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Accuracy of Bankruptcy Predictions of Real Estate Companies in Indonesia Based on the Altman, Springate, Zmijewski, and Grover Models

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ABSTRACT

Covid 19 pandemic has been able to shake up the Indonesian property market, this has worried investors who intend to invest their capital in these companies. Therefore, investors or the market must have knowledge about predictions of a company's bankruptcy. There are various types of bankruptcy predictions for early detection of a company's financial condition, including Altman, Springate, Zmijewski, and Grover models. The purpose of this research is to validate the Altman, Springate, Zmijewski, and Grover bankruptcy prediction model. Is there a difference between the four prediction models and which one is the best at foretelling bankruptcy for real estate businesses in Indonesia? Based on the existing criteria, the research sample consisted of 31 companies, using Kruskal Wallis analysis techniques to prove differences and manual calculations to determine the level of accuracy and error rate. The data processing results demonstrate that there are verifiable distinctions amongst the four prediction models and the Asymp value. Sig 0.000 is less than 0.05 the Grover model is the most reliable indicator of impending bankruptcy model with a higher accuracy value than the other three predictions, namely 76% and an error rate of 24%.

Keywords: Altman, Bankruptcy, Grover, Springate, Zmijewski

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INTRODUCTION

An investor's decision to invest in a company is always related to the capacity of the business to turn a profit or is affected by its financial performance. Investment decisions are related to welfare, when a the financial success of the company is high, welfare expectations investors are also high, and vice versa. Investment activities involve decisions that are truly filled with caution because they have an impact on the long term. Likewise, when an investor decides to invest in a property or real estate company. This signal takes the shape of details outlining management's attempts to carry out the owner's desires. When making investment decisions, business people and investors use this information as a key signal.

The Indonesian property market was jolted by the COVID-19 outbreak. Even at beginning of 2022, there is still stagnation in terms of supply and demand for property. In the first quarter of 2022, the property price index trend remained stagnant every quarter, increasing below 1 percent. In terms of supply, there was a decline of 0.3 percent quarterly. Not only that, the demand index also fell by 2 percent quarterly, all this was conveyed by Marine Novita Country Manager Rumah.com. However, based on Rumah.com Indonesia Property Market Index (RIPMI) data, the property sector is starting to show improvement in the subsequent quarter of 2022. This is evident from the property price index trend which increased by 3.2 percent quarterly. The upward trend was also seen in the supply index which rose by 1.3 percent. Meanwhile, demand rose by 2 percent quarterly. Third-quarter 2022 data shows that the property price index showed a slight increase of 1 percent quarterly, followed by a supply index of 5.1 percent quarterly. In terms of demand, it will increase by 10.5 percent per quarter III/2022. If we look at the past year, the price index and supply index show an increase from 2021 to 2022, namely a 5 percent increase in the price index and a 4 percent increase in the supply index, respectively.

The Association of Indonesian Real Estate Companies (REI) encourages developers in Indonesia to work together to stimulate and restore the property sector in 2023. Developers, both large, medium, and small developers, must unite to overcome various challenges and develop the potential of the property sector in the country. "REI continues to prove itself as a strong backbone in reviving the nation's economy, especially through the property sector for Indonesia's progress,". This means that real estate companies are trying to continue to develop their business so that they can support the economy and progress of Indonesia. However, in 2023 property companies will again face the challenges of the threat of recession and global interest rates, so residential sellers and suppliers must be careful in making decisions.

Looking at the conditions from 2022 to 2023, investors will think twice about investing in property companies. Their biggest fear is when the company goes bankrupt. Bankruptcy (financial distress) occurs when a company has a financial risk condition, meaning a condition where When a business can't meet its commitments or its financial leverage. Financial distress is an early signal of bankruptcy (Amilin, 2015). Financial distress is insufficient funds to run or continue a business (Yuliana, 2018). Some signs of bankruptcy include: 1) the institution has been losing money for several years with no net profit, and the stake is bigger than the pole (Kurniawati, 2017). The operating profit is minus, total assets minus total liabilities is negative and forces the institution to merge with another institution (Hadjaat, Yudaruddin, & Riadi, 2021). When the cash flow's nominal value is smaller than the costs/liabilities that are due, they are forced to make improvements, for example, restructuring assets or financial restructuring (Ir Agus Zainul Arifin, 2018). Bankruptcy signal data is used by management to design a turnaround strategy to regain growth momentum (Suwarsono, 2014) or take alternative corrective actions based on the size of the financial problems (Amilin, 2015).

Because these models can be used to identify and even modify circumstances before they reach bankruptcy, a variety of bankruptcy prediction models are anticipation and early warning systems for bankruptcy (Chandra, Suyanto, Widyastuti, & Ahmar, 2021). To see financial aspects and adequate risks in property companies, an indicator is need to assess the company's performance and health in order to determine whether or not it has the potential to file for bankruptcy. One way is by using financial ratios (Van Horne & Wachowicz, 2021). Several bankruptcy prediction models using financial ratios include 1) the Altman Z-score Model; 2) the Springate Model 3) the Grover Model; 4) the Zmijewski Model; 5) the Ohlson Model; 6) the Shumway Model; 7) the Deakin Model; 8) the Taffler Model; 9) the Beaver Model; and 10) the Opler Model.

The following research has been carried out to predict potential bankruptcy by using financial ratios in analyzing health levels, including: Chandra, et al. (2021) explain that the Grover Model is the best compared to the Zmijewski, Altman, and Springate Models in forecasting financial distress for

service companies (Chandra et al., 2021). Panai, et al. (2023) show that When comparing the Zmijewski Model to the Altman and Springate Models, it performs better for insurance companies (Panai, Hadady, & Bailusy, 2023). Hantono (2019) proves that the Zmijewski model is the best method compared to Altman and Grover in predicting bankruptcy in banking companies (Hantono, 2019). Indrawan (2023) explains that for predicting financial difficulty, the Zmijewski model outperforms the Altman, Grover, Springate, and Taffler models for hotel companies (Indrawan & Gusmarani, 2023). Ulfah (2022) provides evidence that Springate is the most precise forecasting model available for tobacco companies on Indonesian Stock Exchange apart from Altman and Zmijewski (Ulfah & Moin, 2022). Azzahra and Pangestuti (2022) found that the Springate model was a more accurate prediction model than Zmijewski and Altman (Azzahra & Pangestuti, 2022). Sudrajat and Wijayanti (2019) found that the Grover model had greater accuracy than Altman and Zmijewski (Sudrajat & Wijayanti, 2019). The findings of Ramadhani, et al. (2023) shows that the Zmijewski model is dominantly accurate compared to Altman and Grover (Ramadhani, Yuliani, Saputri, & Muthia, 2023). Sudarman, et al. (2020) revealed that the Fulmer Model has a high level of accuracy in predicting bankruptcy in non-financial sector companies (Efni & Savitri, 2020).

Based on several studies, this research seeks to find the best model for predicting bankruptcy in property or real estate companies. The problem statement put out in this study is : 1) Are the forecasts made by the Altman, Springate, Zmijewski, and Grover models for the bankruptcy of real estate or property businesses listed on the Indonesian Stock Exchange different from one another?; 2) Which model—among the Altman, Springate, Zmijewski, and Grover models—predicts property or real estate companies' insolvency with the highest degree of accuracy on Indonesian Stock Exchange?

Theoretical basis

Signaling Theory

The theory of signaling was initially proposed by Spence (1973). He elucidated that information owners, or senders, transmit signals in the form of information that represents a company's state and is advantageous to investors, or recipients. Brigham and Houston (2021) claim that signal theory describes how management anticipates the company will grow, which will affect how possible investors react to the business. This signal takes the shape of details outlining management's attempts to carry out the owner's desires. When making investment decisions, businesspeople and investors use this information as a key signal (Brigham & Houston, 2021).

Signaling theory was developed by Ross (1977). This theory explains the encouragement or reasons for a company to provide certain information to outside parties. A company provides financial report information to outside parties in 2 signals, namely good news and bad news. If the company provides good news to investors, it will give a good impression to investors, The company's share price and value will rise, and investors who are interested in investing more will do so. Still, if a business provides poor news, investors will look for another company that has a better signal (Mahaningrum & Merkusiwati, 2020).

Financial Distress

A corporation is in financial hardship when it lacks the money to pay its creditors and is unable to fulfill its obligations to them (Francis Hutabarat, 2021). According to Sucipto & Muazaroh (2016), Financial distress is a situation where A company's financial situation is unhealthy or in a crisis. This is usually an early sign of bankruptcy because a company has experienced losses for several years (Sucipto & Muazaroh, 2016). A corporation that is in financial hardship is one that is facing obstacles that could jeopardize its survival and ability to fulfill its financial obligations. This can be brought on by things like heavy debt, a decline in income, or changes in the economic environment. According to Putri (2021), When a company's finances are in poor or terrible shape, it is said to be in financial difficulty. which can cause the company to go bankrupt if not handled well (Putri, 2021). According to Setiawan & Amboningtyas (2016), there are three main reasons why a company experiences financial distress, namely: 1) Neoclassical model, which occurs when resource

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allocation is inappropriate. Company management is less capable of allocating resources for operational activities so It's conceivable that the business may face financial difficulties.; 2) The Financial model, which is defined by the financial arrangement of the business is wrong, causing restrictions on liquidation. This shows that in the long term, a company can survive. But the company goes bankrupt in the short term; 3) Model of corporate governance. That is, financial trouble may arise if a business has a sound financial and asset structure but subpar management (Setiawan & Amboningtyas, 2018).

There are several indicators to identify signs of financial difficulties according to Sari (2019) as observed from the business's: 1) falling sales volume due to the business's inability to implement policy; 2) The business's declining ability to generate profits; 3) dependence on quite large debts. The signs of financial difficulties seen from external parties of the company are 1) a decline in the quantity of dividend shares given to shareholders over a number of periods; 2) losses experienced by the company and continuously declining profits; 3) dismissal of employees; 4) continuous decline in market prices.

Altman Model (Z-Score)
Multiple discriminant analysis, or MDA, was initially applied in Altman's Z-score approach (1968). Since each ratio was examined independently, the reasoning behind the technique deviated from the restrictions of ratio analysis and the considerations of financial analysts alone were the basis for ratio considerations. In order to make his model applicable to all businesses, Altman changed it. Equation found in the Altman Z-Score Model is as follows:

Z-Score = 6.56 X1 + 3.26 X2 + 6.72 X3 + 1.05 X4

Information:
X1 = Working Capital / total assets
X2 = Retained earnings / total assets
X3 = EBIT / Total assets
X4 = Book value of equity / book value of total debt
Assessment criteria:
a. If the Z value < 1.81 the company has the potential for financial distress
b. Should the figure be 1.81 < Z-Score < 2.675 the company is in the gray area
c. When the Z-Score is higher than 2.675, the business has no potential for financial distress

Springate Model (S-Score)
Michael Springate created the Springate Model in 1978. The operating cash flow to total debt ratio and the short-term debt to total debt ratio are used in this approach as independent variables. The final results will be classified into 3 categories, namely the green zone (safe), yellow zone (doubtful), and red zone (high risk). Springate model equation:

S-Score = 1.03 X1 + 3.07 X2 + 0.66 X3 + 0.4 X4

Information:
X1 = Working capital / total assets
X2 = EBIT / total assets
X3 = EBIT / current assets
X4 = Sales / total assets
Assessment criteria:
a. lower than 0.862 S-Score indicates that the company may be in financial difficulties.
b. If the company's S-Score number is more than 0.862, there is no chance of financial difficulty.

Zmijewski Model (X-Score)
The Zmijewski model is a predictive model developed by Mark. E Zmijewski 1984. This model uses the ratio of earnings to share, variations in earnings per share, book value to market value ratio, and percentage change in sales as independent variables. The final results will be classified into 2 categories, namely safe zones and risk zones. Equations in the Zmijewski model:

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X-Score = -4.3 – 4.5 X1 + 5.7 X2 + 0.004 X3
Information:
X1 = Return On Assets (ROA)
X2 = Debt Ratio
X3 = Current Ratio
Assessment criteria:
a. Financial distress may be imminent for the company if the X-Score is greater than 0.
b. The company has no possibility for financial difficulty if the X-Score is less than 0.

Grover Model (G-Score)
Grover Model created by Jyoti Grover in 1996. As independent variables in this model, liquidity, solvency, profitability, activity, and market ratios are used. The final results will be classified into 2 categories, namely safe zones and risk zones. Grover model equation:
G-Score = 1.650 X1 + 3.40 X2 – 0.016 X3 + 0.057
Information:
X1 = Working capital / total assets
X2 = EBIT / total assets
X3 = ROA
Criteria:
a. If the company's G-Score is less than 0.01, there is no chance of financial hardship.
b. If the company's G-Score is less than or equal to -0.02, financial distress may be imminent.

Hypothesis
The purpose of this study is to determine which of the four models—Altman, Springate, Zmijewski, and Grover—is the most accurate in predicting the bankruptcy of real estate or property companies in order to demonstrate that there are variations in bankruptcy forecasts. Accordingly, the following hypothesis will be developed:
H1: The Altman, Springate, Zmijewski, and Grover models differ in their forecasts regarding the likelihood of bankruptcy for real estate or property companies listed on the Indonesian Stock Exchange.
H2: When it comes to forecasting bankruptcy in real estate or property companies listed on the Indonesian Stock Exchange, the Grover model is the most reliable.

METHODS

This is a quantitative comparative research project, Property firms that have been listed on the Indonesia Stock Exchange for the duration of the study's population 2020 - 2023. Purposive sampling dictates that the study sample consists of 31 companies with 3 observation periods. The normality test is carried out before hypothesis testing. Hypothesis testing using the Difference Test (Kruskal Wallis) with IBM SPSS version 24 calculations. For the level of accuracy, use your calculations. The four models' accuracy levels are computed to ascertain number of correct and incorrect predictions from each model. Next, the prediction results are compared to determine which bankruptcy prediction model is the most accurate. According to Hasanah in Meiliawati and Isharijadi (2016), the level of accuracy is calculated to determine the number of correct predictions as follows:
Rate of Accuracy = (Quantity of accurate forecasts / Quantity of Samples) x 100%

In addition to each model's degree of accuracy in predicting bankruptcy, the error rate is another factor to take into account. There are two categories of errors: Type I and Type II. An inaccuracy from a sample of businesses that are expected to be solvent but are insolvent is known as a type I error. Type II mistake, on the other hand, refers to the error in the sample of businesses that are expected to file for bankruptcy but do not. This is how the error rate is computed. The error rate is calculated as follows

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Error Type I = (Quantity of Type I mistakes / Quantity of Samples) x 100%.
Error Type II = (Quantity of Type II mistakes / quantity of Samples) x 100%.
The level of accuracy is determined by the highest number of correct predictions, and the lowest error rate (error types I and II).

RESULTS AND DISCUSSION

Descriptive Statistics Results

Table 1. Deskrictive Statistic

Model	Min	Max	Mean	Std. Division
Altman	2,30	2.365,43	91,18	370,96
Springate	-0,56	5,29	0,65	0,74
Zmijewski	-5,59	0,48	-3,00	1,33
Grover	-0,02	2,54	0,71	0,47

Source: Analysis of Data

Based on the table above for the Altman model, shows a minimal amount of 2.30 and the highest possible value of 2,365.43 with a mean value of 91.18. This means that according to the Altman model, the average real estate company in Indonesia is not detected as going bankrupt. The Springate model has a minimum figure of -0.56, a maximum of 5.29 with a mean of 0.65, meaning that the Springate model predicts that on average many real estate companies will be detected as going bankrupt. According to the Zmijewski model with a minimum amount of -5.59 a maximum of 0.48 and a mean value of -3.00, this implies that according to the Zmijewski model, the average real estate company does not have the potential to experience bankruptcy, whereas according to the Grover model the average real estate company in Indonesia does not experience proven bankruptcy. Minimum value -0.02, maximum 2.54 and mean 0.71.

Results of the Normalcy Test

The test for normalcy with Kolmogorov Smirnov gave results that The models Zmijewski, Springate, and Altman were not normally distributed because all Asymp. Sig (2-taled) values were less than 0.05, Grover's model alone had a value above 0.05. So for different tests (hypothesis tests) use the Kruskal-Wallis parametric test.

Hypothesis Test Outcomes

Table 2. Test of Kruskal-Wallis

Chi-Square	df	Asymp.Sig.
309,981	3	0,000

Source: Analysis of Data

Table 3 shows the test results using Kruskal-Wallis showing the Asymp.Sig value. Less than 0.05, so Since H1 is acknowledged, it may be said that there are differences in bankruptcy predictions between the four models. Next, an accuracy test is carried out for each bankruptcy prediction model, following is the calculation of the accuracy of each model:
Altman's model shows that:
In 2021: predicting 31 real estate companies, the number of correct predictions was 22 companies, the number of incorrect predictions for error type I was 8 companies, and error type II was only 1 company
In 2022: predicting 31 real estate companies, the number of correct predictions is 21 companies, the number of incorrect predictions for error type I is 9 companies, and error type II is only 1 company
In 2023: predicting 31 real estate companies, the number of correct predictions is 26 companies, the number of incorrect predictions for errors type I is 5 companies, and there are no errors in type II.

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Springate Model Predictions for each year:
In 2021: predicted 31 real estate companies, the number of correct predictions was 16 companies, there were no incorrect predictions of error type I, and error type II was 15 companies
In 2022: predicting 31 real estate companies, the number of correct predictions is 19 companies, there are no errors in error type I predictions, and error type II predictions are 12 companies
In 2023: predicting 31 real estate companies, the number of correct predictions was 15 companies, incorrect predictions for errors type I were not found, and errors in type II were 16 companies.

Zmijewski's model predicts over the study period:
In 2021: predicting 31 real estate companies, the number of correct predictions was 22 companies, the number of incorrect predictions for error type I was 8 companies, and error type II was only 1 company
In 2022: predicting 31 real estate companies, the number of correct predictions was 23 companies, the number of incorrect predictions for errors type I was 8 companies, and non-errors were type II.
In 2023: predicting 31 real estate companies, the number of correct predictions was 25 companies, 6 companies were predicted wrongly by type I error, and there were no errors in type II.

Grover Model Predictions during the research period:
In 2021: predicting 31 real estate companies, the number of correct predictions was 23 companies, 8 companies were predicted incorrectly, type I error.
In 2022: predicting 31 real estate companies, the number of correct predictions is 23 companies, and the number of incorrect predictions for type I errors is as many companies.
In 2023: predicting 31 real estate companies, the number of correct predictions is 25 companies, and the number of incorrect predictions for type I error is 6 companies.
In Grover's model, no errors type II were found during the 3 research periods.
Based on the prediction results of each model, the following is a recap of the accuracy of the predictions:

Table 3. Calculating the Accuracy of Predictions

Tahun	Altman	Springate	Zmijewski	Grover
Level of accuracy	74,19%	53,76%	75,27%	76,19%
Type Error I	23,66%	0%	23,66%	23,66%
Type Error II	2,15%	46,24%	1,08%	0%
Total	100%	100%	100%	100%

Source: Analysis of Data

Table 3 explains that of the four models, the highest percentage of accuracy and the lowest percentage of errors (Error types I and II) is the Grover model.

Discussion

Disparities in the Prediction of Bankruptcy Models Zmijewski, Grover, Altman, and Springate models.

The results of testing the first hypothesis show that the four models of Altman, Springate, Zmijewski, and Grover differ in their ability to forecast real estate companies listed on the Indonesia Stock Exchange's likelihood of going bankrupt throughout the given period 2021 - 2023. This difference occurs because each model uses different financial ratios. 1) The first model to predict bankruptcy was the Altman model. (1968), initially more on the application of multiple discriminant analysis and specifically for companies that were truly experiencing financial distress as proven by the company experiencing losses for 2 to 3 consecutive years. Over time, the Altman model developed by using several indicators, including working capital, total assets, retained earnings, earnings before interest and tax (EBIT), book value of debt, and book value of equity. All indicators used to assess a company's financial performance are taken into consideration because they are of concern to

creditors and shareholders or other investors (the market). 2) The Springate model pays more attention to managing operating cash flow and its ratio to total debt, the ratio of short-term debt to total debt. So this model prioritizes the company's debt position because this indicator is one of the assessments of investors or the market in assessing company's financial performance. Debt must be managed optimally so as not to pose a high risk to company. Debt is held to increase company's profits, but if it is excessive, especially if it exceeds the total value of equity, this condition threatens the company's financial performance. 3) The Zmijewski model focuses on the earnings per share ratio, book value to stock market value, and percentage change in sales. Zmijewski assumes that investors pay more attention to the profits generated and the share price of company. Investors anticipate that if the business's share price is high then the expected return they will receive will be high and vice versa. To support share prices, the sales percentage is a concern for investors, because increasing and high sales will be able to provide the expected profits so that share prices will also increase and returns will meet expectations. 4) Grover's model for predicting bankruptcy involves liquidity, solvency, profitability, activity, and market ratios, all of which are utilized as a gauge for evaluating the financial success of a business. All of these ratios become benchmarks for investor assessment to make investment decisions and be loyal to a company. Grover believes that if all financial ratios are used, the financial performance of all factors will be represented and bankruptcy will be detected from the start to avoid company bankruptcy. Each model has its advantages in predicting bankruptcy, so this is what causes the four models to differ in their predictions.

The Most Accurate Bankruptcy Prediction Model is the Grover Model.

The second hypothesis' test findings clarify that, when it comes to predicting real estate company bankruptcy within the given period, the Grover model outperforms the Altman, Springate, and Zmijewski prediction models 2021 - 2023. Grover uses all kinds of financial ratios in predicting bankruptcy so that the calculation results are close to accurate, although there are still some error rates. Grover's model all components while evaluating the financial success of a business. The liquidity ratio assesses how well the business can use its present assets to pay its short-term obligations. This explains that if it is unable to fulfill its obligations, especially short term, then company considered to be at risk bankruptcy (financial distress). The solvency ratio seeks to demonstrate the business's capacity to handle both short- and long-term debt. Debts are compared with total assets, how debt is used to procure current assets and fixed assets. Debt is compared with total equity, What percentage of debt and equity are used to fund a company's investment? Using sales, total assets, and total equity as metrics, the profitability ratio evaluates the company's capacity to turn a profit. This ratio provides information to shareholders and stakeholders about the company's strength in managing all its resources in maintaining and even improving its financial performance. Activity Ratio, this metric demonstrates how well a corporation can manage all of its assets, including sales generation, investment in receivables, inventory efficiency, and fixed assets. The market ratio is another tool used to determine a company's worth based on the share price. This ratio will allow one to ascertain the market's reaction to the organization. Compute all of these ratios to assess the financial performance of the business; for this reason, the Grover model outperforms Altman, Springate, and Zmijewski in terms of prediction accuracy.

CONCLUSION

The following conclusions from this study are based on the analysis and discussion results: 1) The Grover model is the most accurate method for predicting bankruptcy of real estate companies on the Indonesian Stock Exchange for the 2021 period; 2) There are significant differences between the Altman, Springate, Zmijewski, and Grover models when it comes to predicting bankruptcy, especially for real estate companies on the Indonesia Stock Exchange for the period 2021 - 2023.

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