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Research Article

Evaluating Precision: Comparing Altman, Springate, Zmijewski, and Grover Models in Financial Distress Prediction

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Abstract
This research examines the accuracy of Altman, Springate, Zmijewski, and Grover methods in predicting financial distress at PT. Garuda Indonesia Tbk during 2017–2021. The population comprises all financial reports of the company, with a saturated sampling technique applied. Data collection utilized documentation methods, and analysis involved descriptive tests and accuracy level evaluations. Results indicate that the Zmijewski method is the most accurate, with an 80% accuracy rate, followed by the Altman method at 60%, and both Springate and Grover methods at 40%. The Zmijewski method shows the highest Type I error rate at 20%, while Altman, Springate, and Grover methods have 0% Type I error rates. Regarding Type II errors, Zmijewski exhibits the highest rate at 80%, Grover at 60%, Altman at 40%, and Springate at 20%. The findings suggest that financial distress prediction methods are valuable tools for management to monitor the company's financial health and ensure operational sustainability. Adopting accurate prediction models can support decision-making and mitigate risks associated with financial distress.

Keywords: Altman, Springate, Zmijewski, Grover

JEL Classification: G33, G34, D81

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1. Introduction

Indonesia frequently faces economic crises, exemplified by the significant decline in the value of the rupiah. This decline can be attributed not just to a weakening economic structure, but also to the substantial debt the state has accumulated with foreign nations. Such conditions severely impact Firms across the nation, leading to sharply rising interest rates and inflation, while investment levels plummet (Sewpersadh, 2022). This results in a decline in the health of many businesses, with some even facing bankruptcy. A Firm's ability to manage resources effectively is crucial to its financial performance. As highlighted by Barry (2019) and Santosa et al. (2020), consistently poor performance signals impending financial distress, indicating the Firm's diminishing competitiveness and its potential journey toward bankruptcy. The reasons for bankruptcy can be categorized into two main areas: internal and external factors. A notable example of potential bankruptcy in this context is PT. Garuda Indonesia Tbk, a prominent airline in the country.

Financial reports serve as essential records that demonstrate a Firm's financial status, applicable to both public and private entities. The impact of the pandemic in 2020 significantly affected PT. Garuda Indonesia, leading to the issue of financial distress. It is important to differentiate between financial distress and bankruptcy; the former refers to a Firm's unhealthy financial condition that may ultimately result in bankruptcy or liquidation, while the latter indicates a complete failure to achieve business objectives. According to Curry & Banjarnahor (2018), financial distress arises when a Firm struggles to meet its financial obligations. As noted by Realestate et al. (2020), this distress begins when a Firm is unable to satisfy its short-term liabilities, including both liquidity and solvencyliabiliries (Santosa et al., 2020; Vo et al., 2019) .

Peter (2011) and (Jaafar et al., 2018) state that the financial distress analysis that is often used is the Z-Score Analysis Altman model, the Springate model and the Zmijewski model and in addition the Grover Analysis. This analysis is known because it is easy, and the accuracy in determining financial distress predictions is also quite accurate. Financial distress analysis is carried out to predict a Firm as an assessment and consideration of a Firm's condition. This analysis will help investors in determining which Firm to invest in and invest their capital in, or to sell or buy and even hold their investment in the Firm concerned. For leaders, this analysis can be used to predict the condition of the Firm, whether the Firm can be said to be in good condition or not, and this analysis can also help leaders to make decisions about the Firm.

Several research studies have utilized the Altman, Springate, Zmijewski, and Grover methods. In Sari (2018), it was found that the Springate model is the most suitable for application in transportation Firms in Indonesia due to its high accuracy level. Sunarji and Sufyani (2017) study indicates that the Zmijewski method is both relevant and accurate for predicting bankruptcy at PT. Smartfren Telecom Tbk, especially when compared to the other three methods-Altman, Springate, and Grover-because the Zmijewski value for PT. Smartfren Telecom Tbk is less than 0, suggesting the potential for bankruptcy (Fifriani & Santosa, 2019). Further research conducted by Lestari et al. (2021) demonstrates that the four analytical models exhibit varying levels of accuracy in predicting financial distress, with the Springate model again showing the highest level of accuracy. However, a study by Pakdaman (2018) asserts that the Grover model achieves the highest accuracy value and thus is the best model for predicting financial distress.

Based on various previous research studies, Sari (2018) and Lestari et al. (2021) conclude that the Springate method demonstrates the highest level of accuracy when compared to the Altman, Zmijewski, and Grover methods, while also exhibiting a smaller margin of error. In contrast, Sunarji and Surfyani (2017) assert that the Zmijewski method is both relevant and precise. Additionally, Pakdaman (2018) indicates that the Grover method achieves the highest accuracy value among the evaluated methods.

In summary, the Altman, Springate, Zmijewski, and Grover methods yield varying results for different subjects when applying these four analytical models. Despite these significant differences, the resulting values do not deviate substantially between the four methods. This research differentiates itself from previous studies primarily through the analytical methods employed, the subjects analyzed, and the research periods considered. The focus of this study is to evaluate the accuracy of the Altman, Springate, Zmijewski, and Grover methods as tools for predicting financial distress, specifically examining PT. Garuda Indonesia Tbk over the period from 2017 to 2021.

This research aims to fill this gap by analyzing the accuracy of the four methods-Altman, Springate, Zmijewski, and Grover-in predicting financial distress for PT. Garuda Indonesia Tbk during the 2017–2021 period, a time marked by economic upheaval and pandemic-induced challenges. This study also seeks to provide insights into which model is most suitable for the transportation sector, particularly in predicting and mitigating financial distress effectively.

2. Literature Review and Hypothesis

Financial statements

According to the Statement of Financial Accounting Standards (PSAK) No. 1 (2015), financial reports provide a structured presentation of an entity's financial position and performance. These structured reports typically include a statement of financial position, a profit and loss statement, a statement of changes in equity, a cash flow statement, notes to the financial reports, and other explanatory information. Kasmir (2019) defines financial reports as documents that reflect a Firm's financial condition at a specific point in time or over a particular period. Additionally, Putra et al. (2017) describe financial reports as summaries of the outcomes of financial transactions that illustrate a Firm's progress, compiled periodically over the span of a year. From these definitions, we can conclude that a financial report is a summary of the accounting processes recorded by a Firm, intended to evaluate its financial condition and performance over a certain period. This includes a financial position report, profit and loss report, statement of cash flows, and acFirming notes to the financial statements (Budiantoro et al., 2022).

Financial Distress

According to Hery (2017) and (Liang, 2020), financial distress is a condition where a Firm experiences difficulty in fulfilling its obligations. This situation occurs when the Firm cannot cover its total costs and experiences losses. For creditors, this situation is an early symptom of debtor failure. Based on the definition above, it can be said that financial distress is the financial condition of an entity that experiences a decline in financial condition, which is usually temporary, before experiencing liquidity but can become worse if the condition is not quickly resolved, which can result in business bankruptcy.

Altman Method

The Firms that Altman uses only come from the manufacturing industry. The reason behind this is that the available data only comes from Moody's Industrial Manual which only contains data on manufacturing Firms (Asmadi et al., 2023). The working capital ratio shows the Firm's ability to generate net working capital from the total assets owned. The calculation of working capital is obtained from current assets minus current liabilities (Munawarah & Hayati, 2019). Altman and Gough (1974) stated, "There is a model for predicting bankruptcy level assessments with a high degree of accuracy. This bankruptcy prediction model is known as the Z-Score model." Altman's Zscore is also known as Altman Bankruptcy Prediction Model Z-score. As time goes by and adjustments to various types of Firms. Altman then modified his model so that it could be applied to all Firms, such as manufacturing, non-manufacturing, and bond-issuing Firms in developing countries. In this modified Z-score, Altman eliminates different asset sizes.

Springate Method

Initially, Springate used 19 financial ratios, but after testing, Springate took four ratios. This method has an accuracy rate of 92.5% using a sample of 40 Firms in predicting bankruptcy. Springate created a financial distress prediction model in 1978. In creating it, Springate used the same method as Altman, namely Multiple Discriminant Analysis (Zidane & Tojibussairin, 2022). Another bankruptcy analysis that can be used to analyze bankruptcy is the Springate Analysis (S-Score). This bankruptcy analysis is known because apart from being easy, the accuracy in determining bankruptcy predictions is also quite accurate. This bankruptcy analysis is carried out to predict a Firm as an assessment and consideration of a Firm's condition.

Zmijewski Method

The prediction method produced by Zmijewski in 1983 is a result of 20 years of research that has been repeated and states that a Firm is considered to be experiencing Financial Distress if the X value is greater than 0. This prediction means that Firms whose X value is greater than or equal to 0 are predicted to experience Financial Distress in the future. On the other hand, Firms whose X value is less than 0 are predicted not to experience financial distress (Zidane & Tojibussairin, 2022). Zmijewski (1983) adds to the validity of financial ratios as a tool for detecting Firm financial failure. Zmijewski conducted a study by reviewing studies in the field of bankruptcy resulting from previous research over 20 years. Financial ratios were selected from previous research financial ratios. With

the assessment criteria, the greater the value of

Grover Method

According to Prihanthini & Sari (2017), the Grover model is a model created by designing and re-evaluating 38 Altman Z-Score models. Jeffrey S. Grover used a sample according to the Altman Z-score model in 1968, by adding thirteen new financial ratios. The sample used was 70 Firms, with 35 Firms that went bankrupt and 35 Firms that did not go bankrupt from 1982 to 1996. The Grover model categorizes a Firm in financial distress if it gets a score of less than or equal to -0.02 (G-Score ≤ -0, 02), while the score for Firms categorized as not experiencing financial distress is more than or equal to 0.01 (G-Score ≥ 0.01). Firms with a score between the upper and lower limits are in the gray area (-0.02 ≤ G-Score ≤0.01) (Zidane & Tojibussairin, 2022).

Research Conceptual Framework

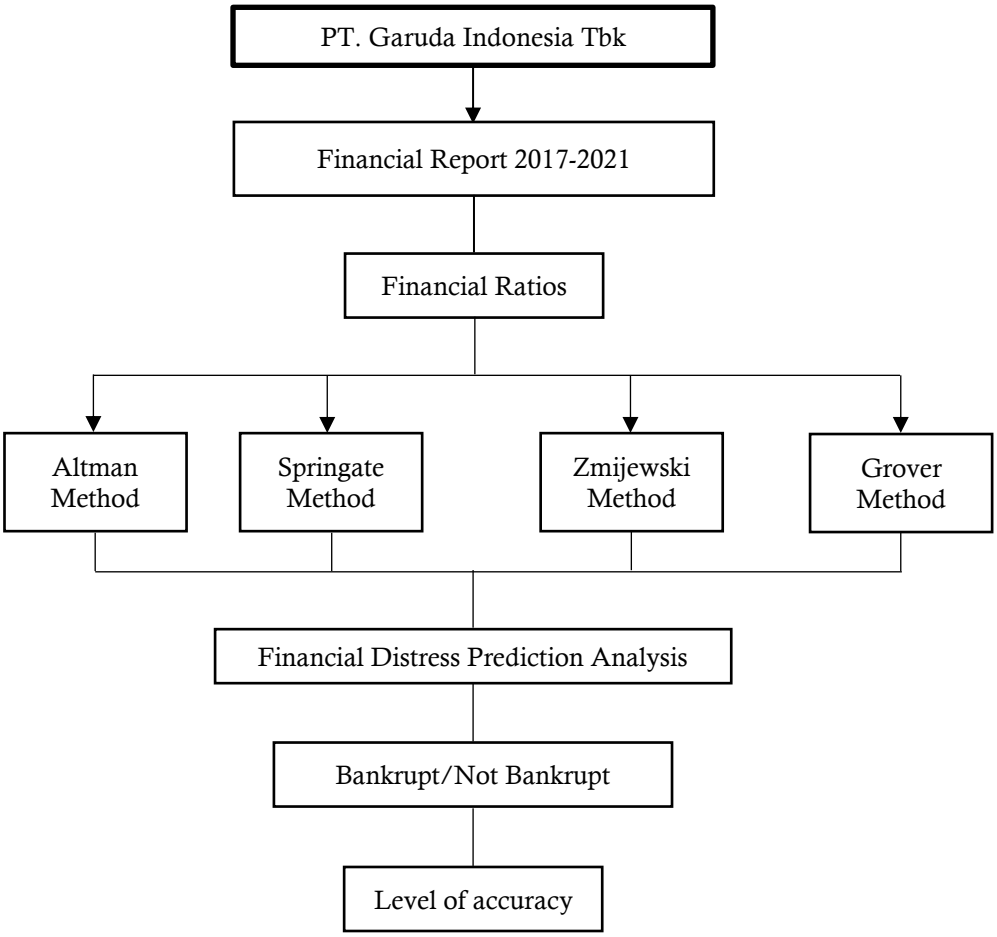

Figure 1. Research Conceptual Framework

The study framework utilized to examine PT. Garuda Indonesia Tbk's financial distress projection for the years 2017–2021 is shown in Figure 1. The Firm's financial reports are the main source of information, with particular attention paid to important financial parameters that are extracted from the reports. The Altman, Springate, Zmijewski, and Grover methods are the four different financial distress prediction techniques that are then subjected to these ratios. Each approach classifies the Firm as either bankrupt or not based on how likely it is that it is experiencing financial difficulties. Additionally, based on the forecasts of these techniques, the Firm's degree of financial stability or distress is evaluated, offering thorough insights into the Firm's financial well-being and bankruptcy risks during the examined time frame.

Altman's Method Hypothesis
Nakamura (2021), for non-financial state-owned Firms, can conclude that the Altman Z-Score model has a gray zone error of 7.41% and produces an accuracy rate of 100%. The Springate S-Score model has a type II error of 7.41%, which states that the model incorrectly predicts the condition of a healthy Firm as a Firm experiencing financial distress and produces an accuracy rate of 92.59%. The Zmijewski The results of accuracy tests in the period after the global financial crisis stated that the Altman Z-Score prediction model had a perfect level of accuracy, followed by Springate S-Score and Zmijewski X-Score.

The results of Adiwafi's (2020) research on Property, Real Estate, and Building Construction Sector Firms Listed on the IDX 2014-2018 can be concluded that the Altman Model is a financial distress prediction model with the highest level of accuracy of 88.44%. Then followed by the Zmijewski model which also has the second highest level of accuracy with an accuracy level of 83.56%. Then, the Springate model is the model with the lowest level of accuracy at 48.44%. This finding is supported by Nakamura (2021), Cholid (2021), and Adiwafi (2020) stated that the Altman Z-Score is the model with the highest level of accuracy of 100% in predicting financial distress. Based on these results, the hypothesis in this research is:
H1: Altman's method is most accurate in predicting financial distress

Springate Method Hypothesis
The results of Sembiring and Sinaga's (2022) research on retail Firms listed on the Indonesia Stock Exchange can be concluded that the Springate method is the most accurate prediction method compared to the Altman, Grover, and Zmijewski methods. The accuracy value of the Springate method is 79%, with a type I error value of 21% and a type II error value of 0%. The Springate method is able to predict Firms that are suspected of experiencing financial distress on the Indonesian Stock Exchange. The second position is occupied by the Grover method, with an accuracy rate of 74% and a type I error of 26% with a type II error of 0%. In the third position is the Zmijewski method, with an accuracy rate of 68%, with a type I error of 26% and a type II error of 5%, and the fourth position is the Altman method, with an accuracy rate of 58%. With type I error 31% and greeny area 11%.

The results of research by Ulfah and Moin (2022) on Tobacco Firms listed on the Indonesia Stock Exchange for the 2017-2021 period can be concluded that the most accurate prediction results among the three models are Springate with the highest accuracy of 80%, then followed by Altman with an accuracy percentage value of 72 %, and finally the Zmijewski model with a percentage value of 64%. This result is supported by Sari (2018), Nakamura (2021), and Nur (2022) stated that the Springate Model has the highest level of accuracy of 100% without any Error Level I or Error Level II in predicting bankruptcy. Based on these results, the hypothesis in this research is:
H2: The Springate method is most accurate in predicting financial distress

Zmijewski Method Hypothesis
The results of research by Arai et al. (2021) on state-owned Firms in Indonesia can be concluded that the Zmijewski model predicts 28 samples to be in a distress condition, 67 samples to be in a non-distress condition with the highest level of accuracy of 66.32% and type I error of 7.36% and type I error of 7.36%. II amounting to 26.31%. followed by the Springate model, there are 44 samples that are in a distress condition, 51 samples are in a non-distress condition, has an accuracy rate of 64.21%, and with type I error is 0% and type II error is 35.79%. Then, the lowest is the Altman Z-Score model predicting 17 samples are in a distress condition, 35 samples are in a gray zone condition, 43 samples are in a non-distress condition, and the accuracy level of the Altman model is 54.74%

The results of research by Wahyudi et al. (2021) on Manufacturing Firms listed on the Indonesian Stock Exchange can be concluded that among the Altman, Springate and Zmijewski methods, the most accurate method compared to the three methods is the Zmijewski method, which has an accuracy rate of 100% which is more accurate than the Altman 72% and Springate methods. 71%.

This finding is in line with research conducted by Sumarna et al. (2020), Kesuma (2020), and Sembiring (2022) stated that the Zmijewski Prediction Model is the most accurate prediction model with the highest percentage of accuracy in predicting bankruptcy, namely 90. This result is supported by Nasriza (2021), Hertina (2020), and Febriani (2022) stated that the Zmijewski Method is a research method with a high level of accuracy. Based on these results, the hypothesis in this research is:

H3: The Zmijewski method is most accurate in predicting financial distress

Grover's Method Hypothesis

The results of Syaputri and Cakranegara's (2021) research on the Automotive and Component Industry listed on the Indonesia Stock Exchange can be concluded that the Grover method is the most suitable prediction method to apply because it has the best performance compared to other prediction methods, namely 85%, with an error rate of 15 %. Meanwhile, the Altman Z-Score method has an accuracy rate of 83.33% with an error rate of 16.67%, and the Zmijewski method is 66.66% with an error rate of 33.34%. This result is in line with research conducted by Sumarna et al. (2020), Kesuma (2020), and Sembiring (2022) stated that the Zmijewski Prediction Model is the most accurate prediction model with the highest percentage of accuracy in predicting. This finding is supported by research conducted by Pakdaman (2018) and Hertina (2020); Pertiwi (2020) stated that the Grover Method has a high level of accuracy. Based on these results, the hypothesis in this research is:

H4: Grover's method is most accurate in predicting financial distress

3. Data and Methods

Types of research

The type of research used in this research is quantitative descriptive research. According to Hermawan and Yusran (2017), quantitative research is an objective research approach that involves collecting and analyzing quantitative data and using statistical testing methods. The type of data used in this research was obtained from secondary data. According to Sekaran and Bougie (2017), secondary data refers to information collected from existing sources in the form of evidence, notes or reports that have been compiled in archives (documentary data) in finished form in the form of publications. In this research, the data source used is a financial report from PT. Garuda Indonesia Tbk obtained from the official PT. Garuda Indonesia website. The data collection technique used in this research is the documentation technique. Data collection techniques are carried out by viewing, analyzing, and quoting records available on the official PT. Garuda Indonesia website.

Population and Sample

The population that will be used in this research is all financial reports at the airline Firm PT. Garuda Indonesia Tbk. The sample selection technique used is saturation sampling. The sample that will be taken in this research is the financial report of the airline Firm PT. Garuda Indonesia Tbk for the period 2017-2021. This sample was drawn by taking financial reports in the last five years because during that time period, the Firm experienced significant financial difficulties in the years before and after the COVID-19 pandemic.

Data analysis method

After the data has been collected, the data is then processed and analyzed. Data analysis is a stage of data processing. The data that has been collected will be analyzed according to the data analysis techniques that will be used (Bahri, 2018). The data analysis tools used are Microsoft Excel and SPSS v.29.0 applications. SPSS (Statistical Package for Social Science) is a computer program used to analyze data with statistical analysis

4. Results

Springate S-Score Method

Table 1. Springate Method Calculations

Year	1.03	X1+	3.07	X2+	0.66	X3+	0.4	X4	S-Score
2017	1.03	-0.25	3.07	-0.02	0.66	1.11	0.4	-0.08	0.07
2018	1.03	1.00	3.07	2.13	0.66	1.04	0.4	-0.09	7.93
2019	1.03	0.99	3.07	2.02	0.66	1.03	0.4	0.02	7.64
2020	1.03	0.45	3.07	0.48	0.66	0.14	0.4	-0.60	1.59
2021	1.03	-0.76	3.07	0.92	0.66	0.19	0.4	-0.79	1.61

Source: Processed data (2023)

From the calculation results in Table 1, it is known that 2017 produced a Z-Score value of -0.71, which means it was included in the Z-Score cut-off category of less than 1.1 (Z-Score < 1.1), so that year, The Firm PT. Garuda Indonesia has the potential for financial distress.

From the results of the Springate method calculations in Table 1, it is known that PT. Garuda Indonesia did not experience financial distress in 2018 and 2019, was in the gray area in 2020 and 2021, and experienced financial distress in 2017.

Zmijewski X-Score Method

Table 2. Zmijewski Method Calculations

Year	-4.3	-4.5	X1+	5.7	X2+	0.004	X3	X-Score	Year
2017	-4.3	-4.5	-0.06	5.7	0.75	0.004	1.95	0.24	2017
2018	-4.3	-4.5	-0.06	5.7	0.85	0.004	2.83	0.78	2018
2019	-4.3	-4.5	0.00	5.7	0.84	0.004	2.87	0.48	2019
2020	-4.3	-4.5	-0.23	5.7	1.18	0.004	8.00	3.49	2020
2021	-4.3	-4.5	-0.58	5.7	1.85	0.004	18.88	8.93	2021

Source: Processed data (2023)

The calculation results in Table 2 show that in 2017, it produced an X-Score value of 0.24, which means it was included in the cut-off category for financial distress.

From the results of the Zmijewski method calculations in Table 2, it is known that PT. Garuda Indonesia in 2017 - 2021 all have the potential for financial distress, and none of them are in good health.

Grover S-Score Method

Table 3. Grover Method Calculations

Year	1,650	X1+	3,404	X2+	0.016	ROA	G-score	Year	1,650
2017	1,650	-0.25	3,404	0.02	0.016	-0.06	-0.42	2017	1,650
2018	1,650	1.00	3,404	2.13	0.016	-0.06	8.96	2018	1,650
2019	1,650	0.99	3,404	2.02	0.016	0.00	8.56	2019	1,650
2020	1,650	0.45	3,404	0.48	0.016	-0.23	2.43	2020	1,650
2021	1,650	-0.76	3,404	0.92	0.016	-0.58	1.93	2021	1,650

Source: Processed data (2023)

From the calculation results in Table 3, it is known that in 2017, it produced a G-Score value of -0.42, which means it falls into the G-Score cut-off category of less than -0.02 (G-Score ≤ -0.02).

Then, this year, the Firm PT. Garuda Indonesia has the potential for financial distress.

In 2018, it produced a G-Score value of 8.96, which means it was included in the G-Score cut-off category of more than equal to 0.01 ($G \geq 0.01$), so that year, PT. Garuda Indonesia had no potential for financial distress.

The results of the Grover method calculations in Table 3 show that PT. Garuda Indonesia experienced financial distress in 2017, while in 2018 - 2021, it did not experience financial distress or was in good health.

Descriptive Statistical Analysis

Table 4. Descriptive Analysis Results

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Altman	5	-4.44	21.34	8.2860	4.67428
Springate	5	.07	7.93	3.7680	3.72124
Zmijewski	5	.24	8.93	2.7840	3.67655
Grover	5	-.42	8.96	4.2920	4.22064

Source: Processed data (2023)

Based on Table 3 above, which has been tested, it is known that Altman has the lowest score in 2021 and the highest score in 2018; apart from that, the average (mean) shows a value of 8.2860 with a standard deviation value of 4.67428. This finding means that the Altman method distribution value results are good because they are diverse

Springate had the lowest score in 2017 and the highest score (which was in 2018; besides that, the average (mean) shows a value of 3.7680 with a standard deviation value of 3.72124. This result means that the results of the Springate method distribution value which is good because it is diverse

Zmijewski has the lowest score in 2017 and the highest score (which is in 2021. Apart from that, the average (mean) shows a value of 2.7840 with a standard deviation value of 3.67655. This result means that the results of the distribution of the Zmijewski method which is not good because it lacks diversity.

Grover had the lowest score in 2017 and the highest score (which was in 2018); besides that, the average (mean) shows a value of 4.2920 with a standard deviation value of 4.22064. This finding means that the results of the Zmijewski method distribution value which is good because it is diverse.

Comparison of Prediction Methods

Table 5. Comparison of Prediction Methods

	Altman		Springate		Zmijewski		Grover	
Year	Year Score	Prediction	Year Score	Prediction	Year Score	Prediction	Year Score	Prediction
2017	-0.71	FD	0.07	FD	0.24	FD	-0.42	FD
2018	21.34	NFD	7.93	NFD	0.78	FD	8.96	NFD
2019	20.74	NFD	7.64	NFD	0.48	FD	8.56	NFD
2020	4.42	NFD	1.59	GA	3.49	FD	2.43	NFD
2021	-4.44	FD	1.61	GA	8.93	FD	1.93	NFD

Source: Processed data (2023)

Based on Table 5, the results of the five-year average calculation at PT. Garuda Indonesia using the Altman method, it is known that from these five years, 2017 and 2021 experienced potential financial distress and in 2018, 2019 and 2020 did not experience potential financial distress or this means that the financial condition was in a state Healthy. The results of calculations for five years using the Springate method showed that in 2017, there was potential for financial distress; in 2018 and 2019, there was no potential for financial distress; and in 2020 and 2021, it was in the gray area. The results of calculations for five years using the Zmijewski method show that in 2017 - 2021, five consecutive years experienced potential financial distress and no one was in good health. The results of calculations for five years using the Grover method show that in 2018-2021, there was no potential for financial distress, and only in 2017, there was potential for financial distress.

Comparison Test of Accuracy Results

Table 6. Comparison Test of Accuracy Results

Prediction Method	Level of accuracy	*Type I Error*	*Type II errors*	*Gray Area*
Altman	60%	0%	40%	0%
Springate	40%	0%	20%	40%
Zmijewski	80%	20%	80%	0%
Grover	40%	0%	60%	0%

Source: Processed data (2023)

Based on Table 6, it is known that the most accurate method with the highest level of accuracy is the Zmijewski method at 80%, then the Altman method with an accuracy level of 60%, and finally, Springate and Grover with the lowest accuracy level at 40%. The method that has the highest type I error rate is Zmijewski, namely 20% and the lowest is Altman, Springate and Grover, namely 0%. Meanwhile, the one with the highest type II error rate is the Zmijewski method, namely 80%, next is the Grover method, 60%, then Altman at 40%. Then, the lowest is the Springate method, which is 20%.

5. Discussion

Comparison of Prediction Calculation Results of Altman, Springate, Zmijewski and Grover

From the calculation results of the four methods, it is known that the results of predicting financial distress for each method have different results. This can be seen from the gray area category, with no potential for financial distress and potential for financial distress. There is one method that produces a gray area condition, namely the Springate method for 2 years. The gray area is a condition where it cannot be determined whether the Firm has the potential for financial distress or not. Different outcomes are found when financial distress is predicted using the Altman, Springate, Zmijewski, and Grover approaches. These variations result from the different variables and presumptions that each model makes use of. As an illustration of the Springate method's unique characteristic of not being able to definitively decide whether or not the Firm has the potential to experience financial hardship, it identified a "gray area" condition in two particular years. Because of their ambiguity, gray area categories can be difficult to use but are also useful for recognizing transitional times.

Results of Prediction Accuracy Analysis of Altman, Springate, Zmijewski and Grover

Based on Table 6, it is known that the most accurate method with the highest level of accuracy is the Zmijewski method, next is the Altman method and finally Springate and Grover with the lowest level of accuracy. The method that has the highest type I error rate is Zmijewski and the lowest is Altman, Springate and Grover. Meanwhile, the one with the highest type II error rate is the Zmijewski method, next is the Grover method and then Altman. Then the lowest is the Springate method. The results of this research are in line with research by Arai et al. (2021), showing that the Zmijewski model produces the highest level of accuracy compared to other methods. Wahyudi et al. (2021) show that in predicting financial distress, using the Zmijewski model produces the highest level of accuracy.

According to the accuracy analysis, the Zmijewski model was the most accurate, with the Altman, Springate, and Grover approaches coming in second and third. The fact that Zmijewski has the greatest Type I mistake rate-the inability to identify businesses that are truly in distress-despite its high accuracy suggests that it is more appropriate for recognizing financially sound businesses. With a reduced Type I error rate, the Altman approach provides a better-balanced trade-off, although being marginally less accurate overall. For businesses like airlines that are subject to quick recovery cycles, the Springate technique works especially well because it has the lowest Type II error rate (false alarms for financial instability).

6. Conclusion

Based on the results of data processing regarding financial distress analysis using the Altman, Springate, Zmijewski and Grover methods, it can be concluded that in the analysis of the Altman method in predicting financial distress, it was found that out of the 5 years, two years experienced financial distress and three years that did not experience financial distress. distress or financial condition in a healthy condition. In the analysis of the Springate method in predicting financial distress, it was found that out of 5 years, one year was predicted to experience potential financial distress, two years were predicted to experience no potential financial distress, and two years were in the gray area condition, namely not can be said to have the potential for financial distress or not, the analysis of the Zmijewski method in predicting financial distress resulted in that out of these 5 years all of the Firm's finances experienced the potential for financial distress. In the analysis of the Grover method in predicting financial distress, it was found that out of the 5 years, there was one year that was predicted to have the potential for financial distress, and four years were predicted not to experience potential financial distress. After carrying out accuracy tests for each method, it is known that the Zmijewski method has the highest level of accuracy. Managerial implications Overall, the use of financial distress prediction methods can be a very useful tool for management in maintaining the Firm's financial health and ensuring operational sustainability.

This study's contribution is its thorough evaluation of four different financial distress prediction techniques over five years: Altman, Springate, Zmijewski, and Grover. By examining the predictive results of each approach, the study provides insightful information about the accuracy and dependability of various models in predicting financial distress. In conclusion, this work makes two contributions: it highlights the usefulness of financial distress prediction models in the field of financial management and advances our understanding of them.

Recommendations

Based on the conclusions and findings from the analysis of the four financial distress prediction methods (Altman, Springate, Zmijewski, and Grover), here are some specific recommendations: It is advised that management thinks about utilizing a combination of models, particularly combining the Zmijewski technique due to its higher accuracy in anticipating financial hardship, given the variety in the findings produced by other methodologies. Other techniques, such as Altman or Springate, could be used to confirm results and give a more comprehensive picture of the business's financial health. Using many models would increase dependability and lower the possibility of missing possible financial issues.

Limitations and avenues for future research

Further research is recommended to examine Firms in other sectors, whether listed on the Indonesia Stock Exchange (BEI) or not. It is also recommended to use different analytical methods to see the differences between each method. Further research is recommended to increase the observation time and sample size.

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