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Analysis of Financial Distress using the Altman Z-Score Model, Springate Model, Zmijewski Model, and Grover Model

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Abstract

The tight competition in the business world in the automotive industry that occurs in the current era of technology and development means that companies must have broad and clever thinking to keep the company from the brink of failure. During this research period there was a decline in automotive sales and company profits in the automotive and component sub-sectors listed on the IDX for the 2016-2020 period. This research aims to find out which prediction model is the most accurate and precise in predicting financial difficulties using model accuracy tests. The population in this study was 13 companies, then a purposive sampling technique was used to obtain 10 companies that were included in the research criteria. The results of this research show that the Altman Z-Score, Springate, Zmijewski and Grover models have different results, the Altman model predicts that there are 5 companies that are indicated to be healthy, 3 companies are in the Gray area, and 2 companies are indicated to have the potential to go bankrupt, the Springate model predicts that there are 5 companies healthy and 5 unhealthy companies, the Zmijewski model predicts that there are 9 healthy companies and 1 company that is indicated to have the potential to go bankrupt, the Grover model predicts that there are 7 healthy companies and 3 companies that are indicated to be unhealthy. With these results, the financial distress model with the highest accuracy is the Zmijewski model with an accuracy level of 92%, while the accuracy levels of the Altman Z-Score, Springate, and Grover models are 76%, 44%, and 76% respectively. With these results, the Zmijewski model is the most suitable model for use in automotive and component sub-sector companies in 2016-2020.

Keywords: Altman z-score, springate, zmijewski, grover, financial distress

1. Introduction

As time goes by, Indonesia is a developing country with the largest population in Southeast Asia, around 270.20 million people in 2020, and the fourth largest country in the world (BPS, 2021). This makes Indonesia a potential market for producers. As a developing country, vehicles are one of the needs of the Indonesian population. Human need for vehicles increases from year to year, because it makes it easier to travel from one place to another, especially in developing countries like Indonesia with high population density. The increasing supply and demand for vehicles in society increases competition between the automotive industry. The tight competition in the business world in the automotive industry that occurs in the current era of technology and development means that companies must have broad and clever thinking to keep the company from the brink of failure. The existence of a free market can also tighten competition because companies compete not only with local companies but also with international companies.

The growth of the automotive sector cannot be separated from the economic improvements that occurred in Indonesia, according to the Central Statistics Agency (BPS), it was noted that the Indonesian economy in 2016 grew 5.02 percent higher than the 2015 achievement of 4.88 percent, in 2017 it also experienced an increase of 5 .07 percent, in 2018 there was also an increase of 5.17 percent, while in 2019 and 2020 there was an economic decline, namely in 2019 it was 5.02 percent and in 2020 there was a growth contraction of 2.07 percent, which means that in 2019 and in 2020 the Indonesian economy experienced a decline. According to the head of BPS Suharianto, the decline in 2019 occurred due to several factors, namely the trade war between the United States and China, political tensions in the Middle East, and fluctuating commodity prices (Harry, 2020). Meanwhile, in 2020 the Indonesian economy experienced a contraction due to the Covid-19 pandemic. With this phenomenon, the author determined the research period in 2016-2020.

With the current situation in Indonesia, it is very vulnerable to financial emergencies in some national companies. This is a consequence of the Covid-19 pandemic which emerged one year ago and resulted in policies such as PPKM (Implementation of Restrictions on Community Activities) which hampered community mobility (Masitoh, 2021). Many companies experienced financial and non-financial losses during this pandemic. According to the Director

General of Taxes, the Department of the Treasury (Kemenkeu) identified three main impacts of the Covid-19 pandemic on the Indonesian economy: first, consumption or household purchasing power, which is the mainstay of 60 percent of the economy, has fallen quite low; the two pandemics created persistent uncertainty, causing investment to slow down and resulting in the cessation of activities; and third, the entire world is experiencing economic weakness, causing commodities to decline and Indonesian exports to various countries to stop (Zuraya, 2020).

Companies are expected to not only be able to adapt to the real world, but also be able to work effectively and efficiently and maintain the company's survival amidst business competition, otherwise the company will become smaller and experience bankruptcy. From this, on the Indonesian Stock Exchange, at least one of the sectors that reflects the manufacturing sector is the Miscellaneous Industry sector with the sub-sector of the automotive industry and its components. Due to this, companies experienced a decline in profits, one of which is the manufacturing industry in the Miscellaneous Industry sector. The following is a graph of the average profit growth for 2019-2020 companies listed on the Indonesia Stock Exchange in Figure 1 Decline in Company Profits in Various Industrial Sectors Listed on the IDX for the 2019-2020 Period.

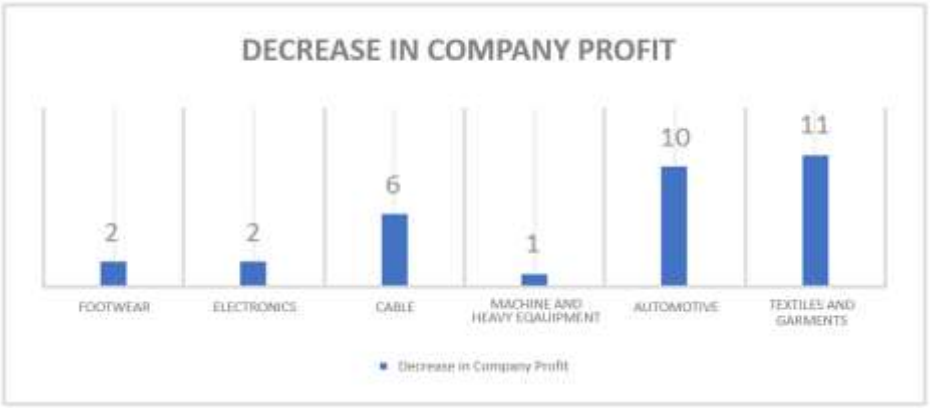

Figure 1: Graph of decline in company profits in various industrial sectors listed on the IDX for the 2019-2020 period
Source: www.idx.co.id (data reprocessed)

From this graph, it can be seen that the companies that experienced the largest decline in profits were in the textile and garment sub-sector with 11 companies and also with 10 companies in the automotive sub-sector. Financial difficulties are where a company experiences a continuous decline in profits, even to the point of experiencing negative profits (Adiwibowo et al., 2023). In general, the company's goal in each of its operational activities is to determine the company's continuity in the future. One of the main goals in starting a business is to make a profit so that the business can function and develop well.

Evaluation of company performance is needed to anticipate future uncertainty. Company performance assessment is a way for management to evaluate company performance using available resources. Annual financial report analysis is a very important tool for obtaining information about the company's financial condition and the results obtained in relation to the company's established strategy. Bankruptcy analysis is carried out to get an early warning of the company's threat of bankruptcy. The earlier signs of bankruptcy are detected, the better for management, because management can make improvements. Various analyzes have been developed to predict the initial potential for company bankruptcy. If the financial distress status is known in advance, corrective action can be taken to avoid serious financial hardship, such as bankruptcy. There are two types of financial difficulties that lead to bankruptcy, namely economic bankruptcy and financial bankruptcy. The economic failure of a company is associated with an imbalance between income and expenses. Economic failure can also be caused by a company's cost of capital being higher than the historical rate of return on investment costs.

Information from the results of bankruptcy analysis can be useful and used by various parties. Creditors or lenders need information based on bankruptcy analysis, so that creditors can know the actual state of an entity's financial performance. Furthermore, based on the results of this analysis, creditors can determine the ideal nominal amount that can be lent to the institution. The results of bankruptcy analysis are also information that investors need, because rational investors will try to invest their capital in entities that will be able to provide profits and are in good condition. Apart from that, investors can also use information based on bankruptcy analysis to buy or acquire an entity based on company value, with a high risk of bankruptcy, of course the company value will be lower (Duțescu and Duțescu, 2019) Financial reports that describe the amount of income, expenses, taxes and company profits or losses at a certain time, also usually a year or quarter. This report is called an income statement. Therefore, this financial analysis aims to obtain an overview of the company's financial development over a certain period of time. By carrying out financial analysis of the company's financial data between the balance sheet and profit and loss report, you will be able to find out the company's financial development and find out the financial or operational results that have been achieved in the past and currently ongoing. By analyzing financial reports from previous years, a company's weaknesses can be identified and results that are considered quite good.

Financial ratios are information that can be used as a tool to predict company performance. One of the techniques used in bankruptcy analysis is to use discriminant analysis which can be used to predict business failure and uses a

model that is assessed by Z-Score. The Z-Score model was developed by Edward I Altman, a financial economist. Z-Score is a score determined from the level of probability of company bankruptcy. By using the company's Z-Score, it is possible to determine the future financial health situation, whether the company is bankrupt, prone to bankruptcy or in good health. Various researchers have examined bankruptcy studies using financial ratios. Altman in his research focused on five categories representing four financial ratios, namely liquidity ratios, profitability, leverage or solvency and performance. By using the ratio of working capital to total assets, the ratio of retained earnings to total assets, the ratio of earnings before interest and tax to total assets, the ratio of market value of equity to the book value of total debt, and sales to total assets (Puspanintias and Nurul, 2018) and the model The next one used is the Springate Model.

The Springate method is a development of the Altman method using Springate's Multiple Discriminant Analysis (MDA) in 1978 (Yunisa and Santi, 2023). Initially, this method used 19 financial ratios, however, after retesting, Springate finally used 4 ratios in determining the criteria for a company being included in the category of a healthy company or a company that has the potential to go bankrupt. The differences in the use of financial ratios between the Springate and Altman models tend to cause differences in forecasting results. Zmijewski is a continuation of the bankruptcy prediction study conducted by Zmijewski in 1983, adding the validity of financial ratios as a tool for detecting company financial failure. The successful model developed by Zmijewski uses financial ratios to measure performance, leverage and liquidity to predict a company's financial difficulties. The Grover model is the latest bankruptcy prediction model, to be precise in 2001 it was discovered by Jeffrey S. Grover, a model created by redesigning and re-evaluating the Altman ZScore model. Jeffrey S. Grover used a sample Altman Zscore model in 1968, adding thirteen new financial ratios. The sample used was 70 companies with 35 bankrupt and 35 not bankrupt from 1982 to 1996.

From the differences in the forecasting results of the Z-Score and Springate models, it is not yet known which model is most appropriate for predicting a company's financial difficulties. Apart from possible differences in forecast results, these two financial distress models have different levels of accuracy. According to Altman's research in 1968, the accuracy rate for the Altman Z-Score model was around 95%, while the Springate method had an accuracy rate of 92.5%, based on tests conducted by Springate in 1978 (Meliawati and Isharijadi, 2017). Previous research shows that bankruptcy analysis can produce different results if different analytical models are used. In addition, the type of industry can influence the value of bankruptcy risk. Research in a journal using the Zmijewski, Springate, Altman Z-Score and Grover models in predicting bankruptcy in transportation companies listed on the Indonesia Stock Exchange. Springate model is the most suitable model to be applied to transportation companies in Indonesia , due to its high accuracy and low error rate compared to other prediction models. The results differ from previous research conducted by Altman in 1968 and Springate in 1978, where the results were that the Altman method had a higher level of accuracy compared to Springate. Other research conducted by Sudjiman and Sudjiman, (2019) in this study found that the two models being compared, namely Molde Altman and Springate, had differences in bankruptcy prediction with the accuracy level for the Altman Z-Score model being 0% while the Springate model was 80%.

Prihanthini and Ratna (2013), researched the risk of bankruptcy in food and beverage companies listed on the Indonesia Stock Exchange using four testing models, namely using the Grover Model, Altman Z-Score Model, Springate and Zmijewski. The test results show that the results of bankruptcy risk analysis have significantly different values between the use of one model and another. Prihanthini and Ratna (2013) used three analysis models to test the risk of bankruptcy in the cosmetics industry listed on the Indonesia Stock Exchange. The results obtained also showed significant differences in bankruptcy risk values between one analysis model and another. The bankruptcy analysis model is closely related to financial ratios, this was tested by (Hapsari, 2012) with research results showing that profitability and leverage ratios have a significant effect on bankruptcy risk.

Previous research shows that there are different bankruptcy risk values when the analytical models used are different. The type of industry also influences differences in bankruptcy analysis results, so this research tries to use two models to analyze the consistency of a company's bankruptcy value. Previous research has shown that there will be companies in an industry that are at risk of bankruptcy, but in different numbers than companies with healthy financial performance. Therefore, it can be said that all industries will face challenges and risk bankruptcy. Based on the problems and phenomena described, the title of this journal's research is about financial difficulties, entitled "Analysis of Company Financial Difficulties in the Automotive Sub-Sector and components listed on the IDX for the 2016-2020 Period Using the Altman Z-Score Model and the Springate Model, the Zmijewski Model, and the Grover.

2. Literature Review

2.1. Financial management

Financial Management is a function of the company that cannot be separated from other management functions. Other management functions cannot run smoothly if the company's financial management fails to generate funds because all production activities, employee recruitment and marketing activities experience obstacles. According to Rohayati et al., (2023), financial or expenditure management is all business activities related to efforts or approaches to obtain a business company budget at low costs and the efforts made to use or allocate the budget effectively. Meanwhile, according to Kasmir (2014), financial management or often called expenditure can be interpreted as all company activities related to efforts to obtain company funds at low costs and efforts to use and allocate these funds efficiently. So it can be seen that financial management is financial management related to efforts to obtain funds to

run the company, how the company manages and allocates these funds so that the company's goals can be achieved.

2.2. Capital market

Basri and Putri, (2023) defines the capital market as a meeting between those who have excess funds and those who need funds by trading securities such as shares and bonds on the stock exchange. Meanwhile, the capital market provides a source of long-term capital used by companies seeking large amounts of funds and used by investors to invest their funds. So it can be seen that the capital market is where capital owners or investors meet with those who need funds for company capital.

2.3. Financial statements

Financial reports are the final result of the accounting process which includes two main reports, namely balance sheet and profit and loss. The financial reports presented will be useful for company owners and management to determine company achievements. The financial report aims to provide financial information to parties inside and outside the company who have an interest in the company, thus the purpose of the financial report is to determine the company's financial condition (Schroeder et al., 2022).

2.4. Financial distress

Financial distress is a situation where the company's cash flow is insufficient to pay current obligations and the company is forced to take corrective action. In this case, financial difficulties can be seen as the company's failure to fulfill its obligations as well as the company's inability to generate sufficient cash flow to make contract payments. Financial difficulties are where a company experiences a continuous decline in profits, even to the point of experiencing negative profits. Financial difficulties are a condition of declining financial performance of a company with a decrease in profits, even negative profits, so that the company will have difficulty fulfilling its obligations (Kisman and Krisandi, 2019).

2.5. Financial Distress Model

2.5.1. Alman Z-Score model

Altman (1968) used MDA Multiple Discriminant Analysis, which is a statistical technique that identifies several financial ratios that can influence the value or outcome of an event, then developed into a method with the aim of making it easier to draw conclusions from an event, with the formulation of Altman's Z- Score as follows:

$$Z = 1.2\ (X1) + 1.4(X2) + 3.3\ (X3) + 0.6\ (X4) + 1.0\ (X5) \quad (1)$$

X1=Working Capital÷Total Assets ; X2=Retained Earnings÷Total Assets ; X3=Earnings Before Interest and Taxes÷Total assets ; X4=Market Value of Equity÷Total Debt ; X5=Sales÷Total Assets

Company criteria using the Altman Z-Score model: If the Z-Score value is greater than 2.99 then the company is healthy, then if the Z-Score value is between 1.81 and 2.99, then the company is Gray area, and if the value The Z-Score is smaller than 1.81, then the company has the potential to go bankrupt.

2.5.2. Springate models

Springate method is a development of the Altman Z-Score method which was developed by Multiple Discriminant Analysis (MDA). The process of developing the Springate method initially used 19 frequently used financial ratios. However, after testing, Springate finally chose four financial ratios. The formulation from Springate is as follows:

$$S = 1.03\ (A) + 3.07\ (B) + 0.66\ (C) + 0.4\ (D) \quad (2)$$

A=Working Capital÷Total Asset ; B=Net Profit before Interest and Taxes÷Total Asset ; C=Net Profit before Taxes÷Current Liabilities ; D=Sales÷Total Assets.

Company criteria using the Springate model: if the S value is smaller than 0.862, it indicates that the company is predicted to be unhealthy and if the S value is greater than 0.862, it indicates that the company is in a healthy financial condition or not bankrupt.

2.5.3. Zmijewski Model

Zmijewski(1984) Introducing probit analysis for financial distress, financial ratio analysis that measures debt performance or leverage and liquidity of a company. In his analysis. Zmijewski's formulation is as follows:

$$X = -4.3 - 4.5\ (X1) + 5.7\ (X2) - 0.004\ (X3) \quad (3)$$

X1=Net Income÷Total Assets ; X2=Total Debt/Total Assets ; X3=Current Assets÷Current Liabilities.

Company criteria using the Zmijewski model: if the company value is less than 0 then the company is in a condition that has no potential for bankruptcy or is healthy and if the value is more than 0 then the company is predicted to have the potential to go bankrupt.

2.5.4. Grover Models

Grover (2001) succeeded in creating a model that was used to analyze the potential for company bankruptcy by redesigning Altman (Prihanthini and Ratna, 2013). Grover's formulation is as follows:

$$G = 1.650 (X1) + 3.404 (X3) - 0.016 (ROA) + 0.057 \quad (4)$$

X1 =Working Capital÷Total Asset ; X3 = Earning Before Interest and Taxes÷Total Asset ; ROA = Net Income÷Total Asset

Company criteria using the Grover model: if the company value is less than or equal to -0.02 then the company is in financial distress or unhealthy and if the value is more than or equal to 0.01 then the company is predicted to be in a healthy condition.

3. Materials and Methods

3.1. Materials

The object of this research is the financial reports of companies in the Automotive and Components sub-sector listed on the Indonesia Stock Exchange (BEI) for 2016-2020. The variables in this research are financial difficulties as the dependent variable and the Altman Z-Score Model, Springate Model, Zmijewski Model, and Grover Model as independent variables. Where the financial reports are used as the basis for calculating the Altman Z-Score method, Springate method, Zmijewski method, and Grover's method. This research uses a population of automotive and component sub-sector companies listed on the Indonesia Stock Exchange (BEI) for the 2016-2020 period, totaling 13 companies.

The sampling technique used in this research is non-probability sampling, namely purposive sampling, which is a technique for determining samples with certain considerations or special selection. The following are the research sample criteria, namely: companies that publish audited financial reports in the 2016-2020 period, both companies that have complete data required in this research and finally companies that experience a decline in profits in the automotive sub-sector and components for the 2016-2020 period. There are 10 companies in the Automotive and Components sub-sector that comply with the purposive sampling criteria. The following are the research samples which will be presented in Table 1.

Table 1: Research sample of automotive companies listed on the indonesian stock exchange

No	Company name	Establishment Date	Listing Date on BEI
1	PT. Astra International Tbk	February 20, 1957	April 04, 1990
2	PT Astra Otoparts Tbk	September 20, 1991	June 15, 1998
3	PT. Garuda Metalindo Tbk	March 15, 1982	07 July 2015
4	PT Indo Kordsa Tbk	July 08, 1981	September 05, 1990
5	PT. Goodyear Indonesia Tbk	January 26, 1917	December 22, 1980
6	PT. Indomobil Sukses International Tbk	March 20, 1987	November 15, 1993
7	PT. Indospring Tbk	May 05, 1978	August 10, 1990
8	PT. Multi Prima Sejahtera Tbk	January 07, 1982	February 05, 1990
9	PT. Prima Alloy Steel Universal Tbk	February 20, 1984	July 12, 1990
10	PT. Selamat Perfect Tbk	January 19, 1976	September 09, 1996

Source: idnfinancials.com 2022

The data collection technique involves collecting data using documentation techniques or searching for data based on past events, namely documents of annual company financial reports for the period 2016-2020 for the automotive sub-sector and components listed on the Indonesia Stock Exchange (BEI).

3.2. Methods

The data analysis technique determined in this research is that in this research data processing only uses the editing and master sheet stages. This research uses quantitative descriptive analysis, where this research is based on figures originating from the financial reports of automotive and component sub-sector companies for the 2016-2020 period which are listed on the Indonesian Stock Exchange (BEI). This research only describes and summarizes the situation of the variables without comparing the variables with the sample and the accuracy test is carried out to determine the level of accuracy of the method used.

4. Results and Discussion

4.1. Predicting Financial Difficulty using the Altman Z-Score Model

The following is a table of predicted financial distress scores using the Altman Z-Score model in the automotive sub-sector and components listed on the Indonesia Stock Exchange (BEI) in 2016-2020 which is presented in Table 2.

Table 2: Results of financial difficulty prediction analysis of the altman z-score model

Company Code on IDX	2016	2017	2018	2019	2020	Average	Prediction
ASII	2.30 Grey	2.32 Grey	2.21 Grey	2.33 Grey	2.33 Grey	2.30	Grey
AUTO	3.27 Grey	3.45 Healthy	3.33 Healthy	3.56 Healthy	3.34 Healthy	3.39	Healthy
BOLT	4.29 Healthy	2.76 Grey	2.40 Grey	2.56 Grey	1.91 Grey	2.78	Grey
BRAM	2.71 Grey	3.19 Healthy	3.44 Healthy	3.92 Healthy	3.35 Healthy	3.32	Healthy
GDYR	2.62 Grey	2.23 Grey	2.11 Grey	1.89 Grey	1.47 Bankrupt	2.06	Grey
IMAS	0.81 Bankrupt	0.72 Bankrupt	0.54 Bankrupt	0.53 Bankrupt	0.37 Bankrupt	0.59	Bankrupt
INDS	4.37 Healthy	6.21 Healthy	6.53 Healthy	7.44 Healthy	7.20 Healthy	6.35	Healthy
LPIN	-0.55 Bankrupt	7.81 Healthy	7.86 Healthy	10.38 Healthy	8.44 Healthy	6.79	Healthy
PRAS	0.54 Bankrupt	0.51 Bankrupt	0.72 Bankrupt	0.23 Bankrupt	0.66 Bankrupt	0.53	Bankrupt
SMSM	4.89 Healthy	5.49 Healthy	5.79 Healthy	5.85 Bankrupt	5.34 Healthy	5.47	Healthy

Source:Data Processing (2022)

In table 2 it can be explained that the results of the Altman Z-Score calculation using the criteria that Altman has determined can produce predictions of financial difficulties, namely that in 2016-2020 the issuers of AUTO, BRAM, INDS LPIN and SMSM were in the healthy category, the issuers of ASII, BOLT and GDYR is in the Gray category and the IMAS and PRAS issuers are in the financial distress category.

4.2. Financial Difficulty Prediction using the Springate Model

The following is a table of predicted financial distress scores using the Springate model in the automotive sub-sector and components listed on the Indonesia Stock Exchange (BEI) in 2016-2020 which is presented in Table 3

Table 3: Results of financial difficulty prediction analysis of the springate model

Company Code on IDX	2016	2017	2018	2019	2020	Average	Prediction
ASII	0.79 Not healthy	0.86 Not healthy	0.83 Not healthy	0.88 Healthy	0.71 Not healthy	0.81	Not healthy
AUTO	0.73 Not healthy	0.82 Not healthy	0.82 Not healthy	0.95 Healthy	0.53 Not healthy	0.77	Not healthy
BOLT	1.89 Healthy	1.52 Healthy	1.01 Healthy	0.95 Healthy	0.13 Not healthy	1.10	Healthy
BRAM	1.15 Healthy	1.35 Healthy	1.19 Healthy	1.22 Healthy	0.35 Not healthy	1.05	Healthy
GDYR	0.58 Not healthy	0.43 Not healthy	0.36 Not healthy	0.20 Not healthy	0.06 Not healthy	0.33	Not healthy

IMAS	0.16 Not healthy	0.13 Not healthy	0.05 Not healthy	0.09 Not healthy	-0.04 Not healthy	0.08	Not healthy
INDS	0.74 Not healthy	1.40 Healthy	1.40 Healthy	1.25 Healthy	0.92 Healthy	1.14	Healthy
LPIN	-0.81 Not healthy	7.83 Healthy	2.23 Healthy	2.74 Healthy	0.94 Healthy	2.58	Healthy
PRAS	0.11 Not healthy	0.08 Not healthy	0.05 Not healthy	-0.28 Not healthy	0.25 Not healthy	0.04	Not healthy
SMSM	2.69 Healthy	3.07 Healthy	3.14 Healthy	3.05 Healthy	2.72 Healthy	2.93	Healthy

Source:Data Processing (2022)

In table 3 it can be explained that the calculation resultsSpringatewith predetermined criteria, it can produce predictions of financial difficulties, namely in 2016-2020 BOLT, BRAM, INDS, LPIN and SMSM issuers are in the healthy category. Furthermore, ASII, AUTO, GDYR, IMAS and PRAS issuers are in the Unhealthy category.

4.3. Predicting Financial Difficulty using the Zmijewski Model

The following is a table of predicted financial distress scores using the Zmijewski model in the automotive sub-sector and components listed on the Indonesia Stock Exchange (BEI) in 2016-2020 which is presented in Table 4.

Table 4: Results of financial difficulty prediction analysis of the zmijewski model

Company Code on IDX	2016	2017	2018	2019	2020	Average	Prediction
ASII	-1.96 No Potential	-1.97 No Potential	-1.85 No Potential	-1.97 No Potential	-2.15 No Potential	-1.98	No Potential
AUTO	-2.87 No Potential	-2.93 No Potential	-2.84 No Potential	-2.98 No Potential	-2.83 No Potential	-2.89	No Potential
BOLT	-3.58 No Potential	-2.42 No Potential	-2.07 No Potential	-2.22 No Potential	-1.94 No Potential	-2.45	No Potential
BRAM	-2.75 No Potential	-3.04 No Potential	-3.14 No Potential	-3.35 No Potential	-3.05 No Potential	-3.06	No Potential
GDYR	-1.51 No Potential	-1.04 No Potential	-1.08 No Potential	-1.04 No Potential	-0.53 No Potential	-1.04	No Potential
IMAS	-0.04 No Potential	-0.28 No Potential	-0.03 No Potential	0.18 Potential Bankrupt	-0.04 No Potential	-0.04	No Potential
INDS	-3.46 No Potential	-3.85 No Potential	-3.86 No Potential	-3.96 No Potential	-3.89 No Potential	-3.80	No Potential
LPIN	1.38 Potential Bankrupt	-6.76 No Potential	-4.29 No Potential	-4.39 No Potential	-3.96 No Potential	-3.60	No Potential
PRAS	1.40 Potential Bankrupt	1.41 Potential Bankrupt	-1.02 No Potential	-0.71 No Potential	-0.37 No Potential	0.14	Potential Bankrupt
SMSM	-3.61	-3.90	-4.01	-4.02	-3.81	-3.87	No

	No Potential	No Potential	No Potential	No Potential	No Potential	Potential

Source:Data Processing (2022)

In table 4 it can be explained that the calculation resultsZmijewskiwith predetermined criteria, it can produce predictions of financial difficulties, namely in 2016-2020 only PRAS issuers have Bankruptcy Potential while other issuers have no potential.

4.4. Predicting Financial Difficulties using the Grover Model

The following is a table of predicted financial distress scores using the Grover model in the automotive sub-sector and components listed on the Indonesia Stock Exchange (BEI) in 2016-2020 which is presented in Table 5.

Table 5: Results of the grover model financial difficulty prediction analysis

Company Code on IDX	2016	2017	2018	2019	2020	Average	Prediction
ASII	0.48 Healthy	0.52 Healthy	0.47 Healthy	0.52 Healthy	0.50 Healthy	0.50	Healthy
AUTO	0.39 Healthy	0.47 Healthy	0.44 Healthy	0.51 Healthy	0.34 Healthy	0.43	Healthy
BOLT	1.10 Healthy	0.94 Healthy	0.67 Healthy	0.63 Healthy	0.12 Healthy	0.69	Healthy
BRAM	0.71 Healthy	0.80 Healthy	0.69 Healthy	0.68 Healthy	0.36 Healthy	0.65	Healthy
GDYR	0.03 Healthy	-0.08 Not healthy	-0.20 Not healthy	-0.33 Not healthy	-0.37 Not healthy	-0.19	Not healthy
IMAS	-0.04 Not healthy	-0.06 Not healthy	-0.15 Not healthy	-0.09 Not healthy	-0.18 Not healthy	-0.10	Not healthy
INDS	0.58 Healthy	0.85 Healthy	0.87 Healthy	0.68 Healthy	0.64 Healthy	0.72	Healthy
LPIN	-0.81 Not healthy	3.19 Healthy	1.11 Healthy	1.04 Healthy	0.80 Healthy	1.07	Healthy
PRAS	0.07 Healthy	0.04 Healthy	-0.10 Not healthy	-0.41 Not healthy	0.33 Healthy	-0.02	Not healthy
SMSM	1.74 Healthy	1.83 Healthy	1.87 Healthy	1.85 Healthy	1.67 Healthy	1.79	Healthy

Source:Data Processing (2022)

In table 5 it can be explained that the calculation resultsGroverwith predetermined criteria, it can produce predictions of financial difficulties, namely in 2016-2020 issuers such as ASII, AUTO, BOLT, BRAM, INDS, LPIN, and SMSM are in the Healthy category while issuers such as GDYR, IMAS and PRAS are in the unhealthy category.

4.5. Testing Model Accuracy Predictions

The model accuracy test is carried out to calculate correct estimates and incorrect estimates. The accuracy level is used to show what percentage of the model predicts correctly and what percentage of the model predicts incorrectly from the entire existing sample. The results will be presented in Table 6.

Table 6: Recapitulation of model accuracy predictions

Calculation	Financial Difficulty Prediction Model			
	Altman Z-Score	Springate	Zmijewski	Grover
Correct Prediction	38	22	46	38
Prediction Error	12	28	4	12
Number of	50	50	50	50

Samples				
Level of accuracy	76%	44%	92%	76%
Type II Error	24%	56%	8%	24%
Amount	100%	100%	100%	100%

Source: Data Processed 2022

Based on this table, the accuracy of the Altman Z-Score and Grover models in the automotive and component sub-sectors listed on the Indonesia Stock Exchange for 2016-2020 predicts that in 10 companies with 50 samples, there are 12 samples that predict incorrectly (Type Error II) and there are 38 samples. which predicted correctly, so it was found that the accuracy level of the Altman Z-Score model was 76% with an Error II level of 24%. The Springate model predicts that from 50 research samples in the automotive and components sub-sector in 2016-2020, there were 28 samples that predicted wrongly (Type Error II) and there were 22 samples that predicted correctly, so it was found that the accuracy level of the Springate model was 44% with an Error II level of 56%. The Zmijewski model predicts that from 50 research samples in the automotive and components sub-sector in 2016-2020, there were 4 samples that predicted wrongly (Type Error II) and there were 46 samples that predicted correctly, so it was found that the accuracy level of the Springate model was 92% with an Error II level of 8%.

4.6. Discussion

Based on the test results on the Altman Z-Score Model, the results showed that the IMAS issuer was categorized as having the potential to experience bankruptcy because in 2016-2020 the working capital of the IMAS issuer was in a negative position, which means that the company's liquidity was low due to negative working capital. Meanwhile, the PRAS issuer is categorized as bankrupt because in 2017-2019 it experienced negative working capital, which means the company's liquidity is low due to negative working capital and also the PRAS issuer experienced a decline in sales from 2016 to 2017 and in 2018 it experienced an increase but in 2019 and 2020 experiencing a decline in sales again, which can reduce the company's profitability because the company experiences a decline in sales, thus companies that are indicated to be experiencing bankruptcy must be more careful and evaluate the company's operational activities so that the company can avoid financial difficulties. Then for the Springate Model, the results obtained were that the ASII Issuer was categorized as unhealthy because in 2016-2018 its current debt behavior continued to increase and decreased in 2019 which resulted in the company having to pay the increasing current debt with the company's pre-tax profits. , and from 2018 to 2020 the company also experienced a decline in sales. GDYR, IMAS, and PRAS issuers have the potential to experience bankruptcy due to having negative working capital, which means that the company's liquidity is low due to negative working capital, thus companies that are indicated to be experiencing bankruptcy must be more careful and evaluate the company's operational activities so that the company can avoid Financial distress.

Then for the Zmijewski Model, the results showed that the PRAS Issuer had the potential to experience bankruptcy because in 2016, 2017, 2019 and 2020, the company experienced a negative net profit, even though in 2018 it experienced an increase, judging by this, the company was unable to produce a good net profit. . And PRAS issuers experienced an increase in total debt in 2019 and 2020 which added to the company's burden, thus companies that are indicated to be experiencing bankruptcy must be more careful and evaluate the company's operational activities so that the company can avoid financial difficulties. Furthermore, for the Grover Model, the results show that GDYR and IMAS issuers are predicted to be unhealthy because in 2016-2020 the working capital owned by the company is negative and this means that the company's liquidity is low, the GDYR issuer also in 2017, 2019 and 2020 has a negative gross profit which is causing negative company profits. The IMAS issuer has a negative company net profit in 2016, 2017 and 2020. And the PRAS issuer is in an unhealthy position because working capital in 2017, 2018, 2019 is in a negative position and is interpreted as having low liquidity and this company also has a negative net profit in 2016, 2017, 2019 and 2020, thus the company Those who are indicated to be experiencing bankruptcy must be more careful and evaluate the company's operational activities so that the company can avoid financial difficulties.

Then from the prediction test calculations by carrying out tests using model accuracy, of the four models the Zmijewski model is the most accurate model compared to the Altman Z-Score, Springate, and Grover models. Because the results of these calculations, the Zmijewski mode has the highest level of accuracy, namely 92% with an error rate or Type Error II of 8%, while the Altman Z-Score, Springate, and Grover models have a lower level of accuracy compared to the Zmijewski model. These results are also in line with or the same as research conducted by (Fatmawati, 2012), (Syafitri and Wijaya, 2016), and (Annisa et al., 2020), namely the Zmijewski model has the highest level of accuracy compared to other prediction models in each research.

5. Conclusion

Based on the results of this research, it can be concluded that several things from the results of model accuracy tests carried out on the Altman Z-Score model obtained an accuracy of 76% with an Error II level of 24%. Furthermore, the results of the model accuracy test carried out on the Springate model showed an accuracy of 44% with an Error II level of 56%. Then the results of the model accuracy test carried out on the Zmijewski model showed an accuracy of 92% with an Error II level of 8%. Then for the results of the model accuracy test carried out on the Grover model, the

accuracy results were 76% with an Error II level of 24% so that the Zmijewski model was the most suitable model to be used in this research, namely automotive and component sub-sector companies listed on the Stock Exchange Indonesia in 2016-2020 because it has the highest level of accuracy and the smallest level of Error II. Therefore, this research suggests using the Zmijewski financial distress prediction model which can be considered as an alternative in assessing a company's financial condition, so that companies can recognize early warning signs so that the company does not experience financial difficulties, making decisions to invest in the right place in the market. capital and how big the ideal loan will be given to the company.

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