score Model which is a combination of five weighted business ratios that is used to estimate the likelihood of financial distress is the most used model to predict bankruptcy. It was developed in 1968 by Edward I. Altman, an Assistant Professor of Finance at New York University, as a quantitative balance-sheet method of determining a company's financial health. It has been proven to be a reliable tool across the globe. There is a piece of evidence that it has 72% accuracy in predicting the bankruptcy of the firms two years prior to the event and 80-90% accurate in predicting bankruptcy one year prior to the event (Business Insider, 2011). The current study analyses and assesses the financial health of the companies and predicts bankruptcy to check the effectiveness of the Altman Z score Model two years prior to the happening of the event.

2. Literature Review

Altman Z Score

S., V., & Thiayalnayaki (2013) mentions that Altman Z-score is one of the important tool and technique to measure companies financial performance as well as operational and financial efficiency. The authors used the model for predicting bankruptcy in non-manufacturing companies, 2-3 years before happening of the event. Altman Z Score is used to predict the possibilities of the bankruptcy of manufacturing companies. Shariq (2016) in his findings stated that companies with high Z-score were financially sound which further helped the managers to take a financial decision, the stockholders to choose investment options and others to look after their interest in the concerned cement manufacturers of the country. Gerantonis et al. (2009) investigated whether Z-score models can predict bankruptcies for a period up to three years earlier. Wherein results revealed that the Altman model performed well in predicting failures and can be used by company management for financing decisions, by regulatory authorities and by portfolio managers in-stock selection. Likewise, V Apoorva D. et al. (2019) used the model to predict bankruptcy of companies two years prior to the happening of the event. Their main aim was to check the efficiency of the model for which 7 companies had been selected. The findings of the research stated that the model predicted the happening of the event however is not 100% accurate. Another study by Sajjan (2016) displayed the financial health of selected listed firms for the past 5 years using the Altman Z-score model. Similarly, Sanesh (2016) tried to predict the probability of default by Nifty 50 companies due to financial distress based on the current financial statistics of the company. Tyagi (2014) in his paper investigated the financial health of logistics industry using the Altman Z score model. Which revealed that Indian logistics industry was financially sound and healthy with an average Z score increase from 2.54 to 3.01 during the global recession. Kumari (2013) tried to estimate bankruptcy for MMTC using Z score analysis. Ramaratnam & Jayaraman (2010) measured the financial soundness of the Indian steel industry by using the Z-score model. A study on the prediction of bankruptcy of the pharmaceutical industry in Bangladesh was done by Mizan et al. (2011) using the Altman Z-score model. Furthermore, Mizan & Hossain, (2014) conducted a study to assess the

financial health of cement industry of Bangladesh which showed that two out of the five firms were financially strong as they had high Z-score.

Bankruptcy

Sun & Hui (2006) believe that bankruptcy not only brings much individual loss to interest parts such as stockholders, creditors, managers, employees, etc. but also disrupts the whole country's economic development. Research with the primary goal of summarizing and analysing existing research on bankruptcy prediction studies was carried out by Gissel et al. (2007). The paper traced the literature on bankruptcy prediction from the 1930s to the present. On the analysis of 165 bankruptcy prediction studies published the 'Multivariate Discriminant Analysis' and 'Neutral Networks' were the most promising methods for bankruptcy prediction models. Furthermore, it also showcased that the higher model accuracy is not guaranteed with a greater number of factors however a model with two relevant factors is also capable of accurate prediction as compared to models with 21 factors. Campbell et al. (2008) proposed a reduced form of the econometric model using both accounting and market data to predict corporate bankruptcies and failures. In which they argued that their model is more accurate than other alternatives. A more accurate reduced-form model of them confirms the negative association between distress risk and equity returns too.

3. Research Methodology

3.1 Research Objectives

- To assess the overall financial health of the companies.
- To determine the operational and financial efficiency of the selected companies.
- To develop Altman's Z-score Model for Jet Airways, Reliance Communications, Jyoti Structures and ABG Shipyard.
- To predict the bankruptcy of the company 2 years before the happening of event.

3.2 Research Design

Relevant Population

Listed manufacturing and non-manufacturing companies are the relevant populations for this study which focuses on the effectiveness of the Altman Z score model. The following four companies such as Jet Airways, Reliance Communications, Jyoti Structures and ABG Shipyard were considered fit for this research.

Sampling Method

The main sample for this study is recent companies which faced bankruptcy in manufacturing and non-manufacturing sector. Non-probability sampling method was chosen as fit for the study. The study covers a sample size of four listed Indian companies out of which two are from the manufacturing sector and remaining two from the non-manufacturing sector. Jet Airways and Reliance Communications are been selected from the non-manufacturing sector whereas Jyoti Structures and ABG Shipyard are been selected from the manufacturing sector. Jet Airways, an Indian international airline, decided to refer the company to National Company Law Tribunal (NCLT) for bankruptcy proceedings in June 2019 likewise Reliance Communications, an Indian mobile network provider and a subsidiary of Reliance Group filed for bankruptcy to resolve its debt-related matters in Feb 2019. Whereas Indian power infrastructure company, Jyoti Structures Ltd, engineering, procurement and construction (EPC) service provider closed its operations in March 2016 and ABG Shipyard, India's biggest private shipbuilder.

3.3 Methods of Data Collection

The data in terms of companies fundamentals was been collected mainly through secondary sources. Annual Report and other websites like Capitaline, Money control, Bse. India were the main sources for data collection. In addition, scholarly articles and research papers were also used to facilitate the study.

3.4 Tools and Techniques

There are various tools and models to analyse and predict the financial performance of the company. One of these models is the Altman Z-Score which was published by Edward I. Altman in 1969 as a Z score formula helps in predicting the status of financial efficiency and distress of the firm 2-3 years in advance. It helps in measuring the financial health of a business organisation by the use of multiple balance sheet values and corporate income. The model is based on five key financial ratios such as Working capital/ total assets, Retained Earnings/Total Assets ratio, Earnings Before Interest and Tax/Total Assets ratio, Market Value of Equity/Total Assets ratio and Total Sales/Total Assets ratio.

For Public Non-Manufacturing Companies,

$$Altman Z-Score = 6.56\times(WorkingCapital)/(TotalAssets)+3.26\times(RetainedEarnings)/(TotalAssets)+6.72\times EBIT/(TotalAssets)+1.05\times(MarketValueOfEquity)/(TotalAssets)$$

Wherein,

i. $Z \geq 2.6$ → Safe Zone, has a negligible probability of filing bankruptcy.
ii. $1.1 \leq Z \leq 2.6$ → Grey Zone,has a moderate probability for bankruptcy.
iii. $Z \leq 1.1$ → Distress Zone, has a very high probability of reaching the stage of bankruptcy.

For Public Manufacturing Companies,

$$Altman Z-Score = 1.2\times(WorkingCapital)/(TotalAssets)+1.4\times(RetainedEarnings)/(TotalAssets)+3.3\times EBIT/(TotalAssets)+0.6\times(MarketValueOfEquity)/(TotalAssets)+0.999\times(TotalSales)/(TotalAssets)$$

Wherein,

i. $Z \geq 2.99$ → Safe Zone, has a negligible probability of filing bankruptcy.
ii. $1.8 \leq Z \leq 2.99$ → Grey Zone,has a moderate probability for bankruptcy.
iii. $Z \leq 1.8$ → Distress Zone, has a very high probability of reaching the stage of bankruptcy.

4. Data Analysis

Jet Airways: Non-Manufacturing Company

Table 1: Altman Z-score Calculation-Jet Airways

Altman Z-Score Calculation

Criteria	Mar-13	Mar-14	Mar-15	Mar-16	Mar-17	Coefficients
X1 (Working Capital/Total Assets)	-0.36	-0.81	-0.63	-0.66	-1.60	6.56
X2 (Retained Earnings/Total Assets)	-0.08	-0.59	-0.30	0.17	0.47	3.26
X3 (EBIT/Total Assets)	0.04	-0.43	-0.07	0.30	0.75	6.72
X4 (The Equity Market Value/Total Assets)	0.57	0.57	1.29	0.64	2.21	1.05
Z-Scores	**-1.72**	**-9.56**	**-4.21**	**-1.05**	**-1.58**	
Zone	**Distress**	**Distress**	**Distress**	**Distress**	**Distress**	

Table 1 shows Z score values of the company which indicates that the firm is not able to fulfil the required Z score for financial soundness. Based on the model the firm the Z score value throughout has remained below 1.8 in all years which has showcased a very poor financial performance although the company improved in 2016 and 2017 by recording Net Profits of Rs.1,201.94 Cr. and Rs.1,445.47 Cr. respectively. However, in November 2018, the company was recorded to have a negative financial outlook due to increasing losses and heavy amount of unpaid debt. Furthermore in March 2019, nearly a fourth of Jet Airways aircraft were grounded due to unpaid lease rents and on 5th April Indian Oil Corporation stopped supplying fuel to the airline, citing non-payment of dues as the emergency funds had still not been credited. Thus as per the Altman's guidelines, the company's financial position remained in "Distress" because of low z-score. Later on April 19, the company suspended all flight operations after running out of funds and on June 19 after getting no acceptable offers from Etihad Airways and Hinduja Group the lenders of Jet Airways decided to refer the company to National Company Law Tribunal (NCLT) for bankruptcy proceedings with a debt of $1.2 billion, thereby proving the accuracy of the model.

Reliance Communications: Non-Manufacturing Company

Table 2: Altman Z-score Calculation – Reliance Communications

Altman Z-Score Calculation

Criteria	Mar 13	Mar 14	Mar 15	Mar 16	Mar 17	Coefficients
X1 (Working Capital/Total Assets)	0.01	0.02	0.08	-0.02	0.00	6.56
X2 (Retained Earnings/Total Assets)	0.01	0.01	0.01	0.01	-0.02	3.26
X3 (EBIT/Total Assets)	0.04	0.04	0.05	0.04	-0.01	6.72
X4 (The Equity Market Value/Total Assets)	0.15	0.03	0.05	0.02	0.06	1.05
Z-Scores	**0.57**	**0.46**	**0.90**	**0.19**	**-0.07**	
Zone	**Distress**	**Distress**	**Distress**	**Distress**	**Distress**	

Table 2 shows Z score the values of an Indian mobile network provider, Reliance Communications. The Z score value throughout has remained below 1.8 in all years which indicates the poor financial performance of the company. Overall the company had started facing a decrease in Sales, Net profit and Market Capitalization from FY2013. Meanwhile, in October 2017 the company also announced a merger with MTS and Aircel. However, in February 2019 the company filed for bankruptcy as it was unable to sell assets to repay its debt worth Rs. 50,000 Cr. Thus as per the Altman's guidelines, the company's financial position remained in "Distress" because of low z-score thereby proving the accuracy of the model.

Jyoti Structures: Manufacturing Company

Table 3: Altman Z-score Calculation – Jyoti Structures

Altman Z-Score Calculation

Criteria	Mar 11	Mar 12	Mar 13	Mar 14	Mar 15	Coefficients
X1 (Working Capital/Total Assets)	0.78	0.72	0.74	0.76	0.78	1.2
X2 (Retained Earnings/Total Assets)	0.08	0.05	0.02	0.00	-0.11	1.4
X3 (EBIT/Total Assets)	0.26	0.19	0.15	0.12	0.02	3.3
X4 (The Equity Market Value/Total Assets)	0.05	0.07	0.04	0.10	0.02	0.6
X5 (Total Sales/Total Assets)	2.11	1.54	1.50	1.50	0.84	0.999
Z-Scores	**4.04**	**3.16**	**2.91**	**2.87**	**1.71**	
Zone	**Safe**	**Safe**	**Grey**	**Grey**	**Distress**	

The above table shows z score values for Jyoti Structures. It can be seen that until March 2012 the company was financially sound and healthy with a z-score more than 2.99 however the score was been deteriorating over the years due to a decrease in sales and net profit. Thus on applying the Altman Z score on Jyoti Structures we have come to a conclusion that the company has been in "Distress" zone since 2015 due to negative profits, increase in debt, deteriorating EBIT and retained earnings which provide an additional evidence to the weak financials. The company was further pushed to bankruptcy in the year 2017 thereby proving the accuracy of the model.

ABG Shipyard: Manufacturing Company

Table 4: Altman Z-score Calculation – ABG Shipyard

Altman Z-Score Calculation

Criteria	Mar 11	Mar-12	Mar 13	Mar 14	Mar 15	Coefficients
X1 (Working Capital/Total Assets)	-0.02	0.01	-0.03	0.11	0.18	1.2
X2 (Retained Earnings/Total Assets)	0.02	0.02	0.01	-0.02	-0.07	1.4
X3 (EBIT/Total Assets)	0.07	0.07	0.05	0.02	-0.03	3.3
X4 (The Equity Market Value/Total Assets)	0.12	0.04	0.03	0.03	0.02	0.6
X5 (Total Sales/Total Assets)	0.26	0.27	0.18	0.12	0.04	0.999
Z-Scores	**0.56**	**0.56**	**0.35**	**0.32**	**0.06**	
Zone	**Distress**	**Distress**	**Distress**	**Distress**	**Distress**	

The above table shows z-score values of ABG Shipyard which is an Ahmedabad-based shipbuilding company in India. The z-score value has remained below 1.8 has been deteriorating over the years highlighting the financial weakness of the company. Thus the company lies in "Distress" zone based on its score. The company not only and witnessed a decrease in sales of 30% approx. but also had huge debt by the end of 2015. Apart from these factors, the yard owed a sum of Rs 18,245 crores to a clutch of banks led by ICICI Bank which led to bankruptcy. It was one of the 12 large companies that the RBI had identified in June 2017 for banks to refer to the bankruptcy court for resolution or liquidation, thereby proving the accuracy of the model.

5. Findings and Conclusion

The financial health of the firm is the biggest concern for the stakeholders. On the basis of financial soundness and health of the firm the stakeholders have a decision regarding their possible involvement with a particular firm. The Altman Z score model is one of the best measurement that can shape and influence the decision of the stakeholders. The current study conducted to assess the financial health of companies namely Jet Airways, Reliance Communications, Jyoti Structures Ltd and ABG Shipyard has revealed that the financial position of the subject companies is in distress and on the verge of bankruptcy. The z-score for Jet Airways has been below 1.8 during the study period i.e. 2013 to 2017 showcasing the poor performance of the company and signs for future bankruptcy. Likewise, Reliance Communications also showed signs for weak fundamentals due to a low score thereby showcasing signs of bankruptcy in the near future. Whereas the z-score of Jyoti Structures has been indicated that the company's financials are weak and the company is expected to go bankrupt in 2 years which was proven to be true in 2017 when the company was dragged to NCLT for bankruptcy proceedings. ABG Shipyard was also witnessing major financial issues which led to its bankruptcy in 2017 and the same was proven to be true by the Altman Z score model. Thus on the basis of the study conducted, we can conclude that the model is highly accurate and effective for predicting bankruptcy 2 years prior to the occurrence of the event. Furthermore, the findings of the study can be useful to managers to make financial decisions, the stockholders to choose investment options and others to look after their interest in the concern of the respective companies.

References

[1] Campbell, J. Y., Hilscher, J., & Szilagi, J. (2008). In Search of Distress Risk. Journal of Finance, 63(6), 2899-2939. doi:https://doi.org/10.1111/j.1540-6261.2008.01416.x

[2] Gerantonis, N., Vergos, K., & Christopoulos, A. G. (2009, October). Can Altman Z-score Models Predict BusinessFailures in Greece? Research Journal of International Studies(12), 21-28. Retrieved June 1, 2020, from https://www.academia.edu/338693/Can_Altman_Z-Score_Models_Predict_Business_Failures_In_Greece

[3] Gissel, J. L., Giacomino, D., & Akers, D. M. (2007). A Review of Bankruptcy Prediction Studies: 1930-Present. Journal of Financial Education, 33, 1-42. Retrieved June 1, 2020, from https://epublications.marquette.edu/cgi/viewcontent.cgi?referer=https://www.bing.com/&httpsredir=1&article=1025&context=account_fac

[4] Kumari, N. (2013, March). Evaluation Of Financial Health Of MMTC of India: A Z Score Model. European Journal of Accounting Auditing and Finance Research, 1(1), 36-43. Retrieved June 1, 2020, from www.ea-journals.org

[5] Mizan, A., & Hossain, M. (2014). Financial Soundness of Cement Industry of Bangladesh: An Empirical Investigation Using Z-score. American Journal of Trade and Policy, 1(1), 16-22. Retrieved from http://publicationslist.org/data/ajtp/ref-2/AJTP_1.2.pdf

[6] Mizan, A., Amin, M., & Rahman, T. (2011). Banking Prediction by Using the Altman Z-score Model: An Investigation of the Pharmaceutical Industry in Bangladesh. Bank Parikrama, 36, 33-56. Retrieved June 1, 2020

[7] Ramaratnam, M., & Jayaraman, R. (2010). "A study on measuring the financial soundness of select firms with special reference to Indian steel industry – An empirical view with Z score. Asian Journal of Management Research, 724-773. Retrieved June 1, 2020
[8] S., V., V., D., & Thiayalnayaki. (2013). Prediction of Business Bankruptcy for Selected Airline Companies using Altman's Model. International Journal of Research in Business Management, 1(4), 19-26. Retrieved June 1, 2020
[9] Sajjan, P. (2016, April). Predicting Bankruptcy of Selected firms by applying Altman's Z-Score Model. International Journal of Research Granthaalayah, 152-158. Retrieved June 1, 2020
[10] Sanesh, C. (2016). The analytical study of Altman Z score on NIFTY 50 Companies. IRA-International Journal of Management & Social Sciences, 3(3), 2455-2267. doi:IRA-International Journal of Management & Social Sciences
[11] Shariq, M. (2016). Bankruptcy Prediction Using the Altman Z-score Model in Oman: A Case Study of Raysut Cement Company SAOG and its subsidiaries. Australasian Accounting, Business and Finance Journal, 10(4), 70-80. doi:10.14453/aabfj.v10i4.6
[12] Sun, J., & Hui, X.-F. (2006). Financial Distress Prediction Based on Similarity Weighted Voting CBR. International Conference on Advanced Data Mining and Applications, (pp. 947-958). China. Retrieved June 1, 2020, from https://link.springer.com/chapter/10.1007/11811305_103
[13] Tyagi, V. (2014). Study To Measures The Financial Health Of Selected Firms With Special Reference To Indian Logistic Industry: An Application of Altman's Z score. Industrial Engineering Letters, 4(4), 43-52. Retrieved June 1, 2020, from https://www.iiste.org/Journals/index.php/IEL/article/viewFile/12246/12599
[14] V, A. D., Curpod, S. P., & Namratha. (2019). Application of Altman Z Score Model on Selected Indian Companies to Predict Bankruptcy. International Journal of Business and Management Invention, 8(1), 77-82. Retrieved June 1, 2020, from www.ijbmi.org
[15] https://en.wikipedia.org/wiki/Jet_Airways
[16] https://www.bseindia.com/stock-share-price/jet-airways-(india)-ltd/jetairways/532617/financials-results/
[17] https://en.wikipedia.org/wiki/Reliance_Communications
[18] https://www.businessinsider.in/transportation/indias-second-largest-airline-is-shutting-down-after-running-out-of-money/articleshow/68925635.cms
[19] https://www.moneycontrol.com/financials/jetairways/consolidated-profit-lossVI/JA01
[20] http://www.capitalmarket.com/Company-Information/Financials/Profit-and-Loss/jet-airways/5586
[21] https://www.indiancompany.info/company/jyoti-structures-limited/
[22] https://www.wallstreetmojo.com/altman-z-score/
[23] https://www.livemint.com/Industry/DUzXDbS2GwrcHyYFGf3yhO/Jyoti-Structures-becomes-first-case-to-be-admitted-for-bankr.html
[24] https://www.thehindubusinessline.com/economy/logistics/private-shipbuilder-abg-set-to-be-liquidated/article26597972.ece
[25] https://economictimes.indiatimes.com/industry/transportation/shipping-/-transport/national-company-law-tribunal-orders-liquidation-of-abg-shipyard/articleshow/69066975.cms?from=mdr
[26] http://www.wisegeek.net/what-are-the-different-ways-to-measure-the-financial-health-of-a-company.htm
[27] https://www.investopedia.com/articles/investing/061916/what-best-measure-companys-financial-health.asp