INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD
ISSN(O): 2455-0620 [Impact Factor: 9.47]
Monthly, Peer-Reviewed, Refereed, Indexed Journal with IC Value : 86.87
Volume - 11, Issue - 07, July - 2025

DOIs:10.2015/IJIRMF/202507022 --:-- Research Paper / Article / Review

Financial Distress Analysis of Selected Automobile Companies in India Using Altman Z-Score Model

Shivani Singh
Research scholar, Faculty of Commerce, Banaras Hindu University, Varanasi, India
Email - singhshivani9794@gmail.com

Abstract: *The automobile industry plays a pivotal role in India's economic development, making significant contributions to GDP, employment creation, and industrial progress. Due to its capital-intensive nature and sensitivity to market dynamics, assessing the financial condition of automobile firms becomes essential. This research employs the Altman Z-Score model to evaluate the risk of financial distress among five major Indian automobile companies Tata Motors, Maruti Suzuki, Mahindra & Mahindra, Bajaj Auto, and TVS Motor during the period from 2015 to 2024. By examining the Z-Score and its five underlying financial ratios, the study highlights differences in financial stability across these firms. The results indicate that companies such as Bajaj Auto and TVS Motor consistently maintain robust financial positions, whereas Tata Motors exhibits signs of financial strain during certain years. The research demonstrates the practical relevance of the Altman Z-Score as an effective tool for stakeholders in assessing corporate solvency within the evolving landscape of the Indian automobile sector.*

Keywords: *Automobile Industries, Financial health, Altman Z score Model, Bankruptcy Prediction, and Financial Distress.*

1. INTRODUCTION:

The automobile industry is a critical component of industrial growth and economic progress, particularly in emerging economies like India. It significantly contributes to GDP, creates large-scale employment, attracts investment, and fosters innovation through its strong linkages with multiple sectors such as steel, rubber, electronics, and logistics. The financial health of this sector, therefore, holds national significance, impacting not just individual firms but also the broader economic ecosystem.

However, the automobile industry is highly capital-intensive and prone to market uncertainties, including shifts in consumer preferences, regulatory changes, and global economic fluctuations. These factors make firms in this sector particularly vulnerable to financial distress. As a result, regular monitoring of financial stability is essential to maintain operational efficiency, investor trust, and long-term sustainability.

To assess the financial soundness of firms, several analytical models are used, among which the **Altman Z-Score model** is widely recognized. Developed by Edward Altman, this model predicts the likelihood of financial distress by integrating five key financial ratios related to liquidity, profitability, leverage, solvency, and activity. These ratios are combined into a single score that categorizes a company into one of three zones: Safe, Grey, or Distress.

This study applies the Altman Z-Score model to examine the financial stability of five major Indian automobile companies Tata Motors, Maruti Suzuki, Mahindra & Mahindra, Bajaj Auto, and TVS Motor over the period from 2015 to 2024. By analyzing trends in Z-Score values, the research aims to identify early signs of financial vulnerability and evaluate the effectiveness of the model in the Indian automotive context. The findings are expected to support strategic decision-making for stakeholders and contribute to the broader discourse on corporate financial health in capital-intensive industries.

1.1. Financial Distress

Financial distress occurs when a company struggles to fulfill its financial obligations, such as paying debts, managing operational expenses, or satisfying creditors. This condition is often seen as an early warning sign of potential insolvency or bankruptcy. Various internal and external factors like declining revenues, rising debt levels, mismanagement, or economic downturns can lead to such a scenario. Early detection of financial distress is essential, as it enables businesses and stakeholders to implement corrective strategies before the situation worsens.

In today's dynamic and uncertain market environment, even well-established firms are vulnerable to sudden financial shocks. The implications of financial distress extend beyond the individual company, affecting employee livelihoods, investor confidence, and overall economic stability. As a result, several analytical models have been developed to assess the likelihood of corporate failure. One such widely accepted model is the Altman Z-Score, which has proven effective in predicting financial instability.

1.2. Automobile Sector

The Indian automobile industry is one of the fastest-growing sectors, with major policy reforms such as the 1991 de-licensing and 100% FDI under the automatic route attracting global manufacturers. Consequently, vehicle production has grown from 2 million units in 1991–92 to nearly 28 million units by 2023-24 (PIB, 2025). With an annual turnover of USD 240 billion (₹20 lakh crore), the sector significantly contributes to GDP and employment, supporting around 30 million jobs. India exported vehicles and auto components worth USD 35 billion and ranks among the top global producers of three and two-wheelers, passenger, and commercial vehicles (Ministry of Heavy Industries, 2024-25).

Given the sector's sensitivity to economic cycles, global dynamics, and internal inefficiencies, assessing the financial health of automobile firms is critical. Evaluating company performance using tools like the Altman Z-Score helps stakeholders identify distress risks and guide decision-making.

2. Review of literature:

Numerous studies have been conducted worldwide to analyze the financial health of companies, using various financial ratios and models to predict corporate stability and distress. Over the decades, accounting ratios have proven to be fundamental tools in assessing a firm's operational and financial efficiency. Researchers have long sought to identify a single ratio that could effectively predict corporate failure, though such efforts often evolved into the development of multivariate models for improved accuracy.

The prediction of corporate financial distress through financial ratios has been a key focus in financial research since the mid-20th century. **Beaver (1966)** pioneered this domain by demonstrating that individual financial ratios could predict corporate failure up to five years in advance. However, the search for a more reliable and comprehensive method led to the development of multivariate models. A landmark contribution was made by **Altman (1968)**, who introduced the **Altman Z-Score model** using Multiple Discriminant Analysis (MDA). This model combined five financial ratios to form a single predictive score for bankruptcy risk. Altman's study, based on a sample of 60 firms, showed superior accuracy compared to previous models, establishing a widely accepted framework for financial distress prediction.

Building on Altman's work, **Rajasekar et al. (2014)** studied the financial health of Indian Navratna companies and emphasized that regular monitoring using predictive models like Z-Score is crucial, even for government-supported firms. Further, **Bhatt (2012)** and **Anjum (2012)** validated the applicability of various Z-Score models for Indian firms, confirming their effectiveness in predicting financial failure two to three years ahead. The Z-Score model's practical relevance has been established across various Indian industries.

For instance, **Ambika and Sengottaiyan (2015)** applied the model to fertilizer companies from 1999 to 2012, identifying Southern Petrochemical Industries Corporation Ltd. (SPICL) as financially the strongest. Focusing on liquidity's influence in the automotive industry, **Ranjithkumar and Eahambaram (2018)** examined key drivers of

financial performance in Indian automotive firms. They emphasized liquidity's critical role in maintaining financial health, noting that adequate liquidity prevents severe financial distress.

Environmental and economic factors also impact the automotive sector. **Yadav et al. (2020)** analyzed how increased disposable income in rural areas leads to higher vehicle demand, subsequently contributing to increased air pollution. Similarly, **Moradi et al. (2020)** highlighted how the COVID-19 pandemic shifted consumer preferences towards personal vehicles for safety, boosting future demand and advocating for electric vehicles to ensure environmental sustainability. Studies applying the Altman Z-Score in varied contexts include **Sulphey and Nisa (2013)**, who evaluated the solvency of 220 small firms listed on the Bombay Stock Exchange (BSE), and **Swalih and Vinod (2017)**, who investigated the financial performance of green companies using the Z-Score model. These studies underscore the model's adaptability and continued relevance in diverse sectors.

3. Statement of problem :

The Indian automobile industry plays a vital role in the economy but faces challenges related to financial instability and market fluctuations. Many companies struggle with maintaining profitability, liquidity, and solvency, which can lead to financial distress. Traditional financial analysis methods may not always provide early warnings of such issues. Therefore, this study aims to evaluate the financial health of selected automobile companies using key financial ratios and the Altman Z-Score model to better predict financial distress and support effective decision-making.

4. Research Gap:

While several studies have assessed the financial performance of Indian automobile companies, limited research has applied the Altman Z-Score model over a long-term period (2015-2024) for multiple leading firms. Most existing literature focuses on short-term analysis or individual companies, lacking comparative evaluation. Additionally, the integration of all five components of the Z-Score for diagnosing financial distress is often overlooked. This study fills the gap by providing a company-wise, year-wise analysis using the full Altman model, offering deeper insights into financial stability trends across the sector.

5. Need of the Study:

The Indian automobile sector significantly influences GDP, employment, and exports. Given its capital-intensive nature and sensitivity to market fluctuations, assessing financial stability is essential. With increasing competition and economic uncertainty, companies face a greater risk of distress. This study uses the Altman Z-Score model to evaluate long-term financial health, offering valuable insights to stakeholders for early risk detection and informed decision-making over a ten-year period.

6. Objectives of the study:

- To evaluate the financial health of selected automobile companies through the application of the Altman Z-Score model.
- To predict the possibility of bankruptcy of selected automobile companies using the Altman Z-Score approach.

7. Research Methodology:

- **Research Design:** The research is quantitative, descriptive in nature, focusing on analyzing and assessing the financial health of selected automobile companies using financial ratios and the Altman Z-Score model.
- **Data Source**: The study is entirely based on secondary data collected from annual reports, company websites, financial databases (such as moneycontrol.com), newspapers, journals, articles, and other reliable online sources.
- **Sample Selection**: The sample consists of five major automobile companies listed on the National Stock Exchange (NSE), selected based on market capitalization as of March 2025. The selected companies are Tata Motors, Mahindra & Mahindra, Bajaj Auto Ltd, Maruti Suzuki, and TVS Motor Company.
- **Study Period**: The analysis covers a ten-year period from 2015 to 2024.

- **Tools and Techniques for Analysis**: The Altman Z-Score model has been used as the primary analytical tool to evaluate the financial health and predict the potential financial distress of the selected companies.

Altman Z-Score Model

Introduced by Edward Altman in 1968, the Altman Z-Score model is a statistical approach designed to evaluate the financial stability of firms and estimate the probability of bankruptcy. It uses a blend of key financial ratios derived from balance sheet and income statement data, combined through a multivariate formula. Due to its reliability and ease of use, the model has gained widespread application in financial research, credit analysis, and risk management.

It combines five key financial ratios covering liquidity, profitability, leverage, solvency, and efficiency into a single composite score. The formula is:

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

Where:

A = Working Capital/Total Assets
B = Retained Earnings/Total Assets
C = Earnings Before Interest and Tax/Total Assets
D = Market Value of Equity/Total Liabilities
E = Total Sales/Total Assets

The Z-score results are interpreted as follows:

- **Z-Score above 2.99** indicates the ***Safe Zone***, suggesting a low likelihood of bankruptcy.
- **Z-Score between 1.81 and 2.99** places a firm in the ***Grey Zone***, reflecting an uncertain or moderate financial position.
- **Z-Score of 1.81 or below** signals the ***Distress Zone***, pointing to a high probability of insolvency.

Originally developed for publicly traded manufacturing companies, the model has since been modified to accommodate private and non-manufacturing firms as well. The formula integrates variables like working capital, retained earnings, operating income, market value of equity, and total assets to generate a Z-Score. A low score signals potential financial trouble, while a high score reflects sound financial health. In the context of India's automobile industry, the Altman Z-Score serves as a valuable tool for assessing corporate stability amid market uncertainties, intense competition, and changing policy landscapes. Its application can help stakeholders identify early signs of financial distress and support informed decision-making for long-term sustainability.

8. Data Analysis and Interpretation:

The financial health of five selected Indian automobile companies Maruti Suzuki, Tata Motors, Mahindra & Mahindra, Bajaj Auto, and TVS Motor has been assessed using the Altman Z-Score model over the period from 2015 to 2024. The analysis includes the computation of five key financial ratios (A to E) for each company, which are then weighted and combined to derive the annual Z-Score. This section presents company-wise data tables and interpretation of Z-Score trends to evaluate their financial stability and the potential risk of financial distress across the study period.

Financial Information of Maruti Suzuki

The financial condition of Maruti Suzuki has been analyzed through the application of the Altman Z-Score model, which integrates five financial ratios to assess the likelihood of financial distress. The Z-Score values, indicate a consistent pattern of financial stability, offering insights into the company's overall solvency position across the years.

Table 1: Altman's Z-Score and Component Ratios of Maruti Suzuki

Maruti Suzuki's Altman's Z-Score							
Year	**A**	**B**	**C**	**D**	**E**	**Z-Score**	**Zone**
2015	-0.0468	0.1545	0.1545	0.0014	1.313	1.984	Grey Zone
2016	-0.1022	0.1221	0.1221	0.0018	1.439	1.891	Grey Zone
2017	-0.0032	0.0624	0.0624	0.0021	1.227	1.518	Distress Zone
2018	0.0345	0.0736	0.0736	0.0022	1.046	1.435	Distress Zone
2019	-0.0458	0.1129	0.1129	0.0024	1.263	1.741	Distress Zone
2020	-0.0284	0.1663	0.1663	0.0024	1.408	2.157	Grey Zone
2021	-0.1267	0.1853	0.1853	0.0025	1.378	2.099	Grey Zone
2022	-0.0868	0.1943	0.1943	0.0029	1.372	2.183	Grey Zone
2023	-0.0761	0.1775	0.1775	0.0036	1.407	2.152	Grey Zone
2024	-0.0186	0.1451	0.1451	0.0045	1.514	2.176	Grey Zone

Sources: compiled by author from Annual reports.

The table represents the Altman Z-Score values for Maruti Suzuki during 2015 to 2024 indicate a fluctuating financial position. From 2017 to 2019, the Z-Scores were below the 1.81 threshold, placing the company in the distress zone and suggesting a higher risk of financial instability. However, for the rest of the years, the company remained in the grey zone, showing moderate financial health. Although the Z-Score improved after 2020, it did not cross the 2.99 mark required to enter the safe zone. This reflects a need for continuous financial strengthening to ensure long-term stability and reduce the likelihood of financial distress.

Financial Information of Tata Motors Limited

The financial condition of Tata Motors has been analyzed through the application of the Altman Z-Score model, which integrates five fundamental financial ratios to assess the likelihood of financial distress. The Z-Score values, indicate a consistent pattern of financial stability, offering insights into the company's overall solvency position across the years.

Table 2: Altman's Z-Score and Component Ratios of Tata Motors

Tata Motors' Altman's Z-Score							
Year	**A**	**B**	**C**	**D**	**E**	**Z-Score**	**Zone**
2015	-0.205	-0.08	-0.08	0.013	0.764	0.152	Distress Zone
2016	-0.125	0.003	0.003	0.012	0.781	0.651	Distress Zone
2017	-0.152	-0.04	-0.04	0.012	0.769	0.406	Distress Zone
2018	-0.131	-0.016	-0.016	0.011	1.02	0.795	Distress Zone
2019	-0.08	0.039	0.039	0.011	1.178	1.274	Distress Zone
2020	-0.17	-0.114	-0.114	0.011	0.724	-0.009	Distress Zone
2021	-0.091	-0.035	-0.035	0.012	0.47	0.203	Distress Zone
2022	-0.017	-0.026	-0.026	0.012	0.75	0.616	Distress Zone
2023	0.143	0.02	0.02	0.012	1.078	1.352	Distress Zone
2024	0.118	0.119	0.119	0.012	1.127	1.833	Grey Zone

Sources: compiled by author from Annual reports.

The table represents the Altman Z-Score values of Tata Motors from 2015 to 2023, consistently remained in the distress zone with Z-Scores well below the 1.81 threshold, indicating prolonged financial vulnerability and heightened risk of distress. The lowest Z-Score was observed in 2020 (–0.009), reflecting severe financial weakness during that year. Although there were slight improvements in 2019 and 2023, the scores still fell within the distress category. In 2024, the company recorded a Z-Score of 1.833, marking a shift into the grey zone for the first time, which signals a marginal

improvement but still does not assure financial stability. The overall trend reflects the need for sustained financial restructuring and performance enhancement.

Financial Information of Mahindra & Mahindra Ltd

The following table presents the component ratios and computed Altman Z-Score for Mahindra & Mahindra over the period 2015 to 2024. The Altman Z-Score is a predictive model used to assess the financial health and bankruptcy risk of a company, particularly in the manufacturing sector. The score is based on five key financial ratios (A to E), which are then weighted and summed to derive the final Z-Score.

Table 3: Altman's Z-Score and Component Ratios of Mahindra & Mahindra Ltd.

Mahindra & Mahindra's Altman's Z-Score							
Year	**A**	**B**	**C**	**D**	**E**	**Z-Score**	**Zone**
2015	0.035	0.127	0.127	0.009	0.101	0.743	Distress Zone
2016	0.05	0.121	0.121	0.008	0.09	0.723	Distress Zone
2017	0.074	0.118	0.118	0.007	0.091	0.74	Distress Zone
2018	0.066	0.129	0.129	0.013	0.092	0.784	Distress Zone
2019	0.071	0.12	0.12	0.011	0.091	0.747	Distress Zone
2020	0.083	0.062	0.062	0.012	0.026	0.422	Distress Zone
2021	0.087	0.025	0.025	0.01	0.005	0.23	Distress Zone
2022	0.106	0.093	0.093	0.009	0.074	0.642	Distress Zone
2023	0.114	0.107	0.107	0.008	0.086	0.732	Distress Zone
2024	0.109	0.161	0.161	0.007	0.128	1.019	Distress Zone

Sources: compiled by author from Annual reports.

The table represents the Altman Z-Score and its component ratios for Mahindra & Mahindra Ltd. from 2015 to 2024 consistently remained in the distress zone, with Z-Scores significantly below the critical threshold of 1.81. The values ranged between 0.23 (2021) and 0.784 (2018), reflecting prolonged financial vulnerability. These persistently low scores suggest challenges related to profitability, retained earnings, and market value in relation to liabilities. Even though there was a marginal increase in the Z-Score to 1.019 in 2024, it was insufficient to move the company out of financial distress. This trend indicates the need for strategic financial improvement to strengthen its solvency position.

Financial Information of Bajaj Auto Ltd

The following table displays the Altman Z-Score and its five underlying component ratios (A to E) for Bajaj Auto Ltd. over the period 2015 to 2024. The Altman Z-Score serves as a reliable tool for evaluating a company's financial soundness and the likelihood of financial distress. It is calculated using five key financial metrics working capital, retained earnings, earnings before interest and taxes (EBIT), market value of equity, and sales in relation to total assets and liabilities.

Table 4: Altman's Z-Score and Component Ratios of Bajaj Auto Ltd.

Bajaj Auto Ltd's Altman's Z-Score							
Year	**A**	**B**	**C**	**D**	**E**	**Z-Score**	**Zone**
2015	0.048	0.287	0.287	0.008	1.346	2.755	Safe Zone
2016	0.118	0.238	0.238	0.009	1.208	2.474	Safe Zone
2017	0.166	0.204	0.204	0.009	1.076	2.239	Safe Zone

2018	0.271	0.188	0.188	0.009	0.92	2.136	Safe Zone
2019	0.095	0.266	0.266	0.012	1.278	2.647	Safe Zone
2020	0.08	0.245	0.245	0.011	1.165	2.418	Safe Zone
2021	0.215	0.243	0.243	0.012	1.113	2.519	Safe Zone
2022	0.297	0.256	0.256	0.014	1.104	2.674	Safe Zone
2023	0.118	0.336	0.336	0.018	1.435	3.169	Safe Zone
2024	0.324	0.262	0.262	0.019	1.426	3.06	Safe Zone

Sources: compiled by author from Annual reports.

The table represents the Altman Z-Score and its five component financial ratios for Bajaj Auto Ltd. during 2015-2024. Bajaj Auto Ltd remained within the Grey Zone from 2015 to 2022, with Z-Scores ranging from 2.136 to 2.755. This indicates a moderate financial position-neither at immediate risk of financial distress nor fully secure. The scores reflect relative financial stability, though not completely free from potential vulnerabilities. A notable improvement was seen in 2023 and 2024, with Z-Scores rising above the 2.99 threshold into the Safe Zone, reaching 3.169 and 3.06 respectively. This upward shift suggests strengthened financial health and reduced bankruptcy risk, possibly due to improved earnings performance, asset utilization, and stronger equity positioning.

Financial Information of TVS Motor Company

The table below presents the Altman Z-Score along with its five constituent financial ratios (A to E) for TVS Motor Company for the period 2015 to 2024. The Altman Z-Score is a recognized model for assessing a firm's financial condition and potential risk of bankruptcy. It incorporates key financial indicators, including the ratio of working capital to total assets, retained earnings to total assets, earnings before interest and taxes (EBIT) to total assets, market value of equity to total liabilities, and sales to total assets.

Table 5: Altman's Z-Score and Component Ratios of TVS Motor Company

TVS's Altman's Z-Score							
Year	**A**	**B**	**C**	**D**	**E**	**Z-Score**	**Zone**
2015	-0.149	0.173	0.173	0.003	1.988	2.625	Safe Zone
2016	-0.167	0.143	0.143	0.003	1.892	2.367	Safe Zone
2017	-0.154	0.102	0.102	0.004	1.756	2.055	Safe Zone
2018	-0.112	0.081	0.081	0.005	1.646	1.895	Grey Zone
2019	-0.136	0.081	0.081	0.005	1.759	1.978	Safe Zone
2020	-0.106	0.115	0.115	0.006	2.177	2.593	Safe Zone
2021	-0.167	0.122	0.122	0.007	2.128	2.506	Safe Zone
2022	-0.112	0.118	0.118	0.008	2.085	2.511	Safe Zone
2023	-0.087	0.127	0.127	0.01	2.263	2.762	Safe Zone
2024	-0.047	0.099	0.099	0.01	2.2	2.616	Safe Zone

Sources: compiled by author from Annual reports.

The table represents the Altman Z-Score and its five financial components for TVS Motor Company over the years 2015 to 2024. Throughout the ten-year period, TVS Motor consistently remained in the Grey Zone, with Z-scores ranging from 1.895 to 2.762. This positioning indicates a moderate financial standing neither reflecting high financial distress nor confirming complete financial safety. Although the company did not fall into the Distress Zone at any point, it also never crossed into the Safe Zone. The gradual upward trend, particularly in the years 2020 to 2024, suggests improving financial performance, likely driven by better profitability and efficient asset utilization. However, the scores imply that TVS Motor still carries a level of financial uncertainty, and stakeholders should monitor the company's performance closely to ensure continued progress toward financial robustness.

Table 6: Comparative Altman Z-Score of Selected Automobile Companies in India

Year	Maruti Suzuki	Tata Motors	Mahindra & Mahindra	Bajaj Auto	TVS Motor
2015	1.984	0.152	0.743	2.755	2.625
2016	1.891	0.651	0.723	2.474	2.367
2017	1.518	0.406	0.74	2.239	2.055
2018	1.435	0.795	0.784	2.136	1.895
2019	1.741	1.274	0.747	2.647	1.978
2020	2.157	-0.009	0.422	2.418	2.593
2021	2.099	0.203	0.23	2.519	2.506
2022	2.183	0.616	0.642	2.674	2.511
2023	2.152	1.352	0.732	3.169	2.762
2024	2.176	1.833	1.019	3.06	2.616

Label: Z-Score Interpretation Zones

- (Red) **Distress Zone (Z < 1.81)** (High risk of financial distress)
- (Yellow) **Grey Zone (1.81 ≤ Z ≤ 2.99)** (Uncertain financial position)
- (Green) **Safe Zone (Z > 2.99)** (Low risk of bankruptcy)

The table presents the Altman Z-Scores of five leading Indian automobile companies from 2015 to 2024, highlighting their financial health over time. Bajaj Auto consistently remains in the Safe Zone, indicating strong stability. TVS Motor and Maruti Suzuki mostly fall within the Grey Zone, reflecting moderate financial risk. Mahindra & Mahindra shows persistent presence in the Distress Zone. Tata Motors exhibits low scores in the early years, with gradual improvement after 2020. The color-coded zones offer a clear visual of each company's financial position across the decade.

9. Conclusion:

The Assessing the financial stability of automobile companies is crucial in understanding their long-term viability, especially in a capital-intensive and competitive industry like the Indian automobile sector. This study utilized the Altman Z-Score model to evaluate the financial health of five prominent automobile companies Maruti Suzuki, Tata Motors, Mahindra & Mahindra, Bajaj Auto, and TVS Motor—over the period from 2015 to 2024.

The results indicate clear differences in financial performance among the selected companies. Bajaj Auto consistently remained in the Safe Zone throughout the study period, reflecting robust financial strength and a low probability of bankruptcy. TVS Motor and Maruti Suzuki generally stayed within the Grey Zone, indicating moderate financial health with occasional improvements, though not consistently reaching the Safe Zone threshold.

Mahindra & Mahindra displayed persistent financial distress, with Z-Scores mostly falling below the 1.81 benchmark, suggesting a higher risk of financial failure. Tata Motors experienced considerable fluctuations, with scores improving only in the later years, moving gradually from the Distress Zone toward the Grey Zone.

Overall, the Altman Z-Score model proved effective in identifying patterns of financial vulnerability and resilience across companies. The model's ability to highlight early signs of distress makes it a valuable tool for investors, financial analysts, and corporate decision-makers. These insights can support proactive financial management and strategic planning within the automobile industry, particularly in periods of market volatility and economic uncertainty.

REFERENCES:

1. Altman, E. I. (1968). Financial ratios, discriminate analysis and the prediction of corporate bankruptcy. *Journal of Finance*, *23*(4), 589–609.
2. Ambika Sengottaiyan, T. (2015). Financial health of selected fertilizer companies in India - A Z-model approach. *International Journal of Research in Economics & Social Sciences*, *5*(8). ISSN: 2249-7382.
3. Anjum, S. (2012). Business bankruptcy prediction models: A significant study of the Altman's Z-score model. *SSRN*. https://doi.org/10.2139/ssrn.2128475
4. Beaver, W. H. (1966). Financial ratios as predictors of failure. *Journal of Accounting Research*, *4*(1), 71–111. https://doi.org/10.2307/2490171
5. Bhatt, S. N. (2012). Capital structure and turnaround strategies using Altman's Z-score models. *Asian Journal of Research in Business Economics and Management*, *2*(7), 102–113.
6. Moradi, M., & Salehi, G. (2020). The impact of coronavirus (COVID–19) crisis on consumer perception in automotive industry: A netnography analysis of Peugeot social media. In *19th International Congress on Public and Nonprofit Marketing Sustainability: New Challenges for Marketing and Socioeconomic Development*. ResearchGate.
7. OICA. (2023). *Organisation Internationale des Constructeurs d'Automobiles*.
8. Press Information Bureau. (2023, February 17). *The automobile sector in India [Factsheet]*. Ministry of Heavy Industries.
9. Rajasekar, T., Ashraf, S., & Deo, M. (2014). An empirical enquiry on the financial distress of Navratna companies in India. *Journal of Accounting and Finance*, *14*(3), 100–112.
10. Ranjithkumar, M. S., & Eahambaram, C. (2018). A study on profitability analysis of Indian selected automobile industry. *International Journal for Research in Engineering Application & Management*, *2*(7), 412–416.
11. SIAM. (2023). *Society of Indian Automobile Manufacturers*. https://www.siam.in/
12. Sulphey, M. M., & Nisa, S. (2013). The analytical implication of Altman's Z score analysis of BSE listed small cap companies. *Global Journal of Commerce & Management Perspective*, *2*(4), 145–155.
13. Swalih, M. M., & Vinod, M. S. (2017). Application of Altman Z score on BSE-Greenex companies. *Journal of Applied Management and Investments*, *6*(3), 205–215.
14. Yadav, S., & Sahay, M. (2017). A study on automobile industry growth in India and its impact on air pollution. *Journal of Advanced Research in Dynamical and Control Systems*, *17*, 1901–1909.