Applicability of Z-Altman's Model to Predict the Financial Distress of Selected Companies of Mahindra Group in India[1]

Dr. K. B. Ratna Kumari
Assistant Professor, Department of Economics, Telangana Mahila Vishwavidyalayam – A Women University, Koti, Hyderabad, Telangana.

Date of Receiving:05 July 2023;
Date of Acceptance:27 August 2023;
Date of Publication: 09 September 2023

ABSTRACT

The implementation of defective business policies reduces company's efficiency, if it continues in long run it affects its financial position which is popularly known as financial distress situation in finance domain. The studies on the financial distress concept are gaining world significance due to a series of corporate failures and bankruptcy. To address these issues many financial distress predication models came into existence among which Z altman's model is popular one. However, the applicability and reliability of this model in India context is untouched area in research domain. Thus, present study focused to fulfilment this gap. The present study applied Z alman's model in the four selected companies of Mahindra group of companies listed in NSE for the period of 2020-2022. The study concludes, that, among four selected companies Tech Mahindra company reported high financial healthiness with Z score of 4.806 which indicates strong financial soundness and no scope to bankruptcy. Thereafter, Mahindra EPC irrigation companies reported Z score of 3.012 which also indicates financial healthiness. Thereafter, Mahindra and Mahindra company reported Z score of 2.743 which indicates caution time for reforms for improvement in financial soundness in near time. Finally, M&M financial services company reported Z score of 1.40 which indicates dangerous zone of financial distress immediately or within two years. Thus, present study concludes that, among four selected companies of Mahindra group three are in safe position and only one is exposed to financial distress and bankruptcy position.

Key words: *Z- Altman's Model; financial distress; Mahendra group companies; bankruptcy.*

JEL codes: G23, B26, F36,

1. INTRODUCTION

Financial distress is an indicator of a situation facing by the companies in repayment of their dues over a period of time, this also leads to bankruptcy in the long run. Financial distress used to measure the unwanted struggle exposed by the corporate sector in meeting of financial obligations timely. The measurement of financial distress helps the company initially to find out the financial un-healthiness and to take immediate precautions to address it. If the Financial distress is high for any company it leads to lower credit rating which affects its fund rating capacity at economical rates. This also leads to increase in pressure on the payment of existing debts. There are different models in use for predicting financial distress in corporate sector these includes univariate model i.e., Fitzpatrick (1932) and the other one is Multiple discriminant analysis model which includes Altman (1986), Edmister (1972), Deakin (1972), Blum (1974), Moyer (1977), [Halderman, Naarayanan, Altman] (1977), Bartezak (1985), [Lawerence and Bear] (1986), [Poston, Harmon] (1994). There are many factors which effect the financial position of the company and leads to distress such as changes in technology, issues in management, Frauds and Scams inside the company, lack of Investment, Inability to proper utilisation of Funds, if the situation continues for a long period it costs much more

[1] *How to cite the article:* Kumari K.B.R; (September 2023); Applicability of Z-Altman's Model to Predict the Financial Distress of Selected Companies of Mahindra Group in India; *International Journal of Law, Management and Social Science*, Vol 7, Issue 3, 80-89

than the usual expenditure of the company, this might leads to default of obligations and high chance to face the bankruptcy, the models prescribed to calculate the financial distress of the companies will predict the situations before and helps the companies to re-organise or to liquidate before getting high pressure.

2. CONCEPTUAL FRAMEWORK

Monika sharma , Govind Patra (2021) this journal is about how the companies are facing the problems mainly in developed countries and reasons for not able to survive in the market and sighted some of the major reasons for companies which are suffering from financial Distress and Bankruptcy. Yonas Nigussie Isayas (2021) The journal is an investigation on the selected insurance companies from the time period 2008 to 2019 by using various statistical tools completely focused companies having negative impact on financial distressed insurance companies. Amiyatosh Purnanandam (2008) The paper 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. Brown, David (2006) 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 external environment issues and suggested re-capitalise options before the situation getting worse. Chen Y (2022) The journal is related to companies in different sectors which are facing severe financial issues taking a huge sample size, he proposed various models to predict 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.

3. REVIEW OF LITERATURE:

Anjum (2012) this journal article is all about the failure of Business and changes that were undertaken in the Altman Z score model over the period from 1968 to 1993 and the comparison on various models developed in respect of bankruptcy. The study states that the model is widely identified as the predictor for bankruptcy. It also states that Altman Z score model can safely be applied to the modern economy to predict bankruptcy two to three years before the bankruptcy case was revealed. Partha (2013) Companies use financial ratios, especially to assess and evaluate the creditworthiness and risk of a firm. Z- Score is a good time-tested method to assess the bankruptcy or insolvency risk of a firm. This paper attempts to study how much Z-score is viable in bankruptcy of the said company. The Altman's Z score model has been employed to investigate the risk of financial distress of Dunlop India Ltd., from 2007-08 to 2011-12. Bal (2015) The objective of the research paper was to find out the position with the help of Altman's Z score model on five selected FMCG companies from the time period from 2011 to 2015. The article contains the data with respect to the liquidity analysis. And, it also mentioned that the Z score model is effective in predicting the bankruptcy of the FMCG companies and it suggested the use the financial investors to practice the same. The study also recommended that the companies should estimate Z-score regularly, in order to make better strategies to improve the financial position of their companies.

Toly (2019) The main purpose of the research paper is to present the possibility of financial distress in Listed companies of Indonesia with reference to Manufacturing Industry by using the Altman Z score Model from the time period 2016-2018, taking 139 companies as sample and also with the help of logistic regression test to identify the four ratios in Z score Model. M Poston (1994) The study is to identify the financially distressed firms during the period 1970 to 1976 and assigned to three groups based on their financial position at that period of time and utilising the Financial Ratios on sample companies to find the unsuccessful companies and suggest the useful efforts to failing firms. C Viswanatha Reedy (2012) The Research paper aims to pretend the bankruptcy and financial distress of Dr. Reddy's Laboratories Limited, from the year 2005-2011, with the usage of Altman's Z-score model. He considered the Risk and Return as the most important aspect of the study, to evaluate results and the study concluded that the company is not in a situation of financial distress.

Shashikanta Baisag (2020) The study states that higher leverage will increase the return on Investment and also stated that Financial Distress is the last stage of decline of corporate where the company will face that situation due to lack of adequate liquidity. Financial Distress is very important as it is an indicator and a warning bell for an entity in order to re-build the existing financial structure and help the entities to take remedial measures in advance, to avoid the

situation of Financial Distress. Lina Harjans (2018) Many researchers developed different models in order to predict the bankruptcy of companies across the world. However, these models are different from other models in all aspects. The main focus of this paper is to show the variety of bankruptcy prediction models and their differences by taking two models with the help of financial ratios, namely Altman's z-score and J-model, which are compared and analysed using a sample of US companies. It concluded that J-Model is a better indicator than Z-score Model. Apoorva D.V (2019) This paper conclude that the model is 85% accurate and effective for three years prior to the occurrence of the event of bankruptcy. As it is not 100% accurate, as it have its own limitations. Concluded that this model can be applicable to Indian companies as well, but it cannot be an accurate predictor. J Aharony (1980) The paper is based on empirical data research by comparing the financial ratios in order to predict the financial distress by taking a sample of failed corporations and non-failed corporations of few years.

4. MODEL DESCRITPTION: ALTMAN'S Z-SCORE MODEL

Altman's Z-score Model is one of the financial distress Model which is a tool used to assess the probability of a company's bankruptcy. It was introduced by Edward Altman in the late 1960s and is based on multiple financial ratios.

The Z-score is calculated using the following formula:

$Z = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E$

Where:

A = Working Capital / Total Assets

B = Retained Earnings / Total Assets

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

D = Market Value of Equity / Total Liabilities

E = Sales / Total Assets

The resulting Z-score is a number that indicates the possibility level of bankruptcy. A score below to 1.8 refers that the company is likely to go bankrupt, score between 1.8-2.7 give an indication to the alarming situation that there is a probability for a company to go bankrupt within coming 2 operating years, score between 2.7-2.99 is an alert for a company to adopt caution, while a score above 3.0 refers that the company is financially healthy. Altman's Z-score was been used in the financial analysis because it is very simple to calculate and provides a report of a company's financial health. However, it is been criticized for being too simple and neglecting other factors which may affect a company's financial position. Altman's Z-score model is an important useful tool for pretending a company's financial position and possibility of bankruptcy. It should be used in conjunction with other financial analysis tools to gain a more comprehensive understanding of a company's financial situation. Ratio analysis: This involves calculating financial ratios such as liquidity ratios, profitability ratios, and efficiency ratios, to gain insights into the company's financial performance. Cash flow analysis: This involves analysing the company's cash flows to determine whether it has sufficient cash to meet its obligations, such as debt repayments. Trend analysis: This involves analysing the company's financial data over time to identify trends and changes in its financial performance. Industry analysis: This involves analysing the company's financial performance relative to other companies in the same industry, as well as analysing industry trends and factors that may affect the company's financial health. By using a combination of these financial analysis tools, investors and analysts can gain a more complete picture of a company's financial situation and make more informed investment decisions.

5. RESEARCH METHODOLOGY

5.1 Research Problem:

The financial distress is 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.

5.2 Objectives of the Study

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

a. **SAMPLE SIZE**: In the present study four companies from the Mahindra group are selected randomly such as Mahindra & Mahindra, Tech Mahindra, Mahindra & Mahindra Financial Services and Mahindra CIE Automotive. The applied sample selection technique is purpose sampling.

b. 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 comprise of Working Capital / Total Assets, Retained Earnings / Total Assets, Earnings Before Interest and Taxes (EBIT) / Total Assets, D = Market Value of Equity / Total Liabilities, E = Sales / 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

6. Data Analysis and Interpretation

Table01: Z score calculation of Mahindra and Mahindra company for the study period of 2020-2022

Year 2022		**Numerator (Rs Cr)**	**TA or TL (Rs Cr)**	**Ratios (x)**	**1.2A + 1.4B + 3.3C + 0.6D + 1.0E**	**Avg.Z-score**
A	Working Capital / Total Assets	7,097.41	67,130.26	0.105	0.126	
B	Retained Earnings / Total Assets	38,139.19	67,130.26	0.568	0.795	

C	EBIT / Total Assets	6,560.68	67,130.26	0.097	0.322	2.963
D	MV of Equity/ Total Liabilities	96,511.87	67,130.26	1.437	0.862	
E	Sales / Total Assets	57,445.97	67,130.26	0.855	0.855	
Year 2021						
A	Working Capital / Total Assets	5,179.13	59,588.80	0.087	0.104	
B	Retained Earnings / Total Assets	33,649.65	59588.80	0.564	0.790	
C	EBIT / Total Assets	1,771.50	59,588.80	0.030	0.098	2.720
D	MV of Equity/ Total Liabilities	96489.49	59588.80	1.620	0.971	
E	Sales / Total Assets	45,040.98	59588.80	0.755	0.755	
Year 2020						
A	Working Capital / Total Assets	4168.67	50,502.06	0.082	0.099	
B	Retained Earnings / Total Assets	33,606.36	50,502.06	0.662	0.931	
C	EBIT / Total Assets	3221.33	50,502.06	0.063	0.210	2.545
D	MV of Equity/ Total Liabilities	33995.66	50,502.06	0.673	0.403	
E	Sales / Total Assets	45,487.78	50,502.06	0.900	0.900	
Overall Z score						2.743

Table 01: The result evidence that, Mahindra and Mahindra company, in 2019-20 working capital to total assets was 0.082, retained earnings to total assets ratio is 0.662, EBITY to total assets ratio is 0.063, market value of equity to total liabilities is 0.673 and sales to total assets is 0.900. These ratios are incorporated in the Z Atman's model, consequently the following result obtained for all the respective ratios as 0.099, 0.931, 0.210, 0.403 and 0.900. Thus, the overall Z-Score for the year 2019-20 is 2.545. The result proved that, Mahindra and Mahindra company, in 2020-21 working capital to total assets was 0.087, retained earnings to total assets ratio is 0.564, EBITY to total assets ratio is 0.030, market value of equity to total liabilities is 1.620 and sales to total assets is 0.755. These ratios are incorporated in the Z Atman's model, consequently the following result obtained for all the respective ratios as 0.104, 0.790, 0.098, 0.971 and 0.755. Thus, the overall Z-Score for the year 2019-20 is 2.720. Similarly, in 2021-22, Mahindra and Mahindra company, working capital to total assets was 0.105, retained earnings to total assets ratio is 0.568, EBITY to total assets ratio is 0.097, market value of equity to total liabilities is 1.437 and sales to total assets is 0.855. These ratios are incorporated in the Z Atman's model, consequently the following result obtained for all the respective ratios as 0.126, 0.795, 0.322, 0.862 and 0.855. Thus, the overall Z-Score for the year 2019-20 is 2.963.

Table 02: Z score calculation of Tech Mahindra company for the study period of 2020-2022

Year 2022	**Numerator (Rs Cr)**	**TA or TL (Rs Cr)**	**Ratios (X)**	**1.2A + 1.4B + 3.3C +**	**Avg.Z-score**

					0.6D + 1.0E	
A	Working capital / Total Assets	10,328.60	35,004.80	0.295	0.35	
B	Retained earnings / Total Assets	25,359.70	35,004.80	0.724	1.01	
C	EBIT / total assets	6,323.00	35,004.80	0.181	0.60	4.796
D	MV of Equity / total liabilities	1,07,348.72	35,004.80	3.067	1.84	
E	Sales / Total Assets	34,726.10	35,004.80	0.992	0.99	
Year 2021						
A	Working capital / Total Assets	14,058.90	33,374.70	0.421	0.51	
B	Retained earnings / Total Assets	24,526.60	33,374.70	0.735	1.03	
C	EBIT / total assets	5,591.80	33,374.70	0.168	0.55	4.701
D	MV of Equity / total liabilities	95,991.70	33,374.70	2.876	1.73	
E	Sales / Total Assets	29,640.90	33,374.70	0.888	0.89	
Year 2020						
A	Working capital / Total Assets	12,329.30	30,322.00	0.407	0.49	
B	Retained earnings / Total Assets	21,377.60	30,322.00	0.705	0.98	
C	EBIT / total assets	5,390.00	30,322.00	0.178	0.58	4.920
D	MV of Equity / total liabilities	95,759.43	30,322.00	3.158	1.89	
E	Sales / Total Assets	29,225.40	30,322.00	0.964	0.96	
Overall Z-Score						4.806

Table 02: The result evidence that, Mahindra and Mahindra company, in 2019-20 working capital to total assets was 0.407, retained earnings to total assets ratio is 0.705, EBITY to total assets ratio is 0.178, market value of equity to total liabilities is 3.158 and sales to total assets is 0.964. These ratios are incorporated in the Z Atman's model (Z = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E), consequently the following result obtained for all the respective ratios as 0.488, 0.987, 0.587, 1.895 and 0.964. Thus, the overall Z-Score for the year 2019-20 is 4.920. The result provided that, Mahindra and Mahindra company, in 2020-21 working capital to total assets was 0.421, retained earnings to total assets ratio is 0.735, EBITY to total assets ratio is 0.168, market value of equity to total liabilities is 2.876 and sales to total assets is 0.888. These ratios are incorporated in the Z Atman's model (Z = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E), consequently the following result obtained for all the respective ratios as 0.51, 1.03, 0.55, 1.73 and 0.89. Thus, the overall Z-Score for the year 2020-21 is 4.701. Similarly, in 2021-22, Mahindra and Mahindra company, working capital to total assets was 0.295, retained earnings to total assets ratio is 0.724, EBITY to total assets ratio is 0.181, market value of equity to total liabilities is 3.067 and sales to total assets is 0.992. These ratios are incorporated in the Z Atman's model (Z = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E), consequently the following result obtained for all the respective ratios as 0.35, 1.01, 0.60, 1.84 and 0.99. Thus, the overall Z-Score for the year 2021-22 is 4.796.

Table 03: Z score calculation of Mahindra and Mahindra Financial Services for the study period of 2020-2022

2021-22		Numerator	**TA or TL (Rs Cr)**	GT	z-score	
A	Working Capital / Total Assets	43,785.61	75,288.73	0.582	0.698	
B	Retained Earnings / Total Assets	15,350.20	75,288.73	0.204	0.285	1.50
C	EBIT / Total Assets	5,274.77	75,288.73	0.070	0.231	
D	Market Value of Equity/ Total Liabilities	19,622.49	75,288.73	0.261	0.156	
E	Sales / Total Assets	9,657.97	75,288.73	0.128	0.128	
Year 2 (2021)						
A	Working Capital / Total Assets	44,473.84	77,036.45	0.577	0.693	
B	Retained Earnings / Total Assets	14,422.35	77,036.45	0.187	0.262	
C	EBIT / Total Assets	5,153.23	77,036.45	0.067	0.221	1.37
D	Market Value of Equity/ Total Liabilities	24,509.96	77,036.45	0.318	0.191	
E	Sales / Total Assets	10,456.11	77,036.45	0.136	0.136	
Year 3 (2020)						
A	Working Capital / Total Assets	41,594.00	74,071.21	0.562	0.674	
B	Retained Earnings / Total Assets	11,192.15	74,071.21	0.151	0.212	
C	EBIT / Total Assets	6,161.18	74,071.21	0.083	0.274	1.34
D	Market Value of Equity/ Total Liabilities	5,522.75	74,071.21	0.075	0.045	
E	Sales / Total Assets	10,097.85	74,071.21	0.136	0.136	

Overall Z-Score	1.40

Table 03: The result evidence that, Mahindra and Mahindra Financial Services company, in 2019-20 working capital to total assets was 0.561, retained earnings to total assets ratio is 0.151, EBITY to total assets ratio is 0.083, market value of equity to total liabilities is 0.074 and sales to total assets is 0.136. These ratios are incorporated in the Z Atman's model (Z = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E), consequently the following result obtained for all the respective ratios as 0.673, 0.211, 0.274, 0.044 and 0.136. Thus, the overall Z score for the year 2019-20 is 1.34. The result evidence that, Mahindra and Mahindra Financial Services company, in 2020-2021 working capital to total assets was 0.577, retained earnings to total assets ratio is 0.187, EBITY to total assets ratio is 0.066, market value of equity to total liabilities is 0.318 and sales to total assets is 0.135. These ratios are incorporated in the Z Atman's model (Z = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E), consequently the following result obtained for all the respective ratios as 0.692, 0.262, 0.220, 0.190 and 0.135. Thus, the overall Z score for the year 2020-21 is 1.50. The result evidence that, Mahindra and Mahindra Financial Services company, in 2021-22 working capital to total assets was 0.58, retained earnings to total assets ratio is 0.20, EBITY to total assets ratio is 0.07, market value of equity to total liabilities is 0.26 and sales to total assets is 0.13. These ratios are incorporated in the Z Atman's model (Z = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E), consequently the following result obtained for all the respective ratios as 0.70, 0.29, 0.23, 0.16 and 0.13. Thus, the overall Z score for the year 2021-22 is 1.50. This indicates the companies

Table 04: Z score calculation of Mahindra EPC Irrigation for the study period of 2020-2022

		Numerator (Rs Cr)	**TA or TL (Rs Cr)**	**Ratios (X)**	**1.2A + 1.4B + 3.3C + 0.6D + 1.0E**	**Avg.Z-score**
2021-22						
A	Working Capital / Total Assets	99.78	279.72	0.357	0.428	
B	Retained Earnings / Total Assets	147.46	279.72	0.527	0.738	
C	EBIT / Total Assets	-9.30	279.72	-0.033	-0.110	
D	MV of Equity/ Total Liabilities	252.64	279.72	0.903	0.542	
E	Sales / Total Assets	211.94	279.72	0.758	0.758	2.356
2020-21						
A	Working Capital / Total Assets	116.43	268.22	0.434	0.521	3.503
B	Retained Earnings / Total Assets	158.87	268.22	0.592	0.829	
C	EBIT / Total Assets	25.78	268.22	0.096	0.317	
D	MV of Equity/ Total Liabilities	396.85	268.22	1.480	0.888	
E	Sales / Total Assets	254.22	268.22	0.948	0.948	
2019-20						

A	Working Capital / Total Assets	97.61	263.93	0.370	0.444	
B	Retained Earnings / Total Assets	142.88	263.93	0.541	0.758	
C	EBIT / Total Assets	34.38	263.93	0.130	0.430	
D	MV of Equity/ Total Liabilities	206.55	263.93	0.783	0.470	
E	Sales / Total Assets	283.96	263.93	1.076	1.076	3.177
OVERALL Z-SCORE Source: Computed by researcher						3.012

Table 04: The result evidence that, Mahindra and Mahindra Financial Services company, in 2019-20 working capital to total assets was 0.370, retained earnings to total assets ratio is 0.541, EBITY to total assets ratio is 0.130, market value of equity to total liabilities is 0.783 and sales to total assets is 1.076. These ratios are incorporated in the Z Atman's model consequently the following result obtained for all the respective ratios as 0.444, 0.758, 0.430, 0.470 and 1.076. Thus, the overall Z score for the year 2019-20 is 3.177. The result evidence that, Mahindra and Mahindra Financial Services company, in 2020-2021 working capital to total assets was 0.434, retained earnings to total assets ratio is 0.592, EBITY to total assets ratio is 0.096, market value of equity to total liabilities is 1.480 and sales to total assets is 0.948. These ratios are incorporated in the Z Atman's model (consequently the following result obtained for all the respective ratios as 0.521, 0.829, 0.317, 0.888 and 0.948. Thus, the overall Z score for the year 2020-21 is 3.503. The result evidence that, Mahindra and Mahindra Financial Services company, in 2021-22 working capital to total assets was 0.357, retained earnings to total assets ratio is 0.527, EBITY to total assets ratio is -0.003, market value of equity to total liabilities is 0.903 and sales to total assets is 0.758. The value of ratios incorporated in Z Atman's model which resulted in the values of 0.428, 0.738, -0.110, 0.542 and 0.758 in each respective ratio. The overall Z score for the year 2021-22 is 2.356.

7. Conclusion

The implementation of defective business policies reduced company's efficiency, if it continues in long run, it affects its financial position which is popularly known as financial distress situation in finance domain. The studies on the financial distress concept are gaining world significance due to a series of corporate failures and bankruptcy due to financial distress. To address these issues many financial distress predication models came into existence among which Z Altman's model is popular one. However, the applicability and reliability of this model in India context is untouched area in research domain. Thus, present study focused to fulfil this gap. The present study applied Z alman's model in the four selected companies of Mahindra group of companies listed in NSE for the period of 2020-2022. The study concludes, that, among four selected companies Tech Mahindra company reported high financial healthiness with Z score of 4.806 which indicates strong financial soundness and no scope to bankruptcy. Thereafter, Mahindra EPC irrigation companies reported Z score of 3.012 which also indicates financial healthiness. Thereafter, Mahindra and Mahindra company reported Z score of 2.743 which indicates caution time for reforms for improvement in financial soundness in near time. Finally, M&M financial services company reported Z score of 1.40 which indicates dangerous zone of financial distress immediately or within two years. Thus, present study concludes that, among four selected companies of Mahindra group three are in safe position and only one is exposed to financial distress and bankruptcy position.

8. References

Aharony, J., Jones, C. P., & Swary, I. (1980). An analysis of risk and return characteristics of corporate bankruptcy using capital market data. *Journal of Finance, 35*(4), 1001–1016. https://doi.org/10.1111/j.1540-6261.1980.tb03506.x

Anjum, S. (2012). *Business bankruptcy prediction models: A significant study of the Altman's Z-score model*. SSRN. https://ssrn.com/abstract=2128475

Apoorva, D. V. (2019). Application of Altman Z score model on selected Indian companies to predict bankruptcy. *International Journal of Business and Management Invention (IJBMI), 8*(1), 77–82.

Baisag, S., & Patjoshi, P. (2020). Corporate financial distress prediction – A review paper. *Palarch's Journal of Archaeology of Egypt/Egyptology, 17*(9). ISSN 1567-214x

Bal, G. R. (2015). Prediction of financial distress using Altman Z score: A study of select FMCG companies. *Indian Journal of Applied Research, 5*(9).

Brown, D., Ciochetti, B., & Riddiough, T. (2006). Theory and evidence on the resolution of financial distress. *Review of Financial Studies, 19*(4), 1357–1397. https://doi.org/10.1093/rfs/hhj031

Chen, Y., Guo, J., Huang, J., & Lin, B. (2022). A novel method for financial distress prediction based on sparse neural networks with L1/2 regularization. *International Journal of Machine Learning and Cybernetics, 13*(7), 2089–2103. https://doi.org/10.1007/s13042-022-01566-y

Ghosh, P. (2013). Testing of Altman's Z-score model: A case study of Dunlop India Ltd. *Indian Journal of Research, 2013*. SSRN. https://ssrn.com/abstract=3787858

Harjans, L. (2018). A comparison of Altman's Z-score and the J-model in assessing corporate failure: Evidence from the USA. *11th IBA Bachelor Thesis Conference*, Enschede, The Netherlands.

Isayas, Y. N., & McMillan, D. (2021). Financial distress and its determinants: Evidence from insurance companies in Ethiopia. *Cogent Business & Management, 8*(1). https://doi.org/10.1080/23311975.2021.1951110

Poston, K. M., Harmon, K., & Gramlich, J. D. (1994). A test of financial ratios as predictors of turnaround versus failure among financially distressed firms. *Journal of Applied Business Research, 10*(1), 41–51.

Purnanandam, A. (2008). Financial distress and corporate risk management: Theory and evidence. *Journal of Financial Economics, 87*(3), 706–739. https://doi.org/10.1016/j.jfineco.2007.04.005

Reedy, C. V. (2012). *Analysis of liquidity, profitability, risk and financial distress: A case study of Dr. Reddy's Laboratories Ltd.* SSRN. https://ssrn.com/abstract=3423225

Sharma, M., & Patra, G. (2021). Prediction of financial distress in Indian firms using Altman Z-score model. *Journal of Contemporary Issues in Business and Government, 27*(2).

Toly, A., Permatasari, R., & Wiranata, E. (2020). The effect of financial ratio (Altman Z-score) on financial distress prediction in manufacturing sector in Indonesia 2016–2018. *Proceedings of the International Conference on Applied Science and Technology on Social Science (ICAST-SS 2020)*. https://doi.org/10.2991/aebmr.k.200606.008