

Analysis of Insurance Company Bankruptcy Predictions Listed on the Indonesian Stock Exchange from 2020 To 2023

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Abstract

This study examines the accuracy of bankruptcy prediction models applied to insurance companies listed on the Indonesia Stock Exchange during the 2020–2023 period. The research aims to compare the predictive performance of the Altman Z-Score, Springate, and Zmijewski models in identifying potential financial distress. A quantitative approach is employed using secondary data derived from annual financial statements of insurance firms. The sample consists of eight companies selected through purposive sampling. Data analysis involves normality testing and non-parametric statistical analysis using the Kruskal–Wallis test, supported by accuracy level evaluation through Type I error analysis. The findings indicate a statistically significant difference in bankruptcy prediction results among the three models. The Zmijewski model demonstrates the highest predictive accuracy, followed by the Altman Z-Score and the Springate model. These results suggest that the Zmijewski model is more reliable for predicting bankruptcy risk in insurance companies during periods of economic uncertainty. This study contributes to financial distress literature by providing empirical evidence on the comparative effectiveness of bankruptcy prediction models and offers practical implications for investors, managers, and regulators in assessing corporate financial health.

Keywords: Bankruptcy Prediction; Financial Distress; Insurance Companies; Financial Ratios; Indonesia Stock Exchange

INTRODUCTION

Amid fierce economic competition, insurance companies are required to maintain profitability through effective risk and financial management. Public participation is key capital, while the company's sustainability is greatly influenced by its ability to adjust its strategy to market dynamics and OJK regulations. Insurance is a risk transfer contract, whereby the insured pays premiums to the insurer, who is obliged to provide compensation when a risk occurs (BMAI). Risk is defined as uncertainty in the future whose impact needs to be minimized (Ardiaprila et al., 2023). As a business entity, insurance companies are formed to generate profits for shareholders (Peter & Yoseph, 2011).

Major corruption cases such as Asabri and Jiwasraya reflect the high risks in Indonesia's insurance industry (www.cnbcindonesia.com). Financial performance analysis is important to prevent default or bankruptcy. The complexity of this industry is influenced by claim uncertainty, dependence on investments, and regulatory changes. Macroeconomic and socio-political challenges, as well as poor investment management, can disrupt the financial stability of companies. If not addressed with innovation and efficiency, the risk of bankruptcy will become a serious threat.

In this study, there is a correlation between signal theory and comparative analysis of bankruptcy predictions. The conclusion of the bankruptcy prediction confirms that the evaluated company does not have the potential for bankruptcy, so the company can receive positive signals that are beneficial to stakeholders. On the other hand, if the bankruptcy prediction conclusion shows that the analysed company identifies bankruptcy predictions, the

entity concerned will receive a bad signal (Faizin & Nuha, 2024). This bankruptcy prediction analysis applies the Altman model, the Springate model, and the Zmijewski model. By using this method, companies can send signals if their performance or assets decline.

Based on the identification of problems, additional examinations are needed to assess the resilience of the insurance industry. This study aims to identify the potential for bankruptcy and the financial health of insurance companies listed on the IDX, given the indications of risk in recent years through the Altman Z-Score, Springate, and Zmijewski prediction methods. The novelty of this study lies in combining the three models to improve prediction accuracy, focusing on the 2020–2023 period. Its contributions include theoretical, practical, and policy aspects, namely enriching the literature and providing insights into financial performance analysis and early warning of bankruptcy in the insurance sector.

LITERATURE REVIEW

Financial Statements

Financial statements are defined as a collection of organized information about the financial performance and position of an organization ([www://manajemenkeuangan.net/](http://www.manajemenkeuangan.net/)). Financial statements are a presentation of financial information that reflects the activities of an entity to its stakeholders, with the aim of providing a transparent picture of the company's overall financial condition. Through financial statements, stakeholders can assess business performance in terms of profitability, liquidity, and solvency. These statements include an income statement showing revenue, expenses, and profit or loss for a specific period, and a balance sheet depicting the company's financial position at the end of the period. Accurate and relevant information from financial statements enables shareholders, creditors, and management to make informed decisions (Bahri et al., 2024).

Bankruptcy

Bankruptcy is a condition where a company is unable to continue its operations due to a lack of funds (Sinaga, Pelleng, et al., 2019). Economic failure occurs when a company's income cannot cover its operating costs, the present value of cash flows is lower than its liabilities, and actual cash flows do not meet expectations (Peter & Yoseph, 2011). Although not all companies experience it, signs of bankruptcy can be identified early through financial statement analysis. Bankruptcy is often associated with liquidation and cessation of operations, so bankruptcy analysis is important to provide early warning to management and stakeholders (Dea Raisa Oma Putri et al., 2022). When a company's financial condition deteriorates, the risk of default increases, and business continuity is threatened (Hendra et al., 2019). Therefore, companies, including insurance companies, need to predict bankruptcy as a preventive measure to reduce the negative impact on business owners, investors, creditors, and the wider community (Eqab & Bzour, 2011).

Financial Ratios

Operational efficiency measurements aim to assess a company's effectiveness in managing sales, costs, accounts receivable, and inventory, which differs from financial ratios that assess a company's liquidity in relation to its financial obligations (Ikhsan, 2016).

Altman Bankruptcy Prediction Model (Z-Score)

Edward Altman, a finance professor at New York University, wanted to create a tool to predict bankruptcy. In 1967, he created a new model using a ratio called the Altman Z-score formula, which was published in 1968 (Baciu et al., 2020).

Altman Z-Score Measurement.:

$$Z = 6,5X1 + 3,26X2 + 6,72X3 + 1,05X4 \dots\dots\dots (1)$$

- X1 = Net Working Capital to Total Assets
- X2 = Retained Earnings to Total Assets
- X3 = Earnings Before Interest and Taxes / Total Assets
- X4 = Book Value of Equity to Total Liabilities

With the following category zones:

If $Z > 2.6$, the company is in the “safe” zone.

If $1.1 < 2.6$, the company is in the “grey” zone.

If $Z < 1.1$, the company is potentially at risk of default, using the following category ratios: Net Working Capital to Total Assets (X1), Retained Earnings to Total Assets (X2), EBIT to Total Assets (X3), and Book Value of Equity to Debt (X4), to assess the company's financial condition, Sales / Total Assets (X5).

Springate Method Bankruptcy Prediction Model

Gorgon L.V. Springate developed the Springate model in 1978. The MDA method requires several financial ratios related to corporate bankruptcy to build an effective model.

Springate method measurement:

$$S = 1,03 X1 + 3,07 X2 + 0,66 X3 + 0,4 X4 \dots\dots\dots (2)$$

- X1 = Working Capital/Total Asset
- X2 = Net Profit before Interest and Taxes/Total Asset
- X3 = Net Profit before Taxes/Current Liabilities
- X4 = Sales / Total Asset

The Springate model identifies companies with a Z score > 0.862 as not potentially bankrupt, and companies with a Z score < 0.862 as less healthy and potentially bankrupt (Pangkey et al., 2018).

Zmijewski Bankruptcy Prediction Model

In the research by Sari & Atahau (2020), Zmijewski created his model by utilizing financial ratios used to measure a company's leverage, performance, and liquidity. The following is the Zmijewski model:

$$X = -4,3 - 4,5X1 + 5,7X2 - 0,004X3 \dots\dots\dots (3)$$

Description:

- ROA = Net Income to Total Asset
- X1 = Total Liabilities to Total Asset
- X2 = Current Asset to Total Asset

A company is predicted to have bankruptcy potential if its score exceeds 0 on the Zmijewski prediction model. Conversely, if the score is less than 0, the company is predicted to have no bankruptcy potential.

Theoretical Framework

This study employs a theoretical framework to systematically compare bankruptcy prediction models used to assess the financial condition of insurance companies listed on the Indonesia Stock Exchange. The framework is designed to illustrate the sequence of data selection, analytical methods, and evaluation techniques applied in this research.

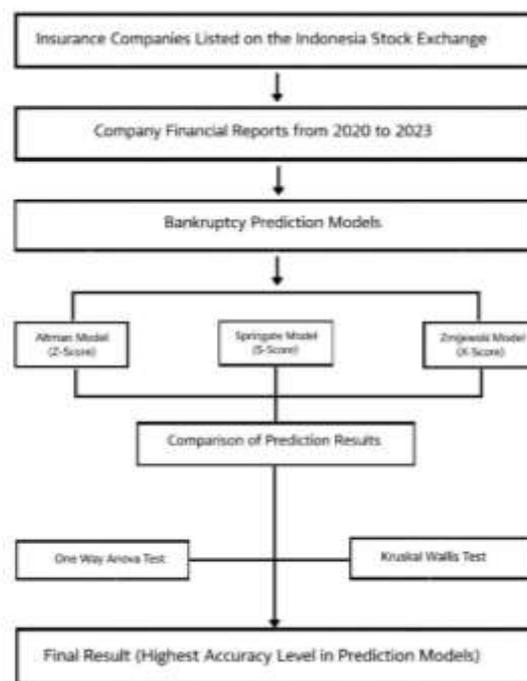


Figure 1. Framework Scheme
Source: (Faizin & Nuha, 2024)

[Figure 1](#) illustrates the research framework used to evaluate and compare bankruptcy prediction models for insurance companies listed on the Indonesia Stock Exchange. The research began with the selection of public insurance companies, then used audited financial reports for the 2020–2023 period as the main data source. The financial data was then analysed using three bankruptcy prediction models that have been widely used in the literature, namely the Altman Z-Score, Springate S-Score, and Zmijewski X-Score models.

The prediction results obtained from each model were then compared to identify differences in the classification of the companies' financial conditions. To ensure the accuracy of the analysis, this study applied parametric and nonparametric statistical approaches, namely the One Way ANOVA test and the Kruskal–Wallis test, which were adjusted to the characteristics of the data distribution. The final stage of this research framework is to determine the model with the highest prediction accuracy, so that it can provide a strong basis for selecting the most suitable bankruptcy prediction model for insurance companies in the Indonesian capital market.

RESEARCH METHOD

The type of research used effectively in this study is quantitative research. According to Hendra et al. (2019), quantitative research is research that emphasizes the analysis of theories, hypotheses, and hypotheses through the measurement of research variables (quantitative) and analyses data using statistical procedures and/or mathematical modelling.

Based on the above explanation, it can be concluded that the researcher wants to compare bankruptcy predictors, where the company bankruptcy methods to be compared are the Altman (Z-Score), Springate (S-Score), and Zemijewski (X-Score) methods. The population in this study includes insurance companies listed on the Indonesia Stock Exchange for the period 2020 to 2023.

The population in this study includes insurance companies listed on the Indonesia Stock Exchange for the period 2020 to 2023. The sampling technique used total purposive sampling, which resulted in 8 companies meeting the selected criteria.

RESULTS AND DISCUSSION

Altman Bankruptcy Prediction Method Calculations using the Altman method analysis in 2020 showed that there were 2 companies that had the potential to go bankrupt. Then, there were 4 companies in the grey area category, which means that these companies were experiencing financial problems but not serious enough to cause bankruptcy. Furthermore, in the safe category with a score > 2.60 , there were 2 companies.

In 2021, there were 2 companies that had the potential to experience bankruptcy. Then, there was 1 company in the grey area category, which means that the company experienced financial problems but not serious ones that had not yet resulted in bankruptcy. Furthermore, in the safe category with a score > 2.60 , there were 5 companies.

In 2022, there were two companies that were potentially facing bankruptcy. Then, there were two companies in the grey area category, meaning that these companies were experiencing financial problems but nothing serious enough to cause bankruptcy. Furthermore, there were four companies in the safe category with a score of > 2.60 .

Throughout 2023, there were two companies that were potentially facing bankruptcy, then there was one company in the grey area category, which means that the company was experiencing financial difficulties but not seriously and had not yet gone bankrupt. Furthermore, there were three companies in the safe category with a value > 2.60 .

Springate Method Bankruptcy Prediction Calculation

The Springate method in 2020 identified 7 companies that were potentially bankrupt. Meanwhile, in the healthy category with a value of < 0.862 , there was 1 company. In 2021, there were 6 companies that were potentially bankrupt. Meanwhile, in the healthy category with a value of < 0.862 , there were 2 companies. In 2022, there were 6 companies that were potentially bankrupt. Meanwhile, in the healthy category with a value of < 0.862 , there were 2 companies. Throughout 2023, there were 6 companies that were potentially bankrupt. Meanwhile, in the healthy category with a value of < 0.862 , there were 2 companies.

Zmijewski Method Bankruptcy Prediction Calculation

The Zmijewski method in 2020 showed that there were 8 companies in the healthy category with a value of < 0 . In 2021, there were 6 companies that were potentially bankrupt. Meanwhile, in the healthy category with a value of < 0 , there were 2 companies. In 2022, there were 5 companies that were potentially bankrupt. Meanwhile, in the healthy category with a value of < 0 , there were 3 companies. Throughout 2023, there was 1 company with the potential to go bankrupt. Meanwhile, in the healthy category with a value of < 0 , there were 7 companies.

Hypothesis Testing

H1 is there are differences between the Altman, Springate, and Zmijewski bankruptcy prediction models for insurance companies listed on the Indonesia Stock Exchange. [Table 1](#) presents the results of the Kruskal–Wallis test comparing bankruptcy prediction scores generated by the Altman, Springate, and Zmijewski models. The mean rank values indicate that the Zmijewski model has the highest mean rank (59.33), followed by the Altman model (53.83), while the Springate model shows the lowest mean rank (32.34). Furthermore, the Kruskal–Wallis test result shows an Asymp. Sig. value of 0.000, which is lower than the 0.05 significance level, indicating a statistically significant difference in bankruptcy prediction scores among the three models..

Table 1. Kruskal Wallis Comparison Test

		Ranks	
Predicted Model		N	Mean Rank
Predicted Score	Altman	32	53.83
	Springate	32	32.34
	Zmijewski	32	59.33
Total		96	

Source: SPSS 26 output

Table 2. Test Statistics

	Predicted Score
Kruskal-Wallis H	16.772
Df	2
Asymp. Sig.	.000

Source: SPSS 26 output, data processed in 2025

[Table 2](#) reports the Kruskal–Wallis test was employed to examine differences in bankruptcy prediction scores across models, following the approach commonly used in previous bankruptcy prediction studies (Faizin & Nuha, 2024). The test yields a Kruskal–Wallis H value of 16.772 with 2 degrees of freedom and an Asymp. Sig. value of 0.000, which is below the 0.05 significance level. This result indicates a statistically significant difference in bankruptcy prediction scores among the three models applied to insurance companies listed on the Indonesia Stock Exchange.

Accuracy Level Test on Prediction Models

[Table 3](#) presents the overall accuracy comparison of the Altman, Springate, and Zmijewski bankruptcy prediction models. The results show that the Zmijewski model achieves the highest accuracy level of 78.13%, correctly classifying 25 out of 32 insurance companies, followed by the Springate model with an accuracy of 71.88% and the Altman model with an accuracy of 65.63%. In terms of prediction errors, the Zmijewski model records the lowest error rate at 21.88%, indicating superior performance compared to the Altman and Springate models. These findings suggest that the Zmijewski model provides the most reliable bankruptcy prediction for insurance companies listed on the Indonesia Stock Exchange.

Table 3. Overall Model Recapitulation

Model	Predicted			Accuracy Level	Type Error
	Wrong	True	Sample		
Altman	11	21	32	65.63%	34.38%
Springate	9	23	32	71.88%	28.13%
Zmijewski	7	25	32	78.13%	21.88%

Source: SPSS 26 output

DISCUSSION

Based on the research conducted, it can be concluded that there is a significant difference between the Altman Z-Score, Springate, and Zmijewski bankruptcy prediction models applied to 32 insurance companies, as shown by the Kruskal-Wallis test results with a significance value of $0.000 < 0.05$. The Altman Z-Score model tends to indicate that companies are in a safe condition or grey area, while the Springate model shows that most companies are in a state of bankruptcy in the 2020–2023 period. Conversely, the Zmijewski model indicates that the majority of companies are not potentially bankrupt. There are also differences in classification results due to differences in formulas, financial ratio weights, and cut-off values for each model. These differences affect the level of accuracy in identifying potential bankruptcy. The Zmijewski model shows high accuracy because its cut-off value is able to group companies more accurately in the research sample. Thus, there are variations in the ability of each model to predict the bankruptcy of insurance companies, and the selection of the model used should be adjusted to the characteristics of the data and the purpose of the analysis.

The most accurate method for predicting insurance company bankruptcy is the Zmijewski Method, which obtained a total score of 78.13% accuracy with 25 correct predictions out of 32 companies. The Altman model had 11 incorrect predictions out of a total of 32 companies, with an accuracy rate of 65.61% and an error rate of 34.38%. The Springate model had a total of 23 correct predictions out of a total of 32 companies, with a total accuracy rate of 71.88%.

CONCLUSION

This study examines and compares the bankruptcy prediction performance of the Altman Z-Score, Springate, and Zmijewski models for insurance companies listed on the Indonesia Stock Exchange during the 2020–2023 period. The results reveal statistically significant differences among the three models, as confirmed by the Kruskal–Wallis test. Among them, the Zmijewski model demonstrates the highest predictive accuracy and the lowest error rate, indicating that it is the most reliable model for identifying bankruptcy risk in the insurance sector. These findings suggest that differences in model structure, financial ratios, and cut-off values substantially influence the accuracy of bankruptcy predictions.

Despite its contributions, this study has several limitations. The sample is limited to a small number of insurance companies and focuses solely on accounting-based financial ratios, which may restrict the generalizability of the findings. In addition, the study does not incorporate macroeconomic factors or qualitative aspects such as corporate governance and managerial performance. Future research is therefore encouraged to expand the sample size, include additional explanatory variables, and apply alternative or advanced analytical methods to improve the robustness and applicability of bankruptcy prediction models in the insurance industry.

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