Accounting 9 (2023) 67–72

Contents lists available at GrowingScience

Accounting

homepage: www.GrowingScience.com/ac/ac.html

Evaluation of financial soundness of Indian auto Ancillary industries using Altman Z-rate model

K. Krishnamoorthy[a]* and R. Vijayapriya[a]

[a]*Kongu Arts and Science College, Erode, India*

C H R O N I C L E

Article history:
Received September 18, 2022
Received in revised format
October 17 2022
Accepted January 22 2023
Available online
January, 22 2023

Keywords:
Auto ancillary
Growth prospects
Financial health
Altman Z rate
Financial distress

A B S T R A C T

The automobile industry is an obvious indication of a country's economic development. Because it requires high performance and quality parts, it is also an innovation and comprehension intensive sector. Because of its deep forward and backward links with many key segments of the economy, the automobile sector is also prominent in India. Because of the strong supply support provided by various auto ancillary manufacturing companies, this sector has a strong multiplier effect and has the potential to be a driver of economic growth. The auto ancillary market is focused on the production and sale of transitional equipment and automotive parts used in the manufacture of automobiles. It is an important part of India's automotive industry. Such industries allow vehicle manufacturers to concentrate on their core competencies. The auto ancillary manufacturing Industry, with its high growth prospects, is one of the emerging industries in Indian markets. The Altman Z rating is a beneficial expedient for identifying a company's economic resilience and the probability of insolvency. The Z rating method was once used in this to find out to check the economic fitness of Indian auto ancillary manufacturing companies. The economic facts of 10 auto ancillary manufacturing companies listed groups on the National Stock Exchange (NSE) have been used to study each unique and rising market Altman Z rating formulae. The findings point out that not all the enterprises listed on the NSE are financially healthy. According to the study, some of the Indian auto ancillary manufacturing companies are sound and dependable without few companies, and some of the auto ancillary manufacturing companies are not likely to face monetary misery or insolvency soon.

© 2023 Growing Science Ltd. All rights reserved.

1. Introduction

Many enterprises that were thought to be sufficiently big to fail have gone out of business over a period of time. Even businesses with a high reputation in the eyes of financiers and investors can face bankruptcy. The investor or financial firm misperception about the company's financial performance is caused by inadequate asset value of the firm. Factors of financial results can be changed. Concentrating on only one factor or a few of them while neglecting others may lead to poor financial decisions. As an outcome of the incorrect or insufficient evaluation, if the losing side is an investor, a bad investment may be stated, whereas a bad credit may be referenced for the financial company.

As a result, it is essential to carry out research and analysis that disclose the corporation's economic performance in different facets. The outcomes of an evaluation purely based on asset criteria size, for instance, may be factually inaccurate. If a large portion of the asset size is funded by debt (high leverage ratio), a company's current fragility will probably increase, as will tediousness paying it back debt, particularly short-term debt. This situation could lead to bankruptcy.

As an outcome, the volume of assets alone cannot focus on providing adequate information about a company's entire financial position. Similarly, analysis based on the period starting with the net profit and loss element, which really is part of the statement of income, may produce inaccurate data. According to local accounting practices known as GAAP

---

* Corresponding author.
E-mail address: krishna.jabez@gmail.com (K. Krishnamoorthy)

© 2023 Growing Science Ltd. All rights reserved.
doi: 10.5267/j.ac.2023.1.002

principles, the net profit and loss element for the period will not indicate a firm's true cash-generating power. However, in the project, and particularly in credit valuation, the firm's real cash-generating power should be considered rather than its profitability level.

The Altman model was at first designed to analyse financial statements from companies based in developed nations. Moreover, many studies on the Z model have been conducted in the publications over time. One of those research findings seems to be the new framework designed in 2014 for developing countries by Meeampol et al. The new version of the Altman Z method designed for emerging nations will be applied to non-financial listed firms in the NSE in this research.

The Indian auto ancillary manufacturing companies are mainly centered on the home market and do no longer play a large function globally. However, when we think about the treads it can make in phases of growth, the balances tip in its favour. The Automobile Industry closely influences the auto ancillary manufacturing companies. Fortunately, India's car enterprise is the fourth-largest in the world, with the presently being the world's fifth-largest producer of automobiles and seventh-largest producer of Commercial vehicles in 2022. The auto part manufacturing enterprise money owed for 7.1% of India's GDP and employs up to 5 million human beings at once and indirectly.

The research on the Altman Z model in the national and global literature is studied and inferred in the second part of the research. The third section contains details more about financial data collection as well as the data used for the analysis. In the fourth section of the study, the original version and modified versions of the Altman Z framework for developing nations is applied to BSE listed firms for the financial year 2021 - 22 period Z rate was calculated. The findings are analysed and interpreted in the final section of the study.

1.1. Review of Literature

Özyeşil (2020) found that the Z-rate formula is essential in any organization, regardless of profit margin range. Even with declining working capital, this improvement is primarily due to higher capitalization rates and lower external debt (Chouhan et al., 2014). Taking financial models into account, investors should think about using tools like Z-rate when deciding to invest. The results of this research can be used as an easy overview by investors when putting money in the Small Cap industries examined in their study (Chadha, 2016). According to their research, if a company's financial setup is poor and it appears to be in financial trouble, all parties relating to commercial and financial activity with the company will suffer. As a result, numerous indicators are used to assess the financial condition and performance of companies and disclose the bankruptcy risk. The Z-rate model developed by Altman is among the most famous of these methods. The model analyses the company's current risk level analytically in a variety of ways (Baciu et al., 2020). According to their findings, the Indian automotive sector industry is reasonable and reliable, and automotive manufacturers are not likely to face financial difficulties or insolvency in the near future (Swalih et al., 2021). Altman's rating demonstrated the financial condition of the selected company in their study, and it discovered that perhaps the entire three dairy co-operatives chosen for the study company were in the Safe zone for the 2018-2019 fiscal year, indicating financial sustainability (Sulphey, 2013). First, the Z rating is computed for ten companies chosen for this purpose over a five-year period. Then it is split according to z scores, and the significance of the modifications in the ratio is determined using the One sample Komogrov-Smirnow test, which shows that the transition in the z rates is not meaningful in all cases.

Altman and Sabato (2010) suggested that the Z-score and ZETA models can be useful tools for predicting financial distress and bankruptcy, but they should be used in conjunction with other analysis and should be regularly updated to reflect changes in the economy and accounting standards. Brealey and Myers (1985) noted that the model has been found to be highly accurate in many studies, with an average prediction accuracy of about 80%. Charitou and Trigeorgis (2002) examined the use of option-based models as a way of predicting bankruptcy, and it provides an overview of the performance of these models in comparison to traditional models such as the Z-score. Elliott et al. (2014) examined the use of hidden Markov models (HMM) in combination with the Altman Z-score model for predicting financial distress and credit rating of companies. Calandro (2007) mentioned that Z-score can be used as a performance management tool for companies in order to assess and evaluate their financial health and identify potential financial problems early on.

Chouhan et al. (2014) applied the Z-score model to a sample of companies listed on the BSE and examined the accuracy of the model in predicting the financial stability of these companies. The study also compares the performance of the Z-score model with other models for predicting financial stability and finds that the Z-score model performs well in comparison. Kulalı (2016) tested the robustness of the Z-score model by using different sub-samples of firms and different time periods, and found that the Z-score model performs well in comparison. Nadirli (2015) compared the Z-score model with other models for measuring credit risk such as credit rating and credit scoring models and found that the Z-score model has a high level of accuracy and reliability. Imelda and Alodia (2017) examined the ability of two financial distress prediction models, the Altman model and the Ohlson model, to predict financial distress in manufacturing companies listed on the Indonesia Stock Exchange. The results indicate that both models can predict financial distress with a high level of accuracy, but that the Ohlson model is slightly more accurate than the Altman model. Jaffari and Ghafoor (2017) reported that both MDA and Logistic Regression are effective in predicting corporate bankruptcy, but Logistic Regression has slightly higher prediction accuracy (Hayes et al., 2010). The authors use data from specialty retail firms, the results show that the Z-score model is effective in predicting bankruptcy for specialty retail firms in contemporary times. Hillegeist et al. (2004) examined several commonly used models, such as the Altman Z-score model, the Ohlson O-score model, and the logistic regression model. They use a sample of firms that filed for bankruptcy between 1980 and 1999 to test the performance of these models. The results show that the logistic regression model is the most effective in predicting bankruptcy, with an accuracy rate of over 90%. Alareeni (2012) showed that the Z-score model is effective in predicting the failure of listed companies in Jordan. (Kumar R, 2012) authors conclude that logistic regression should be considered as the primary model for assessing the probability of bankruptcy in India.

1.2. Altman Z-Rate

Financial stability is essential for the growth of every business. A company's financial soundness is determined by its ability to pay obligations on time, fund its activities sufficiently, and survive unexpected circumstances. There are several ways to determine or indicate a company's financial viability. Ratio analysis like the short - term liquidity ratio and the shareholders' equity to percentage of total assets can help you evaluate Lace's financial health (2010).

The Altman Z-score is a financial ratio that was developed by Edward I. Altman in the 1960s. It is used to predict the likelihood of a company going bankrupt within the next two years.

To predict bankruptcy, Altman (1968) developed the Altman Z-rate model, also widely recognized as a multivariate statistical analysis model (MDA). A linear discriminant mixture of four or five profitability metrics is used in this multivariate model. It is an extremely helpful method that has garnered universal support among a diverse group of stakeholders, including investors.

Altman z-rate model is an extremely precise diagnostic tool for evaluating financial health and consistency, forecasting insolvency 94% of the time one year ahead of time and 72% of the time. in the second year ahead of time. The initial version was still only available to manufacturers. As an outcome, he developed a model for non-manufacturing businesses. He also developed a model to take into consideration the differences between the environments of emerging markets and developed economies. In 1983, Altman (1993) modified his model once more to accommodate relatively small private sector companies.

1.3. Objectives

- To Assess the financially healthiness of the Indian auto ancillary manufacturing companies.
- To help the potential investors recognize financially strong companies among auto ancillary manufacturing companies.

2. Research Methodology

This article's method of analysis was quantitative research, with a predictive conceptual framework used to assess the performance of selected auto ancillary manufacturing companies listed at the NSE. The purpose of this research paper is to establish a framework for potential investors that will further explore the recent strength of the listed firms of auto ancillary manufacturing. The assessment was obtained from a thorough review of the research on the history of the National Stock Exchange, as well as the philosophy of the Altman Z-rate model.

2.1. Design

The descriptive quantitative method was applied to computational data gathered from the selected auto ancillary gear manufacturing companies' annual reports and the moneycontrol.com website. The chosen auto ancillary manufacturing companies are the representative of auto gear manufacturing companies and supplies components to manufacture of passenger cars, trucks, tractors, commercial vehicles, and two and three-wheelers, listed in the National Stock Exchange (NSE) 2022, were analyzed to study the Indian auto ancillary gear manufacturing company's financial well-being.

The Altman Z-rate model, as mentioned by Muthukumar and Sekar, is focused on income statement and balance sheet information to evaluate a company's financial well-being in the short term for the financial year 2021-22. Altman created and modified his original version to accommodate changing requirements by applying a structured mixture of five variables that uses sales and profits, leverage ratios, solvency ratios, liquidity ratios, and activity ratios to assess a firm's financial condition. The research implemented 2 different Altman Z rate designs: the original version for manufacturing firms and the modified design for emerging economies.

The original method developed for public manufacturing companies is as follows;

Model (initial version) 1: $Z = 1.2\times X1 + 1.4\times X2 + 3.3\times X3 + 0.6\times X4 + 0.999\times X5$.

where, $X1$ = Working Capital (CA – CL) / Total Assets

$X2$ = Retained Earnings (RE) / Total Assets (TA)
$X3$ = Earnings Before Interest and Taxes (EBIT) / Total Assets (TA)
$X4$ = Market Value of Equity (MV) / Total Liabilities (TL)
$X5$ = Net Sales / Total Assets (TA)

The Interpretation of the Z-Score Model:

Z rate > 2.99 means “safe” Zones
1.81 < Z rate < 2.99 means “grey” Zones
Z rate < 1.81 means “red” Zones

The Z rate was therefore determined by multiplying each and every one-off financial indicator by an adequate co - efficient and arithmetic total amount. Altman noted significant financial ratios for predicting financial distress as working capital (CA-CL) divided by total assets (TA), retained earnings (RE) divided by total assets (TA), earnings before interest and taxes (EBIT) divided by total assets (TA), and market value of equity (MVE) divided by book value of total liabilities (TL).

The revised Z-score method for emerging economies was also calculated to provide a more accurate assessment of the company's financial condition. It's a four-variable framework with a fixed parameter. The following is the formula:

Model (modified version) 2: $Z = 3.25 + 6.56 \times X1 + 3.26 \times X2 + X3 + 6.72 \times X3 + 1.05 \times X4$.

where,

$X1$ = Working Capital (CA-CL) / Total Assets (TA).
$X2$ = Retained Earnings (RE) / Total Assets (TA).
$X3$ = Earnings Before Interest and Taxes (EBIT) / Total Assets (TA)
$X4$ = Book Value of Equity (BV) / Total Liabilities (TL)

The Interpretation of Emerging Market Score Model:

EM Z rate > 2.60 means “safe” Zones
1.1 < EM Z rate < 2.60 means “grey” Zones
EM Z rate < 1.1 means “red” Zones

The Z-rate model is an outstanding metric for assessing a company's financial position; lower the score, the higher the likelihood of failings. The rating, which integrates interdependently unique ratios into a collective, aids in overcoming the inadequacies of independent financial ratio evaluation. The beauty of the Z-rate model is that it offers a determined indicator based on previous experience rather than personal view.

3. Analysis and Interpretations

The Altman Z rate was utilized to examine the financial well-being of ten auto ancillary gear manufacturing companies listed on the National Stock Exchange. The collected data were analyzed using both the original model (initial version) and the Emerging market model (modified version).

Table 1
Financial information of Indian Auto ancillary gear manufacturing companies.

Company	TA	CA-CL	RE	EBIT	MV	BV	TL	Sales
LG Balakrishnan	1,652.20	525.51	216.08	310.19	2,173.92	212.8	1,652.20	2,007.98
Shanthi Gears	340.76	158.92	33.67	58.73	2,875.00	33.89	340.76	337.07
The Hi-Tech Gea	710.12	46.53	61.65	71.58	469.00	176.23	710.12	624.03
Rane Madras	1,193.89	-72.75	70.24	72.52	603.93	140.26	1,193.89	1,555.00
JTEKT India	945.67	170.32	33.12	55.65	2,838.00	27.05	945.67	1,610.50
Bharat Gears	403.55	66.35	38.08	48.9	204	70.46	403.55	729.44
RACL Geartech	351.22	29.66	29.34	45.34	649	121.88	351.22	271.21
ZF Steering Gea	472.17	93.12	29.04	30.21	476	435.47	472.17	312.8
Him Teknoforge	371.92	54.31	18.45	28.4	80	206.94	371.92	351.65
Shivam Auto	640.68	-125.2	25.34	34.33	408	12.52	640.68	469.2

** TA (Total Assets), CA-CL (Current Assets – Current Liabilities), RE (Retained Earnings), EBIT (Earnings Before Interest and Taxes), MV (Market Value), BV (Book Value), TL (Total Liabilities).

The financial information for the Financial Year 2021 - 2022 was collected from the company’s annual report and moneycontrol.com was analyzed to evaluate the financial position of the selected auto ancillary gear manufacturing companies the Z-rate derived is as follows:

Table 2
Calculated Z-rate values of Indian Auto ancillary gear manufacturing companies.

Company	Original Z score	Modified Z Score
LG Balakrishnan	3.19	7.35
Shanthi Gears	7.32	8.07
The Hi-Tech Gea	1.81	5.00
Rane Madras	1.81	3.63
JTEKT India	3.96	5.03
Bharat Gears	2.84	5.75
RACL Geartech	2.52	5.44
ZF Steering Gea	1.80	6.21
Him Teknoforge	1.57	5.54
Shivam Auto	1.11	2.53
Average Score	2.79	5.46

In interpreting the Altman Z rate, there are three numerical ranges that represent the company's financial position in terms of going bankrupt (based on the original version).

1. Z-rate 2.99 and above : A score greater than 2.99 signifies that the business is in the "safe zone." This indicates that perhaps the company's financial condition is satisfactory. It is financially healthy. If anyone is looking to invest, this is a good company to consider.
2. Z-rate from 2.99 and 1.81 : this range is referred to as a "grey area." Companies with a rating under this range are not extremely secure. Their financial affairs are not stable, and if things improve, they may enter the "danger zone."
3. Z-rate of below 1.81 : Any score less than 1.8 should frighten you. Give it little thought because the company is in the "red zone" or "distress zone." The lesser the score, the greater the risk that the company will go bankrupt soon.

The interpretation from the Table 2 of computed Z-rate based on original version and modified version is as follows:

1. Companies with a Z-rate greater than 2.99 can be found to be safe from the danger of insolvency. In our evaluation, we looked at 10 various companies. According to the original version, approximately 3 numbers (30%) of these companies had Z-rates greater than 2.99, and according to the modified version, most of the companies are in the safe zone 9 numbers (90%) except Shivam Auto, which falls under the grey zone.

2. Companies with a Z-rate less than 2.99 but greater than 1.81 are easily preventable. Why? Since they are on the verge of declaring bankruptcy. Though they do not pose any immediate dangers if the current trend continues, those that may drop below the 1.81 range. Out of the ten companies investigated in this study, approximately 4 (40%) had Z-rates in this range as per the original versions concern and according to the modified version, only one company lies in this range, and the rest are in the safe zone.

3. Z-Score below 1.81: Companies with a Z-rate of less than 1.81 may declare bankruptcy within the upcoming 2 years, based on the Z-rate formula. As a result, its investors should probably sell their holdings now. Out of the 10 companies investigated in this study, approximately 3 numbers (30%) had Z-rate in this range as per the original version. In the modified version no company falls in this range.

4. Conclusion

Evaluating the Altman Z-rate of the Indian auto ancillary gear manufacturing companies, researchers have determined that the 30 % of the companies like LG Balakrishnan, Shanthi Gears, and JTEKT India are in the Safe zone, and according to the modified version 90% of companies are in the safe zone. Almost 40% of the companies are easily preventable since they are on the verge of declaring bankruptcy (grey zone). Though they do not pose any immediate dangers if the current trend continues, those that may go below the current position. There are 3 companies listed in the NSE that are financially healthy such as LG Balakrishnan, Shanthi Gears, and JTEKT India outperform others in the gear manufacturing industry. Even though some of the companies are not healthy as per the Altman Z-rate. Companies like ZF Steering gear, Him technology, and Shivam auto may declare bankruptcy within the upcoming 2 years, based on the Z-rate formula. As a result, its investors should probably sell their holdings now. Out of the ten companies investigated in this research, approximately three (30%) had a Z-rate in the red zone. Investors like individuals and institutions may invest in the Indian auto ancillary gear manufacturing companies based on individual companies’ financial results as some of the companies are likely to go bankrupt or face financial difficulties shortly. The original and modified versions will be studied in a developing economy such as India to analyze the Altman Z-rate values more accurately. The Altman Z-rate is a beneficial method for evaluating a business firm’s financial health, and it is recommended to investors and financial analysts for analyzing and making financial health decisions.

References

Alareeni B, B. J. (2012). redicting listed companies' failure in Jordan using Altman Models: A case study. *International Journal of Business and Management*, *8*, 113–126.

Altman, E.I., & Sabato, M. G. (2010). Predicting Financial Distress of Companies: Revisiting the Z-Score and ZETA Models. *Journal of Applied Corporate Finance*, *22*(3), 3–20.

Baciu, R., Petre, B., & Simon, A. (2020). Insolvency Risk. Application of Altman Z-Score to the Auto Parts Sector in Romania. *International Journal of Innovation and Economic Development*, *6*(1), 7–18. https://doi.org/10.18775/ijied.1849-7551-7020.2015.61.2001

Brealey, R.A., & Myers, S. (1985). The Z-Score Theory of Bankruptcy: A Review of the Empirical Evidence. *Journal of Banking and Finance*, *9*, 5–15.

Calandro, J. (2007). Considering the utility of Altman's Z-score as a strategic assessment and performance management tool. *Strategy & Leadership*, *35*(5), 37-43.

Chadha, P. (2016). Exploring the Financial Performance of the Listed Companies in Kuwait Stock Exchange Using Altman's Z-Score Model. *International Journal of Economics & Management Sciences*, *05*(03). https://doi.org/10.4172/2162-6359.1000341

Charitou, A., & Trigeorgis, L. (2002). *Option-Based Bankruptcy Prediction*.

Chouhan, V., Chandra, B., & Goswami, S. (2014). Predicting Financial Stability of Select BSE Companies Revisiting Altman Z Score. *International Letters of Social and Humanistic Sciences*, *26*, 92–105. https://doi.org/10.18052/www.scipress.com/ilshs.26.92

Elliott, R.J., Siu, T.K., & Eric, S. F. (2014). A Double HMM approach to Altman Z-scores and credit ratings. *Expert Systems with Applications*, *41*, 1553–1560.

Hayes, S. K., Hodge, K. A., & Hughes, L. W. (2010). A study of the efficacy of Altman's Z to predict bankruptcy of specialty retail firms doing business in contemporary times. *Economics & Business Journal: Inquiries & Perspectives*, *3*(1), 130–134.

Hillegeist, S. A., Keating, E. K., Cram, D. P., & Lundstedt, K. G. (2004). Assessing the probability of bankruptcy. *Review of Accounting Studies*, *9*(1), 5–34.

Imelda, E., & Alodia, I. (2017). The Analysis of Altman Model and Ohlson Model in Predicting Financial Distress of Manufacturing Companies in the Indonesia Stock Exchange. Indian-Pacific. *Journal of Accounting and Finance*, *1*(1), 51–63.

Jaffari, A. A., & Ghafoor, Z. (2017). Predicting Corporate Bankruptcy in Pakistan: A Comparative Study of Multiple Discriminant Analysis (MDA) and Logistic Regression. *Research Journal of Finance and Accounting*, *8*(3), 81–100.

Kulalı, İ. (2016). Altman Z-Score Bankruptcy Prediction Model Application To BIST Firms. *Int. Journal of Management Economics and Business*, *12*(27), 283–291.

Kumar R, K. K. (2012). A comparison of bankruptcy models. *International Journal of Marketing, Financial Services & Management Research*, *1*, 76–86.

Nadirli, N. (2015). Role of the Z-score method for the measurement of credit risk. *Journal of Banking and Financial Research*, *1*(1), 1–6.

Özyeşil, M. (2020). A Relationship between Altman's Z Scores and Stock Price Performance: A Review on Listed Companies in Bist-30 Index. *International Journal of Economics and Management Studies*, *7*(2), 179–186. https://doi.org/10.14445/23939125/ijems-v7i2p125

Sulphey, M. M. (2013). *THE ANALYTICAL IMPLICATION OF ALTMAN'S Z SCORE ANALYSIS OF BSE LISTED SMALL CAP COMPANIES* (Vol. 2, Issue 4). https://www.researchgate.net/publication/299175808

Swalih, M. M., Adarsh, K. B., & Sulphey, M. M. (2021). A study on the financial soundness of indian automobile industries using altman z-score. *Accounting*, *7*(2), 295–298. https://doi.org/10.5267/j.ac.2020.12.001

© 2023 by the authors; licensee Growing Science, Canada. This is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (http://creativecommons.org/licenses/by/4.0/).