

# Comparison Analysis of Accuracy and Error Rates In Calculating Financial Distress for Automotive and Component Companies On The IDX From 2022–2024

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## Abstract

**Introduction/Main Objectives:** This study evaluates the accuracy and error rates of three widely used financial distress prediction models—Altman Z-Score, Zmijewski (X-Score), and Grover (G-Score)—within the automotive and component industries listed on the Indonesia Stock Exchange (IDX) from 2022 to 2024. The topic is critical as Indonesia's automotive sector faces declining sales and profitability, making reliable prediction tools essential for anticipating financial crises.

**Background Problems:** The research seeks to answer: Do these three models differ in predictive performance, and which model provides the highest accuracy in assessing financial health?

**Research Methods:** A quantitative approach was applied using secondary data from the annual financial statements of 11 IDX-listed companies between 2022 and 2024. The analysis included descriptive statistics, normality tests, One-Way ANOVA for difference testing, and calculations of prediction accuracy and error rates.

**Finding/Results:** The results indicate significant differences among the models' predictions (Sig. = 0.002), rejecting the null hypothesis. Altman Z-Score achieved the highest predictive accuracy at 81.8%, outperforming Grover (72.7%) and Zmijewski (66.7%).

**Conclusion:** The study concludes that the Altman Z-Score model is the most reliable tool for predicting financial distress in Indonesia's automotive and component sector during market contraction. These findings provide valuable insights for investors and managers to mitigate risks and make informed financial decisions. Future research should explore additional models and incorporate macroeconomic variables to enhance prediction robustness.

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**Keywords:** Financial Distress, Altman Model, Zmijewski Model, Grover Model.



## Introduction

A dynamic national economy leads to fierce competition among businesses. Because this economic instability has a negative long-term impact on business operations, it can be a significant obstacle to business success. Many businesses may experience financial difficulties or crises in such circumstances.

According to Suharsono and Dura (2024), financial distress is a financial state that indicates a decline in business performance. (Jacob (2023) characterizes financial distress as a combination of increased debt, low working capital, declining sales, and decreased profits. Conversely, a company will not experience financial distress (non-financial distress) if its financial condition is stable and healthy. According to Muslimin and Bahri (2022), companies can go bankrupt because they are unable to meet their obligations and have low profits. Most of the time, we conduct financial problem analysis using various models. This model typically uses financial ratios to indicate the financial health of a company. When a company experiences increased sales or deteriorating financial performance, the financial manager makes funding decisions focused on investment decisions, which is a positive signal for investors to decide whether to invest in a company. Conversely, when a company experiences declining sales or deteriorating financial performance, the outcome indicates potential financial difficulties.

According to [Kontan.co.id](https://www.kontan.co.id) (2024), the automotive and component industry in Indonesia is under pressure due to the weakening of the national car market, which is reflected in the declining performance of several issuers, including PT Selamat Sempurna Tbk (SMSM) and PT Garuda Metalindo Tbk (BOLT). Between the first semester and 2024, demand from original equipment manufacturers (OEMs) decreased as car sales fell 17.5% year over year. According to data from the Indonesian Automotive Industry Association (Gaikindo), wholesale car sales in 2023 totaled 1,005,802 units, down 4% from the 2022 figure of 1,048,040 units. Meanwhile, retail car sales also decreased by 1.5%, from 1,053,582 units in 2022. Companies that regularly report declining annual profits and increasing grants may indicate that they are facing or potentially facing financial difficulties.

To analyze and predict this phenomenon, this research specifically compares three established and reliable financial distress prediction models: The Zmijewski Model, the Altman Z-Score Model, and the Grover Model. The Zmijewski Model utilizes logit regression based on a combination of profitability, leverage, and liquidity ratios, a structure proven consistent across various sectors Listyarini (2020) and Suryaningsum (2024) , according to Inayah (2020) the Zmijewski model is proven to be the most accurate in the land transportation subsector. The Altman Z-Score Model is highlighted for its flexibility and emphasis on profitability, often demonstrating the highest predictive accuracy in industries such as mining and manufacturing Aplugi dkk (2024), according to Wahyuni (2021) who conducted research using the Altman Z-Score, Springate, Zmijewski, and Grover models in the plantation sector listed one IDX. Lastly, the Grover Model, developed as an extension of the Altman model by incorporating the Return on Assets (ROA) ratio, has also exhibited consistent high accuracy in numerous empirical studies Maramis (2021) and Rasetianingtias et al (2020) and Suhartono (2024), while research by Elia and Rahayu (2021) and also confirmed that the Grover model is the most accurate method for predicting financial distress conditions in retail companies on the IDX.

This study offers a substantial contribution by addressing a gap in previous literature Rachmandhika dan Prabowo, (2024). The novelty lies in its restricted focus on the direct comparison of only these three prominent models (Altman Z-Score, Zmijewski, and Grover) within the highly specific context of the Indonesian automotive and components sector during a period of significant market contraction. Based on this background and the identified

research gap, two main hypotheses are formulated: H1 There is a significant difference in the predictive results among the Altman Z-Score, Zmijewski, and Grover models; and H2 There is one model that exhibits the highest level of accuracy in predicting financial distress within the automotive and components sector on the IDX.

## Research Methods

The research methodology is primarily grounded in a quantitative approach, focusing on a comparative analysis of the predictive outcomes of the selected financial distress models. This study's objective is to evaluate the relationship and the difference in results across these models. The research object is companies within the automotive and components sector listed on the Indonesia Stock Exchange (IDX) across a three-year observation period, from 2022 to 2024. The total population consists of 15 companies. The sampling technique used was purposive sampling, selecting firms that were continuously listed on the IDX, consistently published complete annual financial statements throughout 2022–2024, and provided adequate financial information required for model calculations. Based on these criteria, the final sample size was 11 companies. The data utilized are secondary quantitative data in the form of annual financial statements, collected through a documentation method from the IDX's official publications.

The central variable of this research is financial distress prediction, which is quantified using three distinct multivariate models.

1. The Altman Z-Score Model utilizes five core financial ratios (Working Capital/Total Assets, Retained Earnings/Total Assets, EBIT/Total Assets, Market Value of Equity/Total Liabilities, and Sales/Total Assets) to produce a combined assessment of the company's liquidity, profitability, solvency, and activity for distress identification. Conversely,
2. the Zmijewski (X-Score) Model is proxied through three primary ratios—profitability (ROA), leverage (Debt to Total Assets), and liquidity (Current Ratio)—aimed at evaluating the probability of financial distress based on earning power, debt structure, and short-term debt capacity. Finally,
3. the Grover (G-Score) Model is applied as an extension of the Altman framework, strengthening its predictive power by specifically incorporating the Return on Assets (ROA) ratio, placing a focused emphasis on overall corporate profitability.

The applied data analysis techniques encompass descriptive analysis and hypothesis testing, primarily utilizing the SPSS version 26 software. Prior to formal hypothesis testing, a preliminary normality test was conducted as a statistical prerequisite. To substantiate Hypothesis 1, which posits a difference in predictive outcomes among the models, the One-Way ANOVA (Analysis of Variance) test was employed. Conversely, to substantiate Hypothesis 2, regarding the model demonstrating the highest predictive accuracy, the calculation for the accuracy rate was performed separately using Microsoft Excel.

## Result

**Table 1. Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
Altman Z-core	33	-2,35	0,79	-0,3987	0,88891
Zmijewski	33	-2,66	2,21	0,1456	1,09788
Grover	33	-3,51	0,91	-0,7774	0,96107
Valid(Listwise)					

Source: Author's Work, 2025.

this section presents the fundamental descriptive statistics for the financial distress prediction scores generated by the three models—Altman Z-Score, Zmijewski, and Grover—for the automotive and components companies on the IDX across the 2022–2024 period. The total number of observations (N) for each model category is 33 data points.

The descriptive analysis reveals that the Altman Z-Score ranged from a minimum value of -2.35 to a maximum of 0.79. The mean score was calculated at -0.3987, which broadly suggests that the sample companies generally tend toward the region indicating a risk of financial distress. The Standard Deviation (SD) of 0.88891 indicates a moderately dispersed variation in predictive scores across the firms. The Zmijewski Model produced the widest score range among the three models, spanning from a minimum of -2.66 to a maximum of 2.21. The mean score was positive at 0.1456. Crucially, this model exhibited the highest Standard Deviation, at 1.09788, which signifies the broadest data dispersion and the most significant variation in predictive results among the sample companies compared to the other two models. The Grover Model scores showed the lowest minimum value at -3.51, with a maximum of 0.91. The mean score for Grover was -0.7774. With a Standard Deviation of 0.96107, the Grover model exhibited greater score variation than the Altman Z-Score but slightly less than Zmijewski. The mean value being the most profoundly negative (-0.7774) strongly indicates that this model predicts the highest level of aggregate financial distress vulnerability among the sample firms.

in conclusion, the significant differences in mean values and standard deviations across the three models (Altman Z-Score, Zmijewski, and Grover) demonstrate that each model possesses varying sensitivities in measuring the potential for financial distress in the automotive and components sector. This variation establishes a crucial basis for proceeding with further comparative tests of accuracy and error rates.

**Table 2. Normality Test**

	Shapiro-Wilk		
	Statistic	df	Sig.
Altman_Z_Score	0,915	19	0,09
Grover	0,966	32	0,404
Zmijewski	0,975	33	0,633

Source: SPSS (2025), processed

The preliminary statistical requirement for parametric testing was met by conducting the Shapiro-Wilk normality test at an alpha level of 0.05. The test results showed that the significance values for all three models exceeded the 0.05 threshold: Altman Z-Score (0.090), Grover (0.404), and Zmijewski (0.633). Given that all values are Sig. > 0.05, it is decisively concluded that the financial distress predictive scores derived from the Altman Z-Score, Grover, and Zmijewski Models are normally distributed. This finding successfully fulfills the

necessary assumption for proceeding with the subsequent parametric analysis, specifically the One-Way ANOVA, to test the formulated hypotheses.

The One-Way ANOVA (Analysis of Variance) test was employed to test Hypothesis 1 (H1), which posits that there is a significant difference in the financial distress predictions among the Altman Z-Score, Zmijewski, and Grover models. The test is appropriate for comparing the means of more than two samples. The decision rule for the ANOVA test dictates that a significant difference exists if the significance value (Sig.) is less than 0.05.

**Table 3. Difference test**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13,959	2	6,979	6,943	0,002
Within Groups	81,427	81	1,005		
Total	95,386	83			

Source: Author's Work, 2025.

the output from the One-Way ANOVA test yields a significance value of 0.002. Since this value is less than the 0.05 threshold ( $0.002 < 0.05$ ), the null hypothesis is rejected, and H1 is accepted<sup>3</sup>. This conclusively demonstrates that there are significant differences among the Altman Z-Score, Zmijewski, and Grover models in predicting the level of financial distress in the sampled automotive and component companies listed on the IDX during 2022–2024.

#### Test the accuracy level and error levels

To test Hypothesis 2 (H2) identifying the most accurate model—a comparative analysis of the accuracy and error rates was performed using a classification matrix.

**Table 4. Recapitulation of Analysis Results of Financial Distress Assessment Methods**

Model	Financial Distres	Non Financial Distres	number of samples
Altman Z-core	6	27	33
Zmijiwski	11	22	33
Grover	9	24	33

Source: Microsoft Excel (2025), processed

Table 4 summarizes the calculation results and their conditions according to the Altman Z-Score, Zmijewski, and Grover methods. The number of predictions is the data required for calculating the accuracy test.

**Table 5. to test the accuracy and error levels of financial distres predictions**

Model	Altman Z-Core	ZmiJewski	Grover
Akurasi	81,8%	66,7%	72,7%
Error	18,2%	33,3%	27,3%

Source: Microsoft Excel (2025), processed

The results unequivocally show that the Altman Z-Score Model exhibited the highest predictive accuracy at 81.8%, along with a relatively low error rate of 18.2%. The Grover (G-Score) method ranked second with 72.7% accuracy and a 27.3% error rate, while the Zmijewski (X-Score) method had the lowest accuracy at 66.7% with a 33.3%. This outcome affirms that the Altman Z-Score model is the superior tool for assessing the financial condition of companies

in this sector. The superiority of the Altman Z-Score is attributed to its comprehensive structure, which effectively combines multiple critical financial ratios—liquidity, profitability, solvency, and activity—to provide a robust measure of a company's financial crisis potential.

### Recommendation for a prediction model

ased on the comparative analysis of predictive accuracy and error rates for *financial distress*, the Altman Z-Score Model emerged as the superior and most recommended predictive instrument for the automotive and component companies on the IDX during the 2022–2024 period. This model achieved the highest accuracy rate of 81.8% with a prediction error rate of 18.2%, significantly outperforming the Grover Model 72.7% accuracy and the Zmijewski Model 66.7% accuracy. The reliability of the Altman Z-Score is attributed to its comprehensive methodology, which effectively integrates five essential financial ratios to simultaneously cover the aspects of liquidity, profitability, solvency, and corporate activity. This finding is consistent with existing literature, including studies by Cipta dan Wibowo (2021) and Syaputri dan Cakranegara (2020), all of whom also identified the Altman Z-Score as the most accurate model across various other industrial sectors.

The high predictive accuracy of the Altman Z-Score renders it a strategic and relevant analytical tool for various stakeholders, including investors, company management, and external auditors. Given its robust predictive capability and low error rate, the model can be effectively utilized as a financial evaluation instrument to assess the going concern and financial stability of firms within the automotive and components sector. The practical application of this model will support data-driven decision-making and strengthen risk mitigation efforts against potential bankruptcy amidst the challenging domestic market conditions faced by the sector.

## Conclusion

The central objective of this research was to compare the differences in predictive scores and the accuracy levels among the Altman Z-Score, Zmijewski, and Grover Models in identifying financial distress within the Indonesian automotive and components sector (IDX) during the 2022–2024 period. The statistical findings definitively demonstrate that a significant difference exists in the predictive outcomes among the three tested models. Furthermore, the analysis of comparative accuracy confirmed the superiority of the Altman Z-Score Model, which proved to be the most effective instrument for predicting financial distress in this specific sector, evidenced by its highest accuracy rate and lowest prediction error. Despite its systematic approach, this study is subject to limitations, including its focus solely on the automotive sector and the use of only three prediction models. Therefore, future research is strongly recommended to expand the predictive scope by incorporating alternative models, such as the Springate and Ohlson (O-Score) Models, and to broaden the industrial scope. Such expansion will enrich comparative results and significantly enhance the external validity of financial distress prediction findings.

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