



## Comparative Analysis Of Financial Distress Methods In The Automotive Component Industry: Altman, Grover, And Zmijewski

Shara Ariesta Syaputri<sup>1</sup> Pandu Adi Cakranegara<sup>2</sup>

Management Study Program, Faculty of Business, President University, Jl. Ki Hajar Dewantara, Cikarang Baru, Bekasi, 17550, Indonesia<sup>1,2</sup>

E-mail: [shrarstas@gmail.com](mailto:shrarstas@gmail.com)<sup>1</sup>, [pandu.cakranegara@president.ac.id](mailto:pandu.cakranegara@president.ac.id)

### ARTICLE INFO

#### Article history:

Received: 01 September 2021

Revised: 10 October 2021

Accepted: 01 November 2021

#### Keywords:

*Financial distress, Altman Z-Score, Grover, Zmijewski*

### ABSTRACT

This study aims to determine whether there are differences between the Altman Z-Score, Grover, and Zmijewski methods in predicting financial distress. Moreover, to identify the most accurate prediction method in predicting Automotive and Component companies registered in Indonesia. The population of this study is the financial statements of automotive and component companies listed on the Indonesia Stock Exchange for the period 2016 to 2020. The sampling technique is pair matching sampling with a sample of 12 companies. A ratio scale measured the dependent and independent variables. The method used is descriptive analysis and normality test, followed by the Kruskal-Wallis test using the SPSS version 25 program. The results showed significant differences between the Altman, Grover, and Zmijewski methods in predicting financial distress. And, the Grover method is the most accurate method for predicting financial distress conditions in automotive and component companies in Indonesia because it has the highest accuracy rate compared to other methods at 85%, followed by the Altman method at 83.33% and the Zmijewski method at 66.66%.

Copyright © 2021 Jurnal Mantik.  
All rights reserved.

## 1. Introduction

The industrial sector is an important sector for a developing country like Indonesia because it supports the Indonesian economy. The automotive industry is one of the many sectors growing rapidly because it shows positive performance and contributes significantly to the national economy (Kemenperin, 2018). The automotive industry is an essential pillar of various manufacturing sectors because many well-known car companies have opened car factories or expanded and increased their production numbers. Indonesia has also grown from being a place to produce cars for export to become a market for sizeable domestic car sales due to an increase in Gross Domestic Product (GDP) per capita (Investment, 2017). The automotive industry to the national economy (GDP) was 1.76 percent or equivalent to Rp. 260.9 trillion last year. Meanwhile, this sector contributed 3.98% to Indonesia's GDP.

The automotive industry plays a role in supporting the Indonesian economy because it has a chain starting from component manufacturing, vehicle production and assembly, network distribution, and sales and services to the public. The developments that occur in this industry have an impact on tax revenue and have become the fourth largest tax contributor in Indonesia. However, the growing world of the automotive industry makes business people required to be more creative, have a competitive advantage, and prepare strategies to survive and compete with competitors (Kemenperin, 2018). Competition in the business and economic world causes the financial aspect of the company to be very important with the aim of building and guaranteeing the life of the company (Andy & Johan, 2020).

The automotive industry's performance is good and developing. In 2018, the transportation equipment industry had increased and contributed up to 10.27 percent to the GDP of the non-oil and gas processing industry. When viewed from the previous performance, there was an increase in the number of exports in-vehicle components, which increased by 13 times, from 6.2 million in 2016 to 81 million pieces in 2017. This increase can also be seen in the increasing number of four-wheeled vehicle production and an increase in vehicle exports in completely build-up (CBU), which has also increased. The public's need for private vehicles also contributed to increased motorized sales in Indonesia and a drastic increase. There was an increase of around 19.4 percent in 2019 compared to 2018. With this development, it has also added to the land of employment, and the total number of workers reached five million people (kemenperin, 2018).

As time goes by, new challenges that are felt by the whole world begin to emerge in early 2020, namely the covid-19 virus. The global economic system is currently experiencing a difficult time due to the impact of the Covid-19 pandemic situation. The impact can be seen as positive for companies in the manufacturing of hygiene, health, and food products due to its increased sales turnover. But it also has a negative impact on the tourism, hospitality, aviation, transportation, especially automotive sectors. Among these sectors, the automotive and components industry can be classified as the sector most negatively affected by Covid-19.



Astra International Tbk is one of the best automotive companies on the IDX, which is affected by the covid-19 virus. Astra International is an automotive company that has many subsidiaries. Almost all business activities of the subsidiaries have decreased so that the company's profits have decreased. Astra stated that the company's net profit in the first six months of 2020 had been reduced by 44 percent. This is due to reduced motorcycle sales, which fell by minus 40 percent, and cars by 45 percent. The worst decline occurred in net profit from the Astra Group's automotive division, which fell by 79 percent. This is because the volume of motor vehicle sales decreased significantly by 80 percent and car sales fell by 92 percent in the first quarter of 2020 (Kencana, 2020). Cumulatively, the automotive market's sales volume from January to November 2020 fell by about 46% compared to November last year. Although experiencing a slow recovery, the increase has not returned to the years before being exposed to the Covid-19 pandemic. This decline was due to the impact of the pandemic, which greatly affected the company's business and financial performance (Manggalani & Nainggolan, 2020).

PT. Yamaha Indonesia Motor Manufacturing (YIMM) also stopped producing motorbike Yamaha in Indonesia or operational activities following the government's appeal to reduce the impact of the Coronavirus pandemic. Not only that, PT. Suzuki Indomobil Motor also stopped the production of cars and motorcycles to protect employees' health while supporting government policies in reducing the spread of the Corona outbreak so that they would not expand by doing social distancing. The number of factories closed while certainly caused the company's profitability to decrease (Sandi, 2020).

This is due to the decline in demand for four-wheeled or motorized vehicles in Indonesia and the problem of depletion of raw materials and other components. This problem is faced by the national automotive industry, especially from countries that implement lockdown policies, and Indonesia is one of the countries implementing this policy (Julaika, 2020). The implementation of Large-Scale Social Restrictions (LSSR) to reduce the spread of Covid-19 is also one of the causes of Indonesia's economic slowdown in the third quarter of 2020. Various government protocols to prevent Covid have significantly reduced people's purchasing power. People tend to be more selective in spending money, which causes a decrease in sales turnover from various automotive industries. Therefore, the Association of Indonesian Automotive Industries (Gaikindo) was forced to revise the sales target from 600,000 units to 525,000 units for 2020 (kumparanOTO, 2020).

April 2020, where the drastic decline from the previous month's sales is due to the Corona outbreak that hit the automotive industry and shows that around 90 percent of national car sales fell. An economic recession hit Indonesia, causing the economy to decline due to the covid-19 virus. Economic crash, people's purchasing power decreased, the automotive factory was temporarily closed, and the event was canceled due to social distancing to reducing the deployment of Covid-19. This caused the decline in car sales throughout 2020 to decline. When comparing the 2020 data with the previous year's car sales, there was a significant decrease of around 48.35 percent. A drastic decline was felt in April 2020 when the outbreak was getting worse. At that time, the automotive industry only shipped 7,868 units of new cars, whereas previously, it shipped up to 80,000 to 90,000 units per month (Gaikindo, 2021).

Based on historical data, the automotive industry is very sensitive to global changes. For example, in 2006, when there was an increase in oil prices, sales fell by 40 percent. In 2009 the Lehman Brothers crisis was due to bankruptcy. The automotive industry fell by 19-22 percent. In 2015, there was a decline in product sales of around 16 percent when the rupiah weakened, and the economy slowed. During the 2015 monetary crisis, car sales fell by 16 percent. In 2020, when the Covid-19 virus appears and is a new challenge that attacks the whole world, this industry has decreased by 40-50 percent (Manggalani & Nainggolan, 2020).

Many challenges are starting from the increase in oil prices, the weakening of the rupiah, the monetary crisis, and the covid-19 virus. This challenge must be responded to immediately by the automotive industry players and the government as stakeholders. If the company cannot make a strategy and a way out of all these obstacles, it will enter the red category, which is predicted to experience financial distress. Many companies have temporarily halted factory operations due to the drastic decline in product sales, such as Goodyear Indonesia, Yamaha Indonesia Motor, PT. Hino Motors and others (Rahadiansyah, 2020). However, some companies have survived until now during a pandemic, such as PT. Astra International. However, it is possible that the surviving companies will continue to survive until the pandemic ends. Not only a pandemic but also the existence of competition between companies can also be a cause of a company's failure. The company's inability to anticipate the possibility of a problem like this will lead the company to financial distress or even going bankrupt.

According to Ghozali (2006), financial distress is when the company's finances are in a crisis or unhealthy condition that occurred before the bankruptcy. In addition, it can also be interpreted as the inability of a company to pay off its obligations at a predetermined time and will experience liquidity problems, which may be a sign of the beginning of a company's bankruptcy. Bankruptcy can be defined as a company's failure to carry out its operations to achieve the desired goals (Rudianto, 2013). To avoid this, it is necessary to take actions that can warn that there will be financial problems that can threaten the company's condition in an undesirable direction. Therefore, a symptom analysis or financial distress prediction is needed to anticipate things that are not desirable in the future (Zakharia, 2018).

Financial distress can be divided into two types, namely economic failure and financial failure. Economic failures can occur when a company fails to cover its operating costs, while financial failure is caused due to technical insolvency and bankruptcy. Technical insolvency is when the company fails to pay its maturing obligations, but its assets exceed its



total debt (Brigham & Daves, 2003). Financial problems that occur are causes of economic distress conditions where management is unable to manage company debt. Large debt but cannot produce a maximum profit, so that the company suffers from continuous losses. If this situation cannot be predicted and is not overcome as soon as possible, it will experience financial difficulties (Salatin, 2013).

Financial distress is a crucial issue to pay attention to because it can lead to a company's bankruptcy. Several factors can cause a company to experience financial difficulties, namely competitive conditions, economic conditions, increased operating costs, excessive expansion, technology lag, weak company management, and decreased industrial trading activities (Wruck, 1990). If negative net operating income for several years, it can also sign that the company is in a difficult or not good financial condition. The risk of bankruptcy can be prevented if we know the situation early and can predict the signs that will lead to a company's failure or bankruptcy. The earlier the company predicts signs of potential default, the earlier the company can anticipate or minimize these conditions (Almilia & Kristijadi, 2003).

Predict financial distress can use the financial indicator. The indicators can be identified through cash flow analysis, corporate strategy, and financial reports (Hanafi & Halim, 2007). Financial statements are used to see the company's financial performance (Ery Yanto et al., 2021). Therefore, an analysis of financial reports is carried out, which is useful as a tool to predict the company's financial condition through the calculation of financial ratios. The company's financial condition can be a tool as a benchmark for a company to what extent can survive or be able to maintain the smooth operation to be in accordance with the initial objectives to be intended (Hanafi & Halim, 2007). Thus, it is necessary to analyze a financial report to know the condition of a company. After researching, it can be known and the company's development and what results have been achieved by the company.

In addition, profitability as a Financial Indicator can reflect the extent to which the company gained profits during operation. The company's activities in carrying out its operations in purchasing, selling, and other activities can also be a tool to predict financial distress because it describes how effectively the company uses its resources (Utami, 2015). In addition, leverage is useful for predicting the level of financial difficulty because it can illustrate how much the company can pay off all liabilities used both in the short & long term when the company dissolves (Rohmadini et al., 2018). Liquidity shows how capable the company is to fulfill its obligations, and the current ratio is the ratio used. There are still more ratios more about any method that can predict failure conditions in the company.

In this study, researchers chose three methods from several methods to predict the company's financial condition. The researcher aims to compare the prediction results to determine which approach is the most accurate in predicting the financial distress of an Automotive and Components company. Because of the availability of data recorded in IDX, the researchers focused on examining automotive companies' financial statements and components during the period 2016 to 2020. Based on the previous background explanation, the author decided to conduct further research with the title, "Comparative Analysis Of Financial Distress Methods In The Automotive Component Industry: Altman, Grover, And Zmijewski Methods"

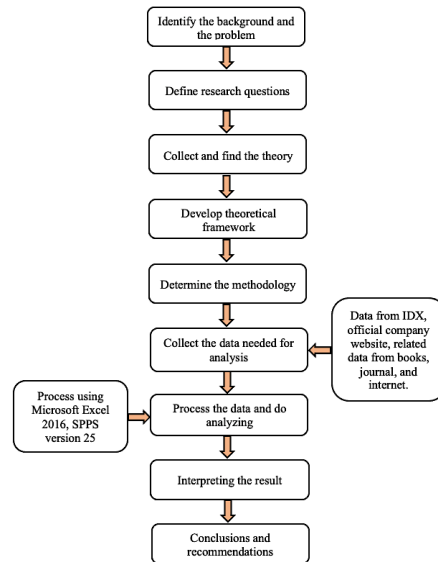
## **2. Methods**

In general, two types of research can be conducted, namely quantitative and qualitative research. The quantitative method is a method that will be used by researchers with data sources in the form of secondary data. Secondary data is data collected by previous researchers from available sources. This method collects data that provides statistical results, is inductive, scientific, and objective. This method is used to examine a particular population or sample.

Before that, several variables and indicators will be used. Variables are symbols of events, traits, or characteristics that can be measured and categorized to be studied and conclusions drawn (Pratiwi et al., 2019). Several different symbols determine the variable according to the related information. This symbol is significant in research because it helps in quantitative calculations so that conclusions can be obtained useful in analyzing and answering problems formulated previously (Ulfa et al., 2020). Therefore, this variable must be measurable and observable.

The research also uses a descriptive approach which aims to explain the results or the object of research. Descriptive means a method that provides an overview of the research object through available samples or data without making general conclusions. This approach adapts to the set variables centered on the problem or phenomenon that is currently happening with the research results in the form of a specific meaning (Ulfa et al., 2020).

Therefore, the researcher will collect and review the literature that contains information related to the problem and hypotheses to build a theory. By analyzing the literature, the researcher determines the independent variables included in the analysis and then builds a theoretical structure. The theoretical context is the basic foundation for the analysis, which defines the relationship between variables. The research framework above describes how the author took all the steps and methods of analysis. After collecting and analyzing several similar articles and previous research, the researcher can start analyzing the theoretical structure to gain further insight on the topic to be discussed.



Source: Adjusted by Researcher, 2021  
 Figure. 3. Research Framework

The research framework above explains the overall stages of the research and the process that the author did in this research. Starting with the background of the topic and identifying problems related to the chosen topic, it is continued by determining what the questions are in the research itself. After that, collect and review some related literature and previous research to develop hypotheses. The research process is continued into the theoretical framework to gain further insights from this research, such as predictions and assumptions. In this study, researchers used two analytical tools; Microsoft Excel 2016 and SPSS version 25.

To obtain information in order to meet research needs, a sampling design is used, which helps get quality research samples. Sampling design is a program to draw an appropriate sample of specific populations and applies to the researcher's process when collecting sample objects. The purpose of the sampling method is to obtain quality results, and a good sampling design is needed. Two things must be determined precisely in the sampling design, namely the size and the sampling technique used. The sample size is determined by the researcher, who is based on statistical and non-statistical aspects. Statistical aspects such as the parameters to be estimated, the type of sampling to be used, and the types of variables involved in the study. Meanwhile, for non-statistical aspects, the sample size is determined by the sampling unit's cost, time, and availability. Selection The sampling technique is based on population size, heterogeneity of researcher variables, availability of sampling frame, and inter-unit dependencies (Tantular, 2015).

There are two types of techniques in sampling design, namely probability sampling and non-probability sampling. Probability sampling is a form of random sampling in which every person in the population has the same probability or chance. Meanwhile, non-probability sampling is a technique in which sampling is not done randomly because certain limitations can sample not all individuals (Uwilan, 2013). This study will use purposive sampling, which is part of the non-probability sampling.

A population is a group of individuals, events, or anything that includes specific characteristics which are used as objects of research to be studied and then drawn conclusions (Utami, 2015). There are 13 automotive and component companies in the manufacturing sector listed on IDX in the 2016 – 2020 period.

Based on the population that has been determined, then proceed to the next step, which is to select the sample that will be used in the study. Sampling is intended to facilitate researchers in researching the population. After obtaining research results on a sample of the food population, it can be generalized to the entire population (Ulinuha, 2018). This study will use purposive sampling because not all companies can be used as samples, only a few samples that meet predetermined criteria. The criteria made consist of general criteria and special criteria. General criteria are criteria that must be met by the entire sample, including:

- a. Automotive and component companies that have gone public and are listed on the Indonesia Stock Exchange.
- b. Have a complete company annual financial report for 2016 – 2020.
- c. Publish financial reports in the rupiah currency.

Based on the general criteria mentioned above, the companies included in these criteria are as follows:

TABLE 1  
 SAMPLE PROPORTION

No	Code	Name	2016	2017	2018	2019	2020
----	------	------	------	------	------	------	------



1.	ASII	PT. Astra International Tbk	1	1	1	1	1
2.	AUTO	PT. Astra Otoparts Tbk	1	1	1	1	1
3.	BOLT	PT. Garuda Metalindo Tbk	1	1	1	1	1
4.	BRAM	PT. Indo Kordsa Tbk	1	1	1	1	1
5.	GDYR	PT. Goodyear Indonesia Tbk	1	1	1	1	1
6.	GJTL	PT. Gajah Tunggal Tbk	1	1	1	1	1
7.	INDS	PT. Indospring Tbk	1	1	1	1	1
8.	LPIN	PT. Multi Prima Sejahtera Tbk	1	1	1	1	1
9.	MASA	PT. Multistrada Arah Sarana Tbk	1	1	1	1	1
10.	PRAS	PT. Prima Alloy Steel Universal Tbk	1	1	1	1	1
11.	SMSM	PT. Selamat Sempurna Tbk	1	1	1	1	1
12.	IMAS	PT. Indomobil Sukses International Tbk	1	1	1	1	1
Total			12	12	12	12	12

60 observation data

Source: Adjusted by Researcher, 2021

In addition to the general criteria above, there are specific criteria that must be met in order to categorize the existing sample. The companies in the sample are divided into two groups, namely companies that experience financial distress and companies that do not experience financial distress. Samples will be selected using the matched pair technique. According to Dewi (2014), special criteria for the sample included in the category of companies experiencing financial distress (category 1), namely:

- a. The company has had negative net income for two consecutive years.
- b. The company has negative equity. This reflects that the company has a total debt that exceeds the total assets it owns ( $TL > TA$ ).

To meet the characteristics of matched pairs, the criteria for companies that are categorized as not experiencing financial distress (category 0) are:

- a. Not having negative net income for two consecutive years.
- b. Does not have a balance sheet value with negative equity.
- c. Coming from the same sector as the sample category 1.
- d. Has a total asset value that is relatively the same as the sample category 1.

For the 2016–2020 period, 12 automobile and component firms from the Indonesia Stock Exchange were chosen as study samples, four companies experienced financial distress and eight other companies that did not experience financial distress or safe conditions. The research sample based on the characteristics of matched pairs can be seen as follows:

TABLE 2  
SAMPLE FINANCIAL DISTRESS AND NON-FINANCIAL DISTRESS

No	Financial Distress	Non-Financial Distress
1.	GDYR	ASII
2.	MASA	AUTO
3.	PRAS	BOLT
4.	IMAS	BRAM
5.		GJTL
6.		INDS
7.		LPIN
8.		SMSM

Source: Adjusted by Researcher, 2021

Operational definition is information that helps researchers to conduct research using the variables to be measured so that they can be operated. A variable is something that can provide variations in value Thanjaya (2016) or object that is the point of research. In this study, there are two variables, namely the dependent and independent variables, whose explanations can be seen as follows:

The dependent variable is the variable that is impacted by the independent variable or its outcome. The dependent variable, performance, or parameters are all terms used to describe this variable. In this study, financial distress is the dependent variable. Financial distress (FD) reflects insurmountable liquidity problems, so that the company is unable to carry out its operational activities effectively to achieve its goal of generating profits. If the condition of financial difficulties

cannot be handled properly so that the corporation is unable to pay its obligations at the specified time, it can cause more significant problems where it is not solvable, or the amount of debt is greater than the amount of assets owned and can be a sign of going bankrupt (Fahma, 2020).

The independent variable is a factor that influences or induces the dependent variable to alter or emerge. These variables are usually called independent variables, stimuli, and predictors (Cahyani, 2019). In this research, several methods such as Altman Z-Score, Grover, and Zmijewski become independent variables. The following is an explanation and measurement used in each prediction method:

TABLE 3  
THE DEFINITION OF VARIABLES

Variable	Definition	Indicator	Scale
Financial Distress	According to (Platt & Platt, 2002), financial distress is an early stage before the occurrence of bankruptcy or liquidation.	Category 1: The company does not experience financial distress. Category 2: The Company is experiencing financial distress.	Ratio
Altman Z-Score	The Altman z score method is often used in analyzing financial reports and financial ratios. He uses a step-wise multiple discriminate analysis (MDA) to analyze high accuracy levels and become the first to use this method successfully (Kurniawati, 2018).	$Z'' = 6.56 (X1) + 3.26 (X2) + 6.72 (X3) + 1.05 (X4)$  $X_1 = WCTA$ $X_2 = RETA$ $X_3 = EBITTA$ $X_4 = BVEBVD$ $X_5 = SETA$	Ratio
Grover	The Grover method is a model that is redesigned and re-evaluated based on the Altman Z-Score method (Prihanthini & Sari, 2013).	$G = 1.650 (X1) + 3.404 (X3) - 0.016 (ROA) + 0.057$  $X_1 = WCTA$ $X_2 = EBITTA$ $ROA = NITM$	Ratio
Zmijewski	This ratio is determined based on experience because it criticizes the sampling method used by previous research. The Zmijewski method develops the X-Score model and uses three financial ratios to measure its financial performance, leverage, & liquidity. (Aminian et al., 2016)	$X = (-4.3) - 4.5 (X1) + 5.7 (X2) + 0.004 (X3)$  $X_1 = Profitability (ROA)$ $X_2 = Leverage (Debt Ratio)$ $X_3 = Liquidity (Current Ratio)$	Ratio

Source: Adjusted by Researcher, 2021

### 3. Result And Discussion

**PT Astra International Tbk (ASII)** is an Indonesian multinational automaker based in Jakarta. PT Astra International Incorporated was established in 1957 as the company's name. ASII became the company's official name in 1990. Since April 4, 1990, this company has been listed on the Indonesia Stock Exchange. In June 2018, Jardine Cycle & Carriage Ltd. owned a majority share of Astra by 50.11 percent. The company's activities are general trading, industry, mining services, transportation, agriculture, development, and consulting services. Astra International's business segments are divided into 7 (seven) businesses: automotive, financial services, agro-industry, infrastructure & logistics, IT, heavy equipment, and property. In the automotive industry, Astra International involves the industry of four-wheeled vehicles, two-wheeled vehicles, automotive supporting components, and various other commodities/services related to automotive. Toyota-Astra Motor, Astra Otoparts, Isuzu Astra Motor Indonesia, Astra Daihatsu Motor, Astra World, and Astra Honda Motor are various branches of the automotive business line.

**PT Astra Otoparts Tbk (AUTO)** is Indonesia's largest and most well-known automotive component manufacturer, producing and distributing a wide range of two- and four-wheeled vehicle components. AUTO was established on September 20, 1991, and began conducting business in 1991. AUTO became a public company in 1998 when it listed its shares on the Jakarta Stock Exchange. Astra Otoparts Tbk's activities are mainly engaged in trading automotive spare parts, both local and export, and manufacturing in the metal, plastic, and automotive spare parts industries. AUTO manufactures and supplies two and four-wheel parts from various segments. The company's largest market segment is the automotive manufacturer market (OEM / Original Manufacturer Equipment) and the substitution market. Its leading products are batteries for two-wheeled & four-wheeled vehicles (GS, Incoe, and Aspira brands), tires for two-wheeled vehicles & trucks (Aspira and Aspira Premio), spare parts for two-wheeled & four-wheeled vehicles (Aspira, Federal, KYB, and TDW) and lubricants for four-wheeled & industrial vehicles (Shell Helix Astra and HEO (Heavy Equipment Oil)).

**PT Garuda Metalindo Tbk (BOLT)** was established on March 15, 1982, and started its commercial operations in the same year. PT Garuda Multi Investama (57.60 percent) and Herman Wijaya (12.80 percent) are the two shareholders that possess more than 5% of Garuda Metalindo Tbk's shares. Based on the Company's Articles of Association, BOLT's scope of activities is to engage in the manufacture of tools and components for all types of motor vehicles. BOLT's primary business activity is to manufacture and trade tools, components, and sub-components (including nuts and bolts) for all types of motor vehicles. PT Astra Honda Motor was BOLT's most important customer in 2016, with a share of 59.97%. BOLT received an official statement from the Financial Services Authority (OJK) on June 26, 2015, to undertake an Initial Public



Offering (IPO) of BOLT Shares to the public of up to 468,750,000 shares with a par value of Rp100,- per share at an offering price of Rp550,- per share. On July 7, 2015, these shares were launched on the IDX.

**PT Indo Kordsa Tbk (BRAM)**, formerly known as PT Branta Mulia, was founded in Indonesia in 1981 as the main supplier of premium tire reinforcing materials in Southeast Asia. In 1985, the company opened its first cable tire factories in Citeureup, Bogor, and West Java. This was followed by opening the distribution of cars, motorcycles, and spare parts. Finally, the company began commercial operations on April 1, 1987. The Jakarta Stock Exchange and the Surabaya Stock Exchange both listed the company's shares in 1990. Kordsa Global AS, part of Turkey's Sabanci Holding Group, purchased 51.3 percent of the company's shares in 2006. In 2007, Kordsa Global changed its name to PT Indo Kordsa Tbk and raised its share ownership to 60.21 percent. Meanwhile, PT Branta Mulia Teijin Indonesia was renamed PT Indo Kordsa Teijin in 2009.

**PT Goodyear Indonesia Tbk (GDYR)**. Based on the Deed of Establishment No.199 dated January 22, 1917, Goodyear Indonesia was initially established on January 26, 1917, under NVGoodyear Tire & Rubber Company Limited. Then changed its name to PT Goodyear Indonesia based on Deed No.73 dated October 31, 1977, made before Eliza Pondaag, Jakarta's Public Notary, approved by the Minister of the Republic of Indonesia with Decree No. YA5 / 250 / 7 dated July 25, 1978. The company's name was changed to PT Goodyear Indonesia, Tbk, after a limited public offering on November 10, 1980. GDYR is the registered name of the publisher. In 1980, GDYR obtained an effective statement from BAPEPAM-LK to conduct an Initial Public Offering of Goodyear Indonesia Tbk shares to the public. These shares were listed on IDX on December 22, 1980. GDYR is engaged in the manufacture of tires for motor vehicles, aircraft, and other related components and the distribution and export of tires. The Market Line is divided into two segments: Customers for personal and passenger car tires, Industrial and OTR for heavy vehicle tires, fleets for transportation and forestry, mining, and agriculture.

**PT Gajah Tunggal Tbk (GJTL)**, established on August 24, 1951, as a bicycle tire manufacturer, expanded its manufacturing capabilities, initially diversified into a motorcycle tire and tubing manufacturer, and gradually became a manufacturer of commercial vehicle and passenger vehicle tires. He started his commercial business activities in 1953. In addition, in 1971, the company expanded its production by allowing model variants with motorcycle tires. 1981, continued with bias tires for passenger and commercial vehicles. GJTL owns and controls the most extensive integrated tire manufacturing plant in Indonesia. The primary focus of GJTL's operations covers the development, manufacture, and sale of rubber products, including tires for all kinds of vehicles, flaps and rim tapes, and manufacturers of tire cords and synthetic rubber. GJTL manufactures and markets high-quality passenger, off-road, motorcycle, SUV, industrial, and commercial tires. Other rubber-related products such as synthetic rubber, o-rings, flaps, tire cords, inner tubes, and others are also produced and sold by the company. Several branded tire production, including own brand (Zeneos and GT Radial) and license (IRC Tire brand, Innoue Rubber Company (IRC) Japan is the holder of the IRC brand). On May 8, 1990, GJTL shares were first listed on IDX.

**PT Indospring Tbk (INDS)**. May 5, 1978, was the time when Indospring Tbk was founded. In 1979, he started his commercial business activities. The scope of activities is engaged in the automotive spare parts industry, especially springs, leaf springs, coil springs (spiral springs), and two derivative products, namely hot coil springs and cold coil springs, valve springs, and wire rings. On August 10, 1990, INDS Shares were first listed on IDX.

**PT Multi Prima Sejahtera Tbk (LPIN)**, formerly known as PT Lippo Champion Glory, was established on January 7, 1982. Not long after, he started his commercial business activities in 1987. On October 17, 1994, LPIN's shares were first listed on IDX. The scope of LPIN's activities, among others: manufacture of spark plugs and motor vehicle spare parts; trade in self-produced goods and/or related companies; and participation in other companies and/or legal entities. The main revenue comes from the manufacture of spark plugs (under the Champion brand).

**PT Multistrada Arah Sarana Tbk (MASA)** was established as an Indonesian tire manufacturer on June 20, 1988. PT Multistrada Arah Sarana Tbk was known as PT Oroban Perkasa for the first time. The scope of activities of Multistrada Arah Sarana Tbk is to run a business in the manufacture of tires for all types of motor vehicles, and the exploitation and management of Industrial Plantation Forests (HTI). The main activity of MASA Tbk is the manufacture of tires for two-wheeled motor vehicles (Corsa brand) and four-wheeled vehicles (Achilles brand). In addition, Multistrada also produces and markets Solid Tire (ST) and Truck and Bus Radial (TBR) tires. MASA has received support from Pirelli (Italy) and Continental (Germany) in improving its production technology. The company was given to the Indonesian Bank Restructuring Agency (IBRA) to save the company during the 1997 Asian financial crisis. The company was taken over under the guidance of PT Indokemika Jayatama in 2004. On 9 June 2005, MASA shares were first listed on IDX. Companies can also increase their capital through equity and syndicated loans, as well as increase productivity and quality.

**PT Prima Alloy Steel Universal Tbk (PRAS)** manufactures and markets aluminum and alloy steel rims, stabilizers, and other related products. The company has sold its products in Asia, the United States, Europe, Africa, and Australia. On July 12, 1990, the company's shares were first listed on IDX. The company was founded on February 20, 1984, with its head office and factory located in Sidoarjo, East Java, Indonesia. He started his commercial activities in 1986. The company's main activities are Iron and Steel Plant, Ferroalloy Plant, Alumina and Aluminum Production and Processing. Prima Alloy Steel is currently engaged in four-wheeled motor vehicle wheels (trademarks of Panther, PCW, Devino, Akuza, Incubus, Ballistic, and others), which are made of aluminum alloy that is widely known as racing wheels or aluminum alloy wheels.

**PT. Selamat Sempurna Tbk (SMSM)** was founded on January 19, 1976, and began doing business in 1980. Selamat Sempurna Tbk's headquarters are at Wisma ADR, Pluit Raya, North Jakarta, and its factories are in Jakarta and Tangerang. On September 9, 1996, the company's shares were first listed on IDX. The scope of SMSM's activities is to manufacture of equipment (spare parts) from various kinds of factory machine tools and vehicles and other similar items. Sakura for S/F and Filtration goods, and ADR for radiator, dump hoist, coolant, and brake components products are some of Selamat Sempurna Tbk's product names.

**PT. Indomobil Sukses Internasional Tbk (IMAS)**, previously known as Indomulti Inti Industri Tbk, was established on March 20, 1987. IMAS was established under the name PT Cindramata Karya Persada. In 1990, the company started its commercial business activities. On September 15, 1993, the company's shares were first listed on IDX. The scope of activities of IMAS is to invest in shares in companies or other activities related to the automotive industry. The main business activities of IMAS and its subsidiaries include brand license holders, vehicle sales distributors, after-sales services, motor vehicle financing services, distributors of spare parts under the "IndoParts" brand, motor vehicle assembly, automotive component manufacturers, vehicle rental services, and others. The products sold by IMAS and its subsidiaries include two-wheeled motor vehicles, four-wheeled motor vehicles, buses, trucks, and heavy equipment under the following brands: Audi, Datsun, Foton, Hino, Infiniti, Manitou, Nissan, Renault, Renault Trucks, Saonon, Suzuki, Volkswagen, Volvo, and others.

The calculation results of the Altman Z-Score, Grover, and Zmijewski methods in 2016 – 2020 are as follows:




TABLE 4  
CALCULATION RESULTS OF THE THREE PREDICTION METHODS

No	CODE	Year	Altman Z-Score	Grover	Zmijewski
1	ASII	2016	3.570	0.480	-1.955
2		2017	3.594	0.518	-1.962
3		2018	3.241	0.472	-1.836
4		2019	3.677	0.522	-1.960
5		2020	4.206	0.502	-2.135
6	AUTO	2016	5.223	0.393	-2.853
7		2017	5.681	0.465	-2.914
8		2018	5.049	0.443	-2.827
9		2019	5.313	0.511	-2.970
10		2020	5.316	0.342	-2.813
11	BOLT	2016	7.814	1.100	-3.545
12		2017	4.876	0.944	-2.396
13		2018	3.723	0.671	-2.058
14		2019	4.000	0.627	-2.202
15		2020	2.804	0.125	-1.928
16	BRAM	2016	4.438	0.709	-2.739
17		2017	5.436	0.804	-3.017
18		2018	5.559	0.690	-3.123
19		2019	6.550	0.681	-3.324
20		2020	5.817	0.361	-3.027
21	GDYR	2016	2.280	0.744	-1.156
22		2017	1.243	-0.164	-1.021
23		2018	1.027	-0.200	-1.076
24		2019	0.642	-0.332	-1.044
25		2020	0.302	-0.366	-0.867
26	GJTL	2016	2.613	0.487	-0.527
27		2017	2.266	0.328	-0.387
28		2018	2.053	0.283	-0.276
29		2019	2.369	0.374	-0.543
30		2020	2.770	0.415	-0.872
31	INDS	2016	7.835	0.578	-3.436



32		2017	11.219	0.850	-3.811
33		2018	11.617	0.869	-3.818
34		2019	13.183	0.675	-3.911
35		2020	13.099	0.637	-3.839
36	LPIN	2016	-2.441	-0.814	1.390
37		2017	15.915	3.187	-6.722
38		2018	15.563	1.109	-4.227
39		2019	20.081	1.044	-4.283
40		2020	16.548	0.801	-3.884
41	MASA	2016	1.618	0.032	-1.706
42		2017	1.185	-0.003	-1.453
43		2018	-0.613	-0.297	-0.414
44		2019	0.900	0.195	-0.950
45		2020	1.887	0.442	-1.824
46	PRAS	2016	17.624	8.527	-0.984
47		2017	18.366	8.901	-1.048
48		2018	33.680	16.861	-1.015
49		2019	-0.960	-0.412	-0.697
50		2020	4.407	1.767	-0.353
51	SMSM	2016	8.856	1.739	-3.585
52		2017	10.009	1.834	-3.873
53		2018	10.601	1.875	-3.977
54		2019	11.133	1.845	-3.987
55		2020	10.824	1.672	-3.768
56	IMAS	2016	0.268	-0.035	-0.033
57		2017	-0.073	-0.100	-0.248
58		2018	-0.382	-0.150	-0.026
59		2019	-0.252	-0.092	0.188
60		2020	-0.431	-0.176	-0.031

Source: Researcher Processed Data, 2021

Information:  = Safe  = Grey Zone  = Financial Distress

**Altman Z-Score.** The first step in this research is to calculate the value of each automotive and component company in Indonesia using the modified Altman Z-Score method (1995). This method uses four financial ratio variables. Clarification of these results into the cut off that has been determined, namely: the value of  $Z'' > 2.60$  then it is in a safe zone condition, the value of  $1.10 < Z'' < 2.60$  then it is in the gray zone condition, and the value of  $Z'' < 1.10$  then it is in the distress zone condition, with the formula:

$$Z'' = 6.56 (X1) + 3.26 (X2) + 6.72 (X3) + 1.05 (X4) \quad (9)$$

The value of each potential bankruptcy financial ratio in Indonesia's automotive and components sector may be shown in table 4 using the Altman Z-Score method. Six companies are predicted to be in a healthy financial condition or not experiencing financial distress, namely PT. Astra International Tbk (ASII), PT. Astra Otoparts Tbk (AUTO), PT. Garuda Metalindo Tbk (BOLT), PT. Indo Kordsa Tbk (BRAM), PT. Indospring Tbk (INDS), PT. Selamat Sempurna Tbk (SMSM).

One company from 2016 – 2019 is predicted to be in the gray zone and, in 2020, is predicted to be in a healthy financial condition, namely PT. Gajah Tunggal Tbk (GJTL). Companies that are in a situation of financial problems categorized in the gray zone means a condition where they can still be saved. The management must immediately take good action and improve financial performance not to be threatened with bankruptcy in the future. In 2020, GJTL was predicted to be in a healthy financial condition where the company can continue to improve its financial performance. Meanwhile, PT. Multistrada Arah Sarana Tbk (MASA) in 2016-2017 was in a gray zone condition. In 2016, the Altman Z-Score calculation yielded 1.618 and decreased to 1.185 in 2017. The company's financial situation continued to decline to -0.613 in 2018. The company continued to improve its performance so that in 2019 it increased to 0.900, although it is still



predicted to be in financial distress condition. In 2020, MASA is predicted to continue to develop by obtaining Altman's calculation results of 1.887, which are in a healthy financial condition.

Furthermore, PT. Goodyear Indonesia Tbk (GDYR) in 2016-2017 is in a gray zone condition, and in 2018-2020, it is predicted to be in an unhealthy financial condition or experiencing financial distress. GDYR's financial condition from 2016-2020 decreased from 2,280 to 0.302. Another thing happened to PT. Indo Mobil Sukses Internasional Tbk (IMAS) is predicted to be in an unhealthy financial condition or financial distress in a row in 2016-2020. The calculation results in 2016 were 0.268; in 2017, it was -0.073; in 2018, it was -0.382; in 2019, it was -0.252; and in 2020, it was -0.431.

**Grover.** The second step in this research is to calculate the value of each company using the Grover method. This method uses three financial ratio variables. Clarification of these results into the cut off that has been determined, namely: the value of  $G \geq 0.01$  then it is in a safe zone condition, while the value of  $G \leq -0.02$  then it is in a distress zone condition, with the formula:

$$G = 1.650 (X1) + 3.404 (X3) - 0.016 (ROA) + 0.057 \quad (10)$$

The value of each potential bankruptcy financial ratio in Indonesia's automobile and components sector may be shown in table 4 using the Grover method. Six companies are predicted to be in a healthy financial condition or not experiencing financial distress, namely PT. Astra International Tbk (ASII), PT. Astra Otoparts Tbk (AUTO), PT. Garuda Metalindo Tbk (BOLT), PT. Indo Kordsa Tbk (BRAM), PT. Gajah Tunggal Tbk (GJTL), PT. Indospring Tbk (INDS), PT. Selamat Sempurna Tbk (SMSM).

Some companies are predicted to be healthy, but the following year will experience financial distress, such as PT. Goodyear Indonesia Tbk (GDYR), PT. Multistrada Arah Sarana Tbk (MASA), and PT. Prima Alloy Steel Universal Tbk (PRAS). In 2016, GDYR was predicted to be in a healthy financial condition with the calculation using the Grover method of 0.744. Over time, 2017 has decreased so that the calculation results are -0.164; 2018 is -0.200; 2019 is -0.332; and 2020 is -0.366. In 2016, MASA was also predicted to be in a healthy financial condition with a calculation result of 0.032. However, in 2017 and 2018, there was a decline, so that it was predicted to be in an unhealthy financial condition or experience financial distress wherein 2017 it was -0.003, and in 2018 it was -0.297. In 2019, MASA managed to improve financial conditions so that it is predicted to be in a healthy financial position where the calculation result is 0.195. In 2020, MASA experienced an improvement in its financial condition with a calculation result of 0.442. Meanwhile, PRAS is predicted to be in a healthy condition in 2016 – 2018, but there is a significant decline, so that in 2019 it is predicted to be in financial distress with a calculation result of -0.412. In 2020, PRAS managed to improve its performance so that it is expected to be in a healthy condition with a calculation result of 1.767.

It is different for LPIN, which in 2016 is predicted to be in an unhealthy financial condition of -0.814; it is predicted to succeed in improving the company's performance, so that in 2017 to 2020, it is expected to be in a healthy financial condition with a calculation result of 0.801. Meanwhile, PT. Indo Mobil Sukses Internasional Tbk (IMAS) is predicted to experience financial distress in a row from 2016 to 2020 with a calculation result of -0.035; -0.100; -0.150; -0.092; and -0.176.

**Zmijewski.** The third step in this research is to calculate the value of each company using the Zmijewski method. This method uses three financial ratio variables. Clarification of these results into the cut off that has been determined, namely: the value of  $X < 0$  then it is in a safe zone condition, while the value of  $X > 0$  then it is in a distress zone condition, with the formula:

$$X = (-4.3) - 4.5 (X1) + 5.7 (X2) + 0.004 (X3) \quad (11)$$

The value of each potential bankruptcy financial ratio in Indonesia's automobile and components sector may be shown in table 4 using the Zmijewski method. Ten companies are predicted to be in a healthy financial condition or not experiencing financial distress, namely PT. Astra International Tbk (ASII), PT. Astra Otoparts Tbk (AUTO), PT. Garuda Metalindo Tbk (BOLT), PT. Indo Kordsa Tbk (BRAM), PT. Goodyear Indonesia Tbk (GDYR), PT. Gajah Tunggal Tbk (GJTL), PT. Indospring Tbk (INDS), PT. Multistrada Arah Sarana Tbk (MASA), PT. Prima Alloy Steel Universal Tbk (PRAS), and PT. Selamat Sempurna Tbk (SMSM).

Another thing happened to LPIN and IMAS. In 2016, PT. Multi Prima Sejahtera Tbk (LPIN) is predicted to experience financial distress. However, from 2017 to 2020, the following year is expected to be in a healthy financial condition where it can be said that this financial problem is handled quickly by the company's management so that for the next year in a row it is predicted to be in good finance. Meanwhile, PT. Indo Mobil Sukses Internasional Tbk (IMAS) is predicted to be in good financial condition from 2016 to 2018, but in 2019, it is predicted to be in financial distress condition. In 2020, it is predicted to succeed in overcoming these financial problems so that it is predicted to return to a healthy position.

**Descriptive Analysis.** To assist researchers in providing brief information that summarizes certain data sets in this study, the results of descriptive analysis interpretation are used to calculate the mean, maximum, minimum, and standard variables of the three financial distress prediction methods examined in this study. There are 60 observation units from 12 Indonesian Automotive and Component industry companies from 2016 to 2020.

#### Altman Z-Score



TABLE 5  
DESCRIPTIVE STATISTICS ALTMAN Z-SCORE METHOD

	N	Minimum	Maximum	Mean	Std. Deviation
WCTA (X1)	60	-0.218	0.562	0.14026	0.199925
RETA (X2)	60	-0.180	0.638	0.25177	0.210173
EBITTA (X3)	60	-0.180	4.989	0.23653	0.778510
BVEBVD (X4)	60	0.121	14.030	2.61738	3.060672
Altman Z-Score <sup>2</sup>	60	-2.441	33.680	6.07861	6.508426
Valid N (listwise)	60				

Source: Researcher Processed Data, 2021

Variable WCTA (X1) is used to measure the company's ability to fulfill short-term debt related to the working capital of the company's total assets. Based on table 5, the minimum value is -0.218, the maximum value is 0.562, the average value is 0.14026, and the standard deviation value is 0.199925. Several values are negative in the WCTA calculation because current liabilities are greater than current assets, so WCTA is negative, affecting total assets. This shows that the company is in a poor financial condition to meet its short-term obligations because it does not have sufficient current assets to meet debts. The findings of the WCTA computation are shown in table 5. The minimum value obtained is -0.218. This minimum value is addressed to PT. Prima Alloy Steel Universal Tbk (PRAS). On the other hand, there is also a positive value which means that current assets are greater than current liabilities. This means that the company's finances are in good condition so that it can meet its short-term obligations and operational activities. The maximum value obtained of 0.562 is addressed to PT. Selamat Sempurna Tbk (SMSM). The greater the value of WCTA, the total assets can guarantee net working capital, so the company will most likely not experience financial distress.

The RETA (X2) variable shows the company's ability to produce retained earnings from the company's total assets. Based on table 5, the minimum value is -0.180, the maximum value is 0.638, the average value is 0.25177, and the standard deviation value is 0.210173. This minimum value is addressed to PT. Multistrada Arah Sarana Tbk (MASA). This means that the company's ability to generate retained earnings from its assets is -0.180. The smaller the RETA generated in a company, it implies that the company is in an unhealthy financial condition, and the possibility of the company going bankrupt is higher. The company does not have an excellent ability to generate retained earnings from its assets. The maximum value in the calculation is addressed to PT. Multi Prima Sejahtera Tbk (LPIN). Conversely, the greater the value of this ratio or positive, it can be said that the operations in the company are running effectively because it shows the increasing role of retained earnings in forming company funds.

The EBITTA variable (X3) serves to show the company's ability to earn profits before paying interest and taxes or knowing the company's productivity in managing its assets. Based on table 5, the minimum value is -0.180, the maximum value is 4.989, the average value is 0.23653, and the standard deviation is 0.778510. The lower the productivity, the more ineffective and inefficient the company is in managing its assets. With low operating income, the company cannot cover other expenses other than that burden and vice versa. This can increase the risk that the company may experience financial difficulties. This minimum value is addressed to PT. Multi Prima Sejahtera Tbk (LPIN). This identifies that LPIN has operating losses where operating costs are greater than gross profit. On the other hand, the maximum value to PT. Prima Alloy Steel Universal Tbk (PRAS). The higher the ratio indicates the company's operations are running effectively, and PRAS has an operating profit where the gross profit is more significant than its operating costs.

The BVEBVD (X4) variable is used to measure its ability to pay its obligations from the market value of capital (shares). Based on table 5, the minimum value is 0.121, the maximum value is 14.030, the average value is 2.61738, and the standard deviation value is 6.508426. The lower the ratio value, the greater the amount of debt accumulated against the company's capital. The amount of debt accumulated to capital is greater than the book value of its equity, indicating that the company will be experiencing problems in fulfilling its debt obligations where the book value of the company's equity is smaller than the amount of its debt and is at risk of the company's bankruptcy condition. The minimum value is addressed to PT. Multi Prima Sejahtera Tbk (LPIN). This shows that the LPIN's ability to fulfill its obligations is smaller than the market value of its capital. Meanwhile, it takes a positive or high ratio value where the book value of equity is greater than the book value of debt. The maximum value is addressed to PT. Multi Prima Sejahtera Tbk (LPIN). In 2016, LPIN got the lowest BVEBVD value of 0.121 and increased drastically, so get a maximum value of 14.030 in 2019. It can be said that the company's performance is always improved and done very well every year so that the company initially only showed a small ability to fulfill its obligations, but 2019 showed that LPIN got the highest results in terms of being able to meet obligations from the capital market value. The higher the ratio value, the lower the amount of debt accumulated against the company's capital so that the company's assets can be used to meet these obligations, and the risk of default and the condition of financial difficulties in the company is getting smaller.

From the results of these calculations, the Altman method obtains a minimum value of -2.441, a maximum value of 33,680, an average value of 6.07861, and a standard deviation of 6.508426. The minimum value is addressed to PT. Multi Prima Sejahtera Tbk (LPIN) in 2016. This is due to obtaining a WCTA of -0.157, RETA of -0.100, EBITTA of -0.180, and

BVEBVD of 0.121. In 2016, LPIN was detected to have the lowest EBITTA and BVEBVD values, where EBIT is negative, which affects the EBITTA ratio and has a debt amount more significant than the book value of equity. Therefore, in that year, LPIN is predicted to be in financial distress. Meanwhile, the maximum value is addressed to PT. Prima Alloy Steel Universal Tbk (PRAS) in 2018. This is due to obtaining a WCTA of -0.108, RETA of 0.031, EBITTA of 4.989, and BVEBVD of 0.726. PRAS is categorized as having the lowest score on WCTA and the highest score on EBITTA. A low WCTA means that PRAS is identified as having the lowest liquidity where the company's current debt is greater than its current assets, causing low working capital. A high EBITTA means that PRAS is identified as having the highest level of productivity in generating profits.

**Grover**

TABLE 6  
DESCRIPTIVE STATISTICS GROVER METHOD

	N	Minimum	Maximum	Mean	Std. Deviation
WCTA (X1)	60	-0.218	0.562	0.14750	0.200217
EBITTA (X2)	60	-0.180	4.989	0.23653	0.778510
NITA (X3)	60	-0.134	0.716	0.04751	0.111573
Grover	60	-0.814	16.861	1.10477	2.630350
Valid N (listwise)	60				

Source: Researcher Processed Data, 2021

Variable WCTA (X1) serves to determine the company's ability to meet short-term debt related to the working capital of the company's total assets. Based on table 6, the minimum value is -0.218, the maximum value is 0.562, the average value is 0.14750, and the standard deviation value is 0.200217. Several values are negative in the WCTA calculation because current liabilities are bigger than current assets, so WCTA is negative, affecting total assets. This shows that the company is in a poor financial condition to meet its short-term obligations because it does not have sufficient current assets to meet debts. The results of the WCTA calculation are shown in table 6, and the minimum value obtained is -0.218. This minimum value is addressed to PT. Prima Alloy Steel Universal Tbk (PRAS). On the other hand, there is also a positive value which means that current assets are greater than current liabilities. This means that the company's finances are in good condition to meet its short-term obligations and operational activities. The maximum value obtained of 0.562 is addressed to PT. Selamat Sempurna Tbk (SMSM). The greater the value of WCTA, the total assets are able to guarantee net working capital, so the company will most likely not experience financial distress.

The EBITTA variable (X2) is used to demonstrate the company's ability to earn profits before paying interest and taxes and determine the company's productivity in managing its assets. Based on table 6, the minimum value is -0.180, the maximum value is 4.989, the average value is 0.23653, and the standard deviation value is 0.778510. The lower the productivity level, the more ineffective and inefficient the company is in managing all of its assets because with a low operating income, the company cannot cover other expenses other than its business expenses and vice versa. This can increase the risk that the company may experience financial distress. This minimum value is addressed to PT. Multi Prima Sejahtera Tbk (LPIN). This identifies that LPIN has an operating loss where operating costs are greater than gross profit. On the other hand, the maximum value is addressed to PT. Prima Alloy Steel Universal Tbk (PRAS). The higher the ratio indicates the company's operations are running effectively, and PRAS has an operating profit where the gross profit is more significant than its operating costs.

The variable NITA (X3) is used to assess the effectiveness or efficiency of the company in managing its assets to generate profits at a certain time. Based on table 6, the minimum value is -0.134, the maximum value is 0.716, the average value is 0.04751, and the standard deviation value is 0.111573. The minimum value is addressed to PT. Multi Prima Sejahtera Tbk (LPIN) in 2016. The smaller the ratio, the less effective the company's performance in generating profits by utilizing its assets, causing its cash flow to be negative and potentially experiencing financial distress. This can be caused by an imbalance between profits or income earned with expenses or operating expenses incurred. However, the maximum value is also addressed to PT. Multi Prima Sejahtera Tbk (LPIN) in 2017. This shows that the management immediately improves the company's performance and effectiveness so that LPIN from a predicted condition to experience financial distress becomes healthy in the following year. It can be said that the performance of LPIN in generating profits increases, or the company will get more significant profits.

From the results of these calculations, the Grover method obtained a minimum value of -0.814, a maximum value of 16.861, an average value of 1.10477, and a standard deviation of 2.630350. The minimum value is addressed to PT. Multi Prima Sejahtera Tbk (LPIN) in 2016. This is due to obtaining a WCTA of -0.157, RETA of -0.100, EBITTA of -0.180, and BVEBVD of 0.121. In 2016, LPIN was detected to have the lowest EBITTA and BVEBVD values, where EBIT is negative, affecting the EBITTA ratio and has a debt amount greater than the book value of equity. Therefore, in that year, LPIN is predicted to be in an unhealthy financial condition. Meanwhile, the maximum value is addressed to PT. Prima Alloy Steel Universal Tbk (PRAS) in 2018. This is due to obtaining a WCTA of -0.108, RETA of 0.031, EBITTA of 4.989, and BVEBVD of 0.726. PRAS is categorized as having the lowest score on WCTA and the highest score on EBITTA. A low WCTA means that PRAS is identified as having the lowest liquidity where the company's current debt is more significant



than its current assets, causing low working capital. A high EBITTA means that PRAS is identified as having the highest level of productivity in generating profits.

### Zmijewski

TABLE 7  
DESCRIPTIVE STATISTICS ZMIJEWSKI METHOD

	N	Minimum	Maximum	Mean	Std. Deviation
WCTA (X1)	60	-0.218	0.562	0.14750	0.200217
EBITTA (X2)	60	-0.180	4.989	0.23653	0.778510
NITA (X3)	60	-0.134	0.716	0.04751	0.111573
Grover	60	-0.814	16.861	1.10477	2.630350
Valid N (listwise)	60				

Source: Researcher Processed Data, 2021

The ROA (X1) variable is used to assess the effectiveness or efficiency of the company in managing its assets to generate profits at a certain time. Based on table 7, the minimum value is -0.134, the maximum value is 0.716, the average value is 0.04793, and the standard deviation value is 0.111665. The minimum value is addressed to PT. Multi Prima Sejahtera Tbk (LPIN) in 2016. The smaller the ratio, the less effective the company's performance in generating profits by utilizing its assets, causing the company's cash flow to be negative and potentially experiencing financial distress. This can be caused by an imbalance between profits or income earned with expenses or operating expenses incurred. However, the maximum value is also addressed to PT. Multi Prima Sejahtera Tbk (LPIN) in 2017. This shows that the management immediately improves the company's performance and effectiveness so that LPIN from a predicted condition to experience financial distress becomes healthy in the following year. It can be said that the performance of LPIN in generating profits increases, or the company will get more significant profits.

Variable Debt Ratio (X2) is a metric for determining how much company assets or needs are funded by debt/creditors. Based on table 7, the minimum value is 0.067, the maximum value is 0.892, the average value is 0.42299, and the standard deviation value is 0.217513. In calculating this ratio, a positive ratio means that the company's liabilities are larger than the company's assets, and the risk of default will be greater. Both the minimum and maximum values are positive. The minimum value is addressed to PT. Multi Prima Sejahtera Tbk (LPIN) in 2019. The maximum value is also addressed to PT. Multi Prima Sejahtera Tbk (LPIN) in 2016. This means that LPIN has greater liabilities than the assets owned by the company. The higher the leverage ratio indicates that the debt owned is higher and causes the company's risk to experience greater financial difficulties and can lead to financial distress conditions.

Variable Current Ratio (X3) is used to see how far the company's current assets are able to pay off its short-term obligations. Based on table 7, the minimum value is 0.602, the maximum value is 13.042, the average value is 2.48315, and the standard deviation value is 2.338542. In calculating this ratio, a positive ratio means that the company's current assets are greater than the short-term liabilities that must be met. The minimum value is addressed to PT. Prima Alloy Steel Universal Tbk (PRAS) in 2019. The maximum value is addressed to PT. Multi Prima Sejahtera Tbk (LPIN) in 2019. This means that PRAS and LPIN are able to finance their short-term obligations because they have larger current assets. The greater the ratio, the more capable the firm is of meeting its short-term obligations.

From the results of these calculations, the Zmijewski method obtained a minimum value of -6.722, a maximum value of 1.390, an average value of -2.09466, and a standard deviation of 1.532242. The minimum value is addressed to PT. Multi Prima Sejahtera Tbk (LPIN) in 2017. This is due to obtaining a ROA of 0.716, a Debt Ratio of 0.137, and a Current Ratio of 5.207. In 2017, LPIN was detected as having the highest ROA value. This means that the company's performance in generating profits is getting better. Therefore, in that year, LPIN is predicted to be in a healthy financial condition. Meanwhile, the maximum value is addressed to PT. Multi Prima Sejahtera Tbk (LPIN) in 2016. This is due to obtaining a ROA of -0.134, a Debt Ratio of 0.892, and a Current Ratio of 0.714. In 2016, LPIN was categorized as having the lowest score on ROA and the highest score on Debt Ratio. A low ROA means that the LPIN company's performance in generating profits is getting worse. Meanwhile, a high debt ratio means that LPIN is identified as having high debt, and the company does not have sufficient assets to finance the debt. Therefore, in that year, LPIN is predicted to be in financial distress.

**Normality Test.** The purpose of a normality test is to identify whether or not the data under investigation is normally distributed. Normality testing in this study was carried out through statistical analysis using the Kolmogorov - Smirnov test (K-S). The residual data is normally distributed if the K-S statistical test value has a significant probability larger than 0.05. On the other hand, the residual data is not normally distributed if the value is less than 0.05. The results of the normality test using the Kolmogorov-Smirnov model on the Altman Z-Score, Grover, and Zmijewski methods are shown in table 8:

TABLE 8  
ONE-SAMPLE KOLMOGOROV-SMIRNOV TEST

		Altman	Grover	Zmijewski
N		60	60	60
Normal Parameters <sup>a,b</sup>	Mean	0.0000000	0.0000000	0.0000000
	Std. Deviation	0.0000000	0.0000000	0.0000000
Most Extreme	Absolute	0.244	0.337	0.196

Differences	Positive	0.136	0.249	0.196
	Negative	-0.244	-0.337	-0.134
Test Statistic		0.244	0.337	0.196
Asymp. Sig (2-tailed)		0.000 <sup>c</sup>	0.000 <sup>c</sup>	0.000 <sup>c</sup>
a.	Test distribution is Normal.			
b.	Calculated from data.			
c.	Lilliefors Significance Correction.			

Source: Researcher Processed Data, 2021

The Asymp Sig value (2-tailed) for all Altman, Grover, and Zmijewski calculation methods is 0.000, according to the findings of the statistical normality test in Table 8. Because all methods get a significance value of less or less than 0.05, the assumption of normality is not met, so that the hypothesis testing will use the Kruskal-Wallis H test or the H-test.

**Differential Test.** The researcher uses hypothesis testing to see if there is a significant difference between the Altman, Grover, and Zmijewski methods in predicting the company's financial distress. This hypothesis test uses the Kruskal-Wallis H Test. This test is commonly used as an alternative to the One Way Anova test when the assumption of normality is not met. This test is also used to see a comparison between two or more variables. The basis for deciding on the Kruskal-Wallis H test is to compare the significance value with a probability of 0.05. The decision-making provisions are as follows; If the Asymp.Sig value is greater than 0.05, then there is no significant difference, or H0 is accepted; If the Asymp.Sig value is less than 0.05, then there is a significant difference, or H0 is rejected. Based on the Kruskal-Wallis test output as shown in table 8 above, it is known that the Asymp Sig value in the three financial distress methods is  $0.000 < 0.05$ . As a result, H0 is denied and H1 is approved, indicating that there is a significant difference in the calculations of the three methods, namely Altman Z-Score, Grover, and Zmijewski, in predicting financial distress in Automotive and Component companies listed on the IDX from 2016 to 2020.

**Accuracy Test.** The final hypothesis testing is to test the accuracy of predictions. This step is carried out to calculate correct and incorrect estimates or test the accuracy level and the level of error generated by each prediction method. The formula for the level of accuracy and the type of error has been explained in chapter 3. Next is to compare the prediction results and the sample categories for all existing samples. The level of accuracy indicates what percentage of the method correctly predicts the entire sample. The test results on the accuracy of predictions will be discussed one by one and presented in a table. The following is a table and explanation for testing the accuracy and error types of the Altman, Grover, and Zmijewski methods.

**Altman Z-Score Modification.** The first test was carried out on the Altman method. The following are the findings of the Altman method's prediction accuracy computation. Table 9 illustrates the overall calculation for the 60 samples and can correctly predict as many as 50 of the 60 samples. Altman's method failed to predict the other ten samples correctly. From these calculations, it can be seen that the Altman method produces an accuracy rate of 83.33%.

Furthermore, table 10 above shows the results of calculating the error rate in the Altman method. There are two prediction errors that occur, namely type I error where companies that are in fact experiencing financial distress are considered not experiencing financial distress and type II error where companies that are in fact not experiencing financial distress (FD) are considered to be experiencing FD. But in Altman's calculation there is a gray area condition where it cannot be determined whether the firm is in a healthy condition or FD, then the condition is separated from FD and non-FD conditions. Based on the calculation results, Altman predicts 39 companies in non-FD conditions, 12 companies in FD conditions, and 9 companies in the gray area. In fact, there are 36 companies in the non-FD condition, 20 in the FD condition, and 4 in the gray area. The total calculation of type I errors in 2016 to 2020 is 4 samples from all samples. So the type I error rate is 6.67%. Furthermore, the total type II error from 2016 to 2020 is 1 sample from the entire sample. So the type II error rate is 1.67%. The total error in the condition of the gray area from 2016 to 2020 is 5 samples from all samples. So that the gray area error rate is 8.33%. In total, Altman's error rate is 16.67%.

**Grover.** The second test was carried out on the Grover method. The following are the findings of the Grover method's prediction accuracy computation describes the overall calculation for 60 samples and can correctly predict 51 out of 60 samples. Grover's method failed to predict the other 9 samples correctly. From these calculations, it can be seen that the Grover method produces an accuracy rate of 85%. Furthermore, above shows the results of calculating the error rate in the Grover method. Two prediction errors occur, namely type I error where companies that are in fact experiencing financial distress are considered not experiencing FD and type II error where companies that are not experiencing FD are considered to be experiencing FD. The error rate for Grover and Zmijewski only has two types, in contrast to Altman, which has a gray zone. Based on the calculation results, Grover predicts 47 companies in non-FD conditions and 13 FD conditions. In fact, there are 40 companies in non-FD conditions and 20 in FD conditions. The total calculation of type I error in 2016 to 2020 is eight samples from all samples. So the type I error rate is 13.33%. Furthermore, the total error type II from 2016 to 2020 is 1 sample from the entire sample. So the type II error rate is 1.67%. In total, Grover's error rate is 15%.

**Zmijewski.** The third test was carried out on the Zmijewski method. The following are the findings of the Zmijewski method's prediction accuracy computation level of accuracy on zmijewski illustrates the overall calculation for 60 samples and can correctly predict 40 of the 60 samples. Zmijewski's method failed to predict the other ten samples correctly. From these calculations, it can be seen that the Zmijewski method produces an accuracy rate of 66.66%. Based on the calculation results, Zmijewski predicts 58 companies in non-FD conditions and 2 companies in FD conditions. In fact, there are 40 companies in non-FD conditions and 20 in FD conditions. The total calculation of type I error in 2016 to 2020 is 19 samples



from all samples. So the type I error rate is 31.67%. Furthermore, the total error type II from 2016 to 2020 is 1 sample from the entire sample. So the type II error rate is 1.67%. In total, Grover's error rate is 33.34%.

**Interpretation of Result.** Comparison of the results of calculating financial distress predictions using the Altman Z-Score, Grover, and Zmijewski methods. From the results that have been calculated using the three methods, namely Altman, Grover, and Zmijewski, it can be seen that there are differences between the three methods in predicting financial distress in automotive and component companies. See Comparison Of Predictions, which shows the comparison of each prediction method. During 2016-2020, Zmijewski predicts 58 times the company is in a healthy condition, Grover takes the second position, which predicts 47 times, and Altman occupies the last position by predicting 40 times. Meanwhile, Grover occupies the first position in predicting the most financial distress conditions as much as 13 times. Altman occupies the second position by predicting 12 times, and Zmijewski occupies the last place by predicting 2 times. A grey area is one of the categories in the Altman method prediction and is predicted eight times. A grey area is an area that cannot be determined whether the company's prediction is bankrupt or in good health. Still, the company's management must prepare a strategy to prevent bankruptcy at a certain time. The difference between the three methods was also proven from the normality test. In the normality test for the three methods, the Asymp. Sig. (2-tailed) value was obtained, which was 0.000, where the significance value was less or less than 0.05, then continued with the Kruskal-Wallis H test or H-test. In the Kruskal-Wallis H test, the Asymp. Sig. value in the three financial distress methods is  $0.000 < 0.05$ . So, it can be concluded that there are differences between the calculations of the three methods.

Companies With Similar Predictions, there are several companies whose prediction results are in accordance with reality. For example, PT. Astra International Tbk (ASII), PT. Astra Otoparts Tbk (AUTO), PT. Garuda Metalindo Tbk (BOLT), PT. Indo Kordsa Tbk (BRAM), PT. Multi Prima Sejahtera Tbk (LPIN), and PT. Selamat Sempurna Tbk (SMSM) predicted not going bankrupt or being in a safe condition in the three prediction methods. In fact, the company is still operating during 2016 – 2020. Likewise, PT. Multi Prima Sejahtera Tbk (LPIN) in 2016 and PT. Indo Mobil Sukses Internasional Tbk (IMAS) in 2019 is predicted to be in financial distress according to the specified criteria. PT. Multi Prima Sejahtera Tbk (LPIN), which is predicted to be in financial distress in 2016, it is known in the financial statements that the amount of other expenses caused the loss in 2016, there was also an increase in dollar prices that affected the price of raw materials so that companies must reduce orders for raw materials. If there is a reduction in ordering raw materials, it will reduce the amount of production and sales as well. Furthermore, the company also expanded its business in the coffee shop retail sector, namely PT. Maxx Coffee Prima. At the end of 2016, they had 77 coffee outlets but decreased in 2017 to 76 coffee outlets, and they had to revise their original plan, which would continue to add outlets to 115 outlets but did not do so because they were more focused on improving the coffee business. In addition, LPIN's operating expenses also increased from Rp. 59 billion in 2015 to Rp. 121 billion in 2016. The cost of employee salaries contributed significantly to selling expenses. The outlet equipment fund almost doubled. This is one of the reasons for the decline in LPIN's financial performance.

To overcome these problems, LPIN has prepared several strategies, such as expanding the market network, strengthening sales, and conducting promotions to all workshops on the island of Java and outside Java. LPIN also began to focus on providing guidance to retailers and workshops that accommodate purchases and actively carry out product branding. In the extraordinary general meeting, the shareholders also approved the corporate action plan to split the nominal value of the shares, aka the stock split. Meanwhile, IMAS is predicted to be in a state of financial distress due to declining sales of passenger vehicles which is the cause of a decline in IMAS revenue. In 2018, IMAS showed a better performance than the previous year by having a positive net income. Based on Motoris.ID (2018), after reducing share ownership in PT. Nissan Motor Indonesia (NMI), the brand holder agent (APM) and manufacturer of Nissan-Datsun in Indonesia, showed in its first-quarter financial report that IMAS improved its finances. At that time, IMAS posted a revenue increase of around 13.5%. Loss match expenses also decreased because IMAS no longer needed to include Nissan's profit and loss in its financial statements, which previously lost Rp. 141 billion to Rp. 36 billion.

To overcome these problems, IMAS made profit improvements driven by increased volume and better margins with the launch of the new Nissan New Grand Livina. Another strategy is the potential soaring profit of its subsidiary, namely PT. Indomobil Multi Jasa Tbk (IMJS) due to an increase in the rental truck fleet. At the end of 2019, it was stated that the number of IMJS truck fleets had more than doubled. Therefore, this affects IMAS finances so that in 2018 net income increased from the previous year. In 2019 it also actually showed better results than the previous year because there was a lot of demand, but the news of covid and the worsening covid condition caused sales to drop drastically. The impact of the pandemic in Indonesia has hampered supply chains from around the world, as well as a decline in economic activity, especially with the government's health protocols such as PSBB, Work From Home, lockdown, and others (Saleh, 2020). There was a lot of demand, but because the government protocols made the number of workers limited and the reduction in workers makes it difficult for companies to produce a lot of goods. This is what causes IMAS net income to decline again in 2019. There is also a change in people's purchasing power which is more selective in spending money due to the economic situation that makes it difficult for people to earn income and this causes a decrease in sales turnover from the automotive industry.

In addition, stagnant economic growth coupled with low commodity prices affected the demand for cars. The increase in public transportation in several big cities is slowly encouraging people to use public transport, which is relatively affordable in terms of cost rather than buying a private vehicle. This has begun to change the pattern of society towards

personal vehicles, making more use of public transportation that is more efficient and effective. This condition can have an impact on the demand for cars or motorcycles in Indonesia (Putri & Syukri, 2020).

The most accurate financial distress prediction method for companies in the Automotive and Components Industry sector in Indonesia. The analysis results using the three methods, namely Altman, Grover, and Zmijewski, may be shown in Comparison Of The Accuracy Of The Three Prediction Methods, with one method having the highest level of accuracy. Grover has the highest level of accuracy with an accuracy value of 85% and has the lowest error rate of 15%. Altman occupies the second position with an accuracy value of 83.3% and an error rate of 16.7%. And, the last position is occupied by Zmijewski, which has an accuracy rate of 66.7% and an error rate of 33.3%. Research results from Alifiah (2014) stated that the significant ratios in predicting financial distress are debt ratio, total asset turnover ratio, working capital ratio, and net income to total asset ratio. In the Grover method, there are three ratios used to measure the condition of the company, namely WCTA, EBITTA, and NITA. Two ratios are the same in determining that the ratio is significant in predicting the company's finances, namely working capital, and NITA. ROA is an aspect of profitability that describes the efficiency and effectiveness of using company assets in generating profits (Muflihah, 2017).

Meanwhile, in the Altman Z-Score calculation, the variables that stand out to have decreased are RETA and EBITTA. EBIT is used to measure the profit generated by the company from its operations, so it is identical to operating profit. Companies that cannot generate EBIT are vulnerable to financial distress. Generally, companies experiencing financial distress have negative profitability. If the company's profitability is getting smaller and even negative, it can be said that the company's performance is less effective in processing company assets in generating net income. This can cause losses that result in negative cash flows, and the risk of the company experiencing financial distress will be even greater (Hariansyah & Soekotjo, 2020).

Based on the calculation of the ROA ratio in the Grover method, it appears that GDYR, MASA, PRAS, and IMAS got a negative score, and several companies were predicted to experience financial distress. This can be due to an imbalance between operating expenses and income generated (Muflihah, 2017). Therefore, this ratio plays a significant role in anticipating a company's financial distress. According to Muzakky & Prabowo (2018), the ratio that has a significant effect on the Altman method is the EBITTA ratio. Meanwhile, the Zmijewski is a debt ratio. Based on the formula described by Altman and Zmijewski, it can be concluded that Altman places more emphasis on profitability ratios and views losses as the most influential factor in the company's financial health. Meanwhile, Zmijewski emphasises the leverage ratio and views the cost of debt as the most influential factor in determining the company's financial distress.

This is supported by researcher Dewi (2014) says that the financial ratios of RETA and EBITTA influence predicting financial distress conditions in manufacturing companies. Furthermore, in research (Permana et al., 2017), it is said that the Grover method places more emphasis on EBITTA, which means it emphasizes how much the company's assets can generate profits. Thus, the three ratios used by Grover, namely WCTA, EBITTA, and NITA, affect predicting financial conditions based on the conclusions of several previous researchers. Therefore, Grover's method got the highest level of accuracy between Altman and Zmijewski.

The findings of this study are supported by results Prihanthini & Sari (2013) which compare the Grover, Altman, Springate, and Zmijewski methods, finding that the Grover method is also the best financial distress prediction method with an accuracy rate of 100%. While the Altman Z-Score method is 80%, the Springate is 90%, and the Zmijewski is 90%. This is supported by (Hirawati, 2017), which states that Grover is a predictive method with a higher level of accuracy than Altman for predicting the company's condition in the future so that it can assist in decision making.

#### 4. Conclusion

The Grover method is the most suitable prediction method to be applied to automotive and component companies listed on IDX. This method has the best performance compared to other prediction methods, which is 85%, with a 15% error rate. While the Altman Z-Score method has an accuracy rate of 83.33% with a 16.67% error rate, and the Zmijewski method of 66.66% with a 33.34% error rate. This is because Grover has three influential ratios in predicting financial distress and focuses on its capacity to handle assets to produce revenues. The three ratios are WCTA (liquidity), NITA, and EBITTA (profitability), emphasizing the company's ability to generate working capital and profit. In this study, there are still many limitations in terms of financial methods, research period, and company sector. So, for further research, it is hoped to obtain the amount of diversification in the study, further researchers are advised to take a more varied sample or population of inputs in order to obtain a representative conclusion by comparing each sector of the companies listed on the IDX, not only in the automotive and component industries. The observation period can also be extended to get a more specific background on the automotive and components industry. In this analysis of the potential for financial distress, three prediction methods are used. So, further researchers are advised to add more financial distress prediction methods to find out and compare which method is more accurate in predicting company finances, such as the Springate, Ohlson, Fuzzy, Beaver, Fulmer, or so on. Further researchers can also compare the variables in each method to see which one is the most influential in predicting financial



distress in automotive and component companies in Indonesia. It can even be directed to create a new financial distress prediction method that can be applied to all companies in Indonesia.

## References

- [1] Alifiah, M. N. (2014). Prediction of Financial Distress Companies in the Trading and Services Sector in Malaysia Using Macroeconomic Variables. *Procedia - Social and Behavioral Sciences*, 129, 90–98. <https://doi.org/10.1016/j.sbspro.2014.03.652>
- [2] Almilia, L. S., & Kristijadi. (2003). Analisis Rasio Keuangan Untuk Memprediksi Kondisi Financial Distress Perusahaan Manufaktur Yang Terdaftar Di Bursa Efek Jakarta. *Jurnal Akuntansi dan Auditing Indonesia*, 7(2), 28.
- [3] Aminian, A., Mousazade, H., & Khoshkho, O. I. (2016). Investigate the Ability of Bankruptcy Prediction Models of Altman and Springate and Zmijewski and Grover in Tehran Stock Exchange. *Mediterranean Journal of Social Sciences*, 7(4). <https://doi.org/10.5901/mjss.2016.v7n4S1p208>
- [4] Andy, A., & Johan, S. (2020). Analisis Faktor- Faktor yang Memengaruhi Nilai Perusahaan di Sektor Properti dan Real Estate Terdaftar di Bursa Efek Indonesia pada Tahun 2014—2018. *Jurnal Manajemen Bisnis dan Kewirausahaan*, 4(6), 246. <https://doi.org/10.24912/jmbk.v4i6.9791>
- [5] Brigham, E. F., & Daves, P. R. (2003). *Intermediate Financial Management, eight edition*. <https://bandi.feb.uns.ac.id/wp-content/uploads/2018/09/intermediate-brigham-full.pdf>
- [6] Cahyani, S. U. A. (2019). Analisis Model Altman, Springate, Dan Ohlson Dalam Memprediksi Financial Distress Pada Perusahaan Kompas 100 Yang Terdaftar di Bursa Efek Indonesia Tahun 2014 – 2018. 169.
- [7] Dewi, K. D. (2014). Analisis Prediksi Financial Distress Berdasarkan Model Altman dan Zmijewski Pada Perusahaan Manufaktur yang Terdaftar di Bursa Efek Indonesia. *Doctoral Dissertation*.
- [8] Ery Yanto, Irene Christy, & Pandu Adi Cakranegara. (2021). The Influences of Return on Asset, Return on Equity, Net Profit Margin, Debt Equity Ratio and Current Ratio Toward Stock Price. *International Journal of Science, Technology & Management*, 2(1), 300–312. <https://doi.org/10.46729/ijstm.v2i1.155>
- [9] Fahma, Y. T. (2020). Analisis Financial Distress Dengan Metode Altman, Zmijewski, Grover, Springate, Ohlson, dan Zavgren Untuk Memprediksi Kebangkrutan Pada Perusahaan Ritel Yang Terdaftar Di Bei Periode 2015-2018. 220.
- [10] Gaikindo. (2020). Indonesian Automobile Industry Data – GAIKINDO. <https://www.gaikindo.or.id/indonesian-automobile-industry-data/>
- [11] Gaikindo. (2021). Tahun 2020: Wabah, Resesi Ekonomi, dan Turunnya Penjualan Mobil 48 Persen – GAIKINDO. <https://www.gaikindo.or.id/wabah-resesi-ekonomi-dan-turunnya-penjualan-mobil-48-persen-pada-2020/>
- [12] Ghozali, I. (2006). Aplikasi analisis multivariate dengan program SPSS. *Badan Penerbit Universitas Diponegoro*.
- [13] Gujarati, D. N., Porter, D. C., & Gunasekar, S. (2012). *Basic Econometrics*. McGraw-Hill Education (India) Private Limited.
- [14] Habibi, M. (2018). Analisis Penggunaan Model Altman Z-Score Dan Model Springate Dalam Mengukur Potensi Financial Distress Pada Bank Umum Syariah Di Indonesia Periode 2012-2016.
- [15] Hanafi, M. M., & Halim, A. (2007). Analisis Laporan Keuangan, edisi 3. *Yogyakarta: Penerbit UPP STIM YKPN*.
- [16] Hariansyah, M. S., & Soekotjo, H. (2020). Pengaruh Rasio Likuiditas, Profitabilitas, Dan Aktivitas Terhadap Prediksi Financial Distress Perusahaan Tekstil Dan Garmen. *Jurnal Ilmu Dan Riset Manajemen (JIRM)*, 9(10), Article 10.
- [17] Hirawati, H. (2017). Analisis Prediksi Financial Distress Berdasarkan Model Altman Dan Grover Pada Perusahaan Manufaktur Yang Terdaftar Di Bursa Efek Indonesia. 2(1), 10.
- [18] Investment, I. (2017). Industri Manufaktur Otomotif Indonesia—Penjualan Mobil | Indonesia Investments. <https://www.indonesia-investments.com/id/bisnis/industri-sektor/otomotif/item6047?>
- [19] Julaika, H. (2020, April 8). Dampak Covid-19, Permintaan Industri Otomotif Nasional Anjlok. <https://mediaindonesia.com/ekonomi/302222/dampak-covid-19-permintaan-industri-otomotif-nasional-anjlok>
- [20] kemenperin. (2018). Kemenperin: Laju Industri Otomotif Nasional Kian Melesat. <https://kemenperin.go.id/artikel/19529/Laju-Industri-Otomotif-Nasional-Kian-Melesat?>
- [21] Kencana, M. R. B. (2020, July 29). Penjualan Mobil dan Motor Anjlok, Laba Bersih Astra Turun 44 Persen. <https://www.liputan6.com/saham/read/4318149/penjualan-mobil-dan-motor-anjlok-laba-bersih-astraturun-44-persen>
- [22] kumparanOTO. (2020). Akibat Pandemi dan Resesi, Gaikindo Revisi Lagi Target Penjualan Mobil. <https://kumparan.com/kumparanoto/akibat-pandemi-dan-resesi-gaikindo-revisi-lagi-target-penjualan-mobil-1uZtl9oIlyF>
- [23] Listyarini, F., Rambe, P. A., & Kusasi, F. (2016). Analisis Perbandingan Prediksi Kondisi Financial Distress Dengan Menggunakan Model Altman, Springate Dan Zmijewski Pada Perusahaan Manufaktur Yang Terdaftar Di Bursa Efek Indonesia 2011-2014. *Universitas Maritim Raja Ali Haji*, 17.
- [24] M.J. Carr, C.E. Lymer, & J.M. Cowley, In: J.M. Cowley (Ed.), *Electron Diffraction Technique*, vol. 1, International Union of Crystallography/Oxford University Press, New York, p.122, 1999.



- [25] Manggalani, R. U., & Nainggolan, M. J. (2020, December 18). Pandemi, Penjualan Retail Daihatsu Merosot 43 Persen Dibanding 2019. suara.com. <https://www.suara.com/otomotif/2020/12/18/202145/pandemi-penjualan-retail-daihatsu-merosot-43-persen-dibanding-2019>
- [26] Muflihah, I. Z. (2017). Analisis Financial Distress Perusahaan Manufaktur Di Indonesia Dengan Regresi Logistik. *Majalah Ekonomi*, 22(2), 254–269.
- [27] Muzakky, R. A., & Prabowo, S. C. B. (2018). Prediksi Financial Distress Dengan Menggunakan Model Altman (Z-Score) Dan Zmijewski (X-Score) (Studi Pada Perusahaan Otomotif Dan Komponen Yang Terdaftar Di Bursa Efek Indonesia Periode 2013-2016). *Doctoral dissertation, Universitas Brawijaya*, 14.
- [28] OTO. (2021). Desember 2020: Angka & Analisis Penjualan Mobil Indonesia. Oto. <https://www.oto.com/berita-mobil/desember-2020-angka-analisis-penjualan-mobil-indonesia>
- [29] Permana, R. K., Ahmar, N., & Djadang, S. (2017). Prediksi Financial Distress Pada Perusahaan Manufaktur Di Bursa Efek Indonesia. *ESENSI: Jurnal Bisnis dan Manajemen*, 7(2), 149–166. <https://doi.org/10.15408/ess.v7i2.4797>
- [30] Platt, H. D., & Platt, M. B. (2002). Predicting Corporate Financial Distress: Reflections On Choice-Based Sample Bias. *Journal of Economics and Finance*, 26(2), 184–199. <https://doi.org/10.1007/BF02755985>
- [31] Pratama, A. B. (2019). Analisis Financial Distress Terhadap Perusahaan Manufaktur di Bursa Efek Indonesia. *Doctoral Dissertation, Universitas Wiraraja*.
- [32] Pratiwi, L., Amboningtyas, D., & Fathoni, A. (2019). Analisis Laporan Keuangan Dengan Menggunakan Model Altman Z-Score Dan Springate Dalam Memprediksi Kebangkrutan. *Journal Of Management*, 5(5), 15.
- [33] Prihanthini, N. M. E. D., & Sari, M. M. R. (2013). Prediksi Kebangkrutan Dengan Model Grover, Altman Z-Score, Springate Dan Zmijewski Pada Perusahaan Food And Beverage Di Bursa Efek Indonesia. *E-Jurnal Akuntansi*, 5(2), 417–435.
- [34] Putri, H. T., & Syukri, M. (2020). Penggunaan Model Zmijewski dan Model Grover dalam Memprediksi Kesulitan Keuangan pada Industri Otomotif yang Terdaftar di BEI Tahun 2014-2018. *Journal of Economics and Business*, 4(2), 11. <https://doi.org/10.33087/ekonomis.v4i2.169>
- [35] Rahadiansyah, R. (2020). Pabrik Mobil dan Motor RI yang Tumbang Sementara karena Corona. detikoto. <https://oto.detik.com/berita/d-4973844/pabrik-mobil-dan-motor-ri-yang-tumbang-sementara-karena-corona>
- [36] Rahmah, M. (2018). Analisis Model Zmijewski, Springate, Altman Z-Score Dan Grover Pada Financial Distress Bank Umum Syariah Di Indonesia Periode 2012-2016. Uin Syarif Hidayatullah.
- [37] Rohmadini, A., Saifi, M., & Darmawan, A. (2018). Pengaruh Profitabilitas, Likuiditas Dan Leverage Terhadap Financial Distress (Studi Pada Perusahaan Food & Beverage Yang Terdaftar Di Bursa Efek Indonesia Periode 2013-2016). *Jurnal Administrasi Bisnis*, 61(2), 11–19.
- [38] Rudianto, E. (2013). *Akuntansi Manajemen, Informasi Untuk Pengambilan Keputusan Strategis*. Jakarta: Erlangga.
- [39] Salatin, A. (2013). Penerapan Model Altman (Z-score) untuk Memprediksi Kebangkrutan pada Industri Tekstil dan Produk Tekstil yang terdaftar di BEI periode 2009-2011. *Jurnal Administrasi Bisnis*, 6(2), 10.
- [40] Saleh, T. (2020, November 20). 3 Kuartal Tekor, Indomobil Derita Rugi Q3 Rp 467 M. <https://www.cnbcindonesia.com/market/20201120140720-17-203376/3-kuartal-tekor-indomobil-derita-rugi-q3-rp-467-m>
- [41] Sandi, F. (2020). Selain Honda, Suzuki dan Yamaha Juga Tutup Pabrik Sementara. News. <https://www.cnbcindonesia.com/news/20200403125955-4-149610/selain-honda-suzuki-dan-yamaha-juga-tutup-pabrik-sementara>
- [42] Sofi, P. W. M. (2019). Analisis Komparatif Tingkat Risiko Kebangkrutan Perbankan di Indonesia Dengan Menggunakan Metode Altman Z-Score Modifikasi. 126.
- [43] Tantular, B. (2015). *Desain Sampling Untuk Pemodelan Spatial*. 8.
- [44] Thanjaya, R. (2016). Analisa Kegunaan Model Altman, Grover dan Zmijewski Untuk Memprediksi Financial Distress. 103.
- [45] Ulfa, M., Negri, U. I., & Ibrahim, M. M. (2020). Jurusan Manajemen Fakultas Ekonomi Universitas Islam Negri (Uin) Maulana Malik Ibrahim Malang 2020. 196.
- [46] Ulinuha. (2018). Analisis Pengaruh Gcg, Rasio Keuangan Early Warning System Terhadap Tingkat Solvabilitas Unit Usaha Syariah Asuransi Di Indonesia Periode 2014-2017.
- [47] Utami, M. (2015). Pengaruh Aktivitas, Leverage, dan Pertumbuhan Perusahaan Dalam Memprediksi Financial Distress. *Jurnal Akuntansi*, 3(1), 29.
- [48] Wruck, K. H. (1990). Financial distress, reorganization, and organizational efficiency. *Journal of Financial Economics*, 27(2), 419–444. [https://doi.org/10.1016/0304-405X\(90\)90063-6](https://doi.org/10.1016/0304-405X(90)90063-6)
- [49] Zakharia, R. (2018). Diajukan untuk Memenuhi Salah Satu Syarat Penyelesaian Program Pendidikan Sarjana Program Studi Akuntansi. 21.

