Analysis of the Calculation of the Altman Z-Score Method (Modified) and the Springate Method in Predicting Potential Financial Distress in Retail Companies Listed on the Indonesia Stock Exchange (IDX) in 2020 – 2022

Chikita Audyna Satoto[1], Krisnawuri Handayani[2]
Universitas Merdeka Malang, Indonesia
Email: krisnawuri.handayani@unmer.ac.id

KEYWORDS	ABSTRACT
Financial Distress, Altman Z-Score, Springate.	This study evaluates the potential for financial distress in retail companies listed on the Indonesia Stock Exchange (IDX) for the 2020–2022 period using the Altman Z-Score Modified and Springate methods. Financial distress is a company's unhealthy financial condition and can lead to bankruptcy. This research aims to identify the financial condition of retail companies whether they are in the safe, vulnerable, or at risk of bankruptcy category, as well as provide strategic recommendations to overcome them. Data is obtained from the company's annual financial statements which are analyzed using both methods. The Altman Z-Score method assesses a company's ability to meet short-term obligations, maintain profits, and manage assets well. The Springate method evaluates working capital efficiency, income, and the ability to pay short-term debt. Data analysis techniques include descriptive statistical tests, normality tests, and calculation of accuracy levels and prediction errors. The results show that several companies, such as PT Global Teleshop (GLOB) and PT Trikomsel Oke (TRIO), consistently experience financial distress, with the average Z-Score and Springate below the threshold. Meanwhile, companies such as PT Mitra Komunikasi Nusantara (MKNT) and PT Song Topas Tourism Industry (SONA) showed financial stability with positive results in both methods. The main recommendations include evaluating the company's operations, reducing the debt burden, and implementing lean management for efficiency. Regulators are advised to strengthen supervision of high-risk companies to protect investors. This research provides important guidance for companies, investors, and policymakers in facing financial challenges.

1. INTRODUCTION

The retail business is a business that involves buying and selling products to consumers in units or retail. Retail plays an important role in the distribution process of goods (Aadilah & Hadi, 2022; Purwanti, 2016). This sector is defined as an industry that sells a variety of fulfillment of the needs of individuals, groups. The products sold include meeting household needs, including basic materials (Ramadhani et al., 2023; Wahab, 2019). The definition of retailing is the process of marketing products to customers directly.

According to the Indonesian Retail Entrepreneurs Association, the development of retail business in Indonesia began in the 1980s in line with economic growth in Indonesia. The increasing growth that occurs in the middle class

is triggered, namely by the emergence of demand for supermarkets and department stores (convenience stores) in urban areas. The retail industry in Indonesia continues to grow (Aji & Anwar, 2022; Ratna & Marwati, 2018), marked by the opening of new outlets spread across various regions, including those managed by foreign retail companies such as Makro (Netherlands), Carrefour (France) and Giant (Malaysia) and also PT Hero Supermarket Tbk which is spread across major cities.

In 2017, the well-known company Matahari was forced to close two of its branches due to sales that did not meet the required targets (Azizah, 2019; Robiansyah et al., 2022). In addition, the affected retail company is PT Hero Supermarket Tbk which stopped Giant's operational activities starting July 2021, the cause of this occurred due to changes in people's shopping patterns, especially in the supermarket segment. Since 2021, the Indonesian Retail Entrepreneurs Association), has stated that there are hundreds of retailers closing and stopping operations in Indonesia every day. The retail sector is fashion retail, food, and other non-food retail outlets. In addition to Giant, PT Trans Indonesia or Transmart also decided to permanently close and dismiss its operational activities in 2023, namely 7 out of 95 outlets spread across Indonesia (Tempo.Co, Jakarta).

Based on the current phenomenon, it is stated that threats to the retail business occur due to the development of other means of buying and selling in the form of shopping systems through telephone lines, the internet, and shopping catalogs. There are many factors that affect the sustainability of a retail business, including population growth, lifestyle changes, per capita income of the population, government policies and regulations, and producer behavior (Gultom

& Safrida, 2020; Gupita et al., 2020). In this case, the management of retail companies needs to pay attention to these factors because they can affect the continuity of the business's operations (Harlen, 2018; Sari & Ariyani, 2022).
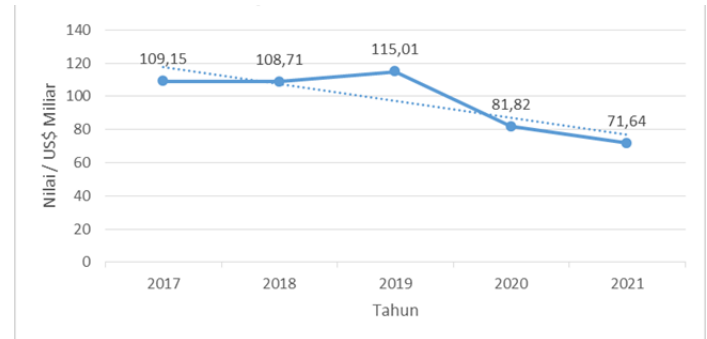

Figure 1. The Value of Indonesian Retail Wholesale Sales
Source : https://databoks.katadata.co.id (data processed, 2023)

Based on the graph above, it can be seen that in 2020 sales decreased by 28.9% from the previous year. In 2021, retail sales were recorded at US$ 71.64 billion and again decreased by 12.4% from sales in 2020. As we know that in 2020 there was a Covid-19 outbreak where the government implemented social distancing policies to reduce the risk of spreading the virus. In addition, the negative impact of the social distancing policy also caused a decrease in retail purchase activities (br Sembiring & Nainggolan, 2022; Pratiwi & Wiweko, 2022).

The serious threat facing the retail industry today is a significant decline in people's purchasing power, especially in terms of consumption. This can affect the profitability value of retail sector companies in accordance with Kurniawan's research (2022) which stated that there was a decrease in the ROEi value of retail companies in 2019-2020 which occurred because net profit experienced a significant decrease compared to net profit before the pandemic.
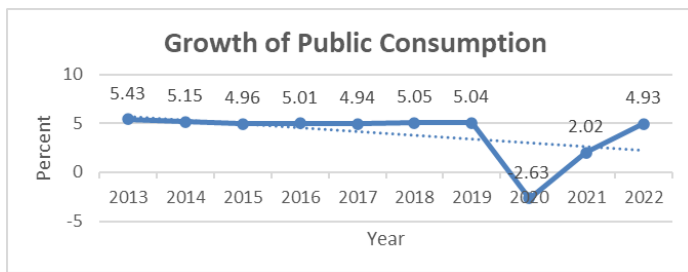
Figure 2. Growth of Public Consumption
Source : https://databoks.katadata.co.id (data processed, 2023)

Based on the graph above, it can be seen that people's consumption power tends to decline from 2013 to 2020 due to a slump due to the pandemic. Supported by research by Hadning (2020) revealed that during the implementation of social distancing, there was a decrease in monthly income by 46.2 followed by a decrease in monthly expenses by 3.0%.

In 2021-2022, public consumption growth has increased again from the previous year. Despite the recovery in the following year, Indonesian household consumption has not yet reached pre-pandemic levels (Perdana & Dillak, 2019; Sudaryanti & Dinar, 2019).

In addition, social distancing that occurred during the Covid-19 pandemic also encouraged the growth of e-commerce globally, including Southeast Asia. Changes in shopping patterns, including the popularity of online shopping that affects people's purchasing behavior, are also other factors that cause a decline in retail sales value. According to marketer market research firm, e-commerce growth in Southeast Asia reached 14.3% in 2021, with e-commerce retail sales reaching US$ 45.07 billion. Of that amount, as much as US$ 20.21 billion comes from Indonesia, as well as being the largest in the Southeast Asian region.

Retail businesses that rely on physical stores will experience pressure due to changes in physical stores due to changes in shopping trends that switch to online systems. Digital transactions that continue to grow are making it easier for consumers to get the goods they want without having to leave their homes (Weston & Copeland, 1997; Zamzami, 2021).

To overcome the change in people's shopping patterns, there are now several real industries that are making physical stores efficient and switching to the online world due to the rapid development of the times, so that companies that are unable to keep up will slowly decline.

Meanwhile, the existence of goods from abroad is much cheaper to be traded through digital platforms, causing goods sold directly such as in the market or offline to be threatened with losing competition in terms of price. Online sales platforms are becoming more attractive to consumers.

The decline in sales volume and the level of profitability of the company is one of the signs of financial distress in a company (Febriana & Wahidahwati, 2018). Financial distress can be interpreted as a condition in which a company's finances are in an unhealthy state, in crisis or in a condition before bankruptcy occurs (Curry & Banjarnahor, 2018). A company can be said to experience financial distress when it is in a situation where net profit is negative for several years. Financial distress occurs due to the company's short-term obligations that are not met. In addition, the use of very large debt also affects the financial condition of a company. The increase in the amount of debt used will increase the risk of the company experiencing financial distress.

Table 1. Profit for the current year (negative)

Code	Profit for the current year (negative)		
	2020	**2021**	**2022**
ECII	(20.502.166.781)	8.707.297.154	514.481.593.301
GLOB	(50,608,122,770)	(58,735,842,609)	(69,493,222,649)
IMAS	(675,710,445,502)	123.738.000.000	562.551.000.000
MKNT	(63.440.559.860)	(34.676.018.586)	(44,239,084,134)
RALS	(138.874.000.000)	170.575.000.000	351.998.000.000
SONA	(38.510.530.050)	(57.300.993.143)	(48.290.136.664)
TRIO	(276.596.537.437)	(154.647.642.961)	404,828,994,821
ZONE	(37.620.281.385)	30.781.262.235	72.940.513.980

Source: www.idx.co.id (data processed, 2023)

According to the table above, there are several companies that earned net profit with negative values in 2020-2022, so this shows that the company has the potential to face financial distress. Companies that experience prolonged financial distress will end up going bankrupt or bankruptcy. In the midst of fierce competition in this business world, of course, it urges the company's management to improve and strengthen the business units it manages. One of the actions that companies can take to maintain the current condition is by analyzing their finances. The management is required to be able to forecast and anticipate the company's growth, so that the company can survive and stay away from bankruptcy.

Financial disturbances can be identified through financial statements because financial statements are one of the indicators used to analyze the bankruptcy of a company, namely by looking for indications of declining financial performance. Financial statements are needed in making decisions because they are one of the sources of information.

To anticipate the occurrence of financial distress and estimate financial risks, the company uses a prediction formula method that has been developed by several experts. Predictions are made to find out the financial condition before bankruptcy occurs. With this financial prediction, the management hopes that the financial condition during the crisis can recover so as to avoid potential bankruptcy.

There are several bankruptcy analysis prediction methods proposed by previous researchers, but the most commonly used in research are the Altman Modified Z-Score analysis model and the Springate Model. These two analysis models are more often used because judging from several previous studies have proven to be accurate when predicting the likelihood of bankruptcy of a company. This is reinforced by research conducted by Laksamana (2019) which revealed that the accuracy level used to predict potential bankruptcy is 90%, thus it can be said that the Altman Z-Score Model is worthy of being used as a calculation model (Laksmana, 2019).

Meanwhile, according to Loppy (2018), the Springate Method is a method that can be used as a bankruptcy prediction tool with an accuracy level of 92.5% accompanied by 4 types of ratios. The Altman Z-Score and Springate models are

the 2 methods that have the highest level of accuracy compared to the Zmijewiski and Grover models (Loppies et al., 2022).

2. METHOD

The study evaluated a company's financial distress using two main methods: Altman Modified Z-Score and Springate, which utilizes financial ratios (Sugiyono, 2019). The Altman Z-Score Modified method includes the ratio of Working Capital to Total Assets (X_1), Retained Income to Total Assets (X_2), EBIT to Total Assets (X_3), and Equity to Total Debt (X_4). This formula is used to assess a company's ability to meet its obligations, maintain profits, and manage assets effectively:

$$Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4.$$

The Springate method uses similar ratios, including Working Capital to Total Assets (X_1), EBIT to Total Assets (X_2), Profit Before Tax to Current Debt (X_3), and Sales to Total Assets (X_4), which are formulated as:

$$S = 1.03X_1 + 3.07X_2 + 0.66X_3 + 0.4X_4.$$

Both of these methods help to effectively predict a company's financial stability and bankruptcy risk, supporting strategic decision-making.

This study analyzes financial distress in retail companies listed on the Indonesia Stock Exchange (IDX) for the 2020-2022 period using the Altman Z-Score Modified and Springate methods. The goal is to identify the condition of the company, whether it is in the safe category, vulnerable, or at risk of bankruptcy. This research was conducted on retail companies listed on the Indonesia Stock Exchange (IDX) using secondary data, such as financial statements, obtained through the official IDX website in www.idx.co.id.

Based on the results of the purposive sampling that has been carried out, from a population of 29 companies, 8 Retail companies listed on the Indonesia Stock Exchange (IDX) in 2020-2022 can be taken as research samples. The companies mentioned as samples in this study are:

Table 3. Sampel

No	Code	Company Name
1	ECII	PT Electronic City Indonesia Tbk
2	GLOB	PT Global Teleshop Tbk
3	IMAS	Indomobil Sukses Internasional Tbk
4	MKNT	Mitra Komunikasi Nusantara Tbk.
5	RALS	Ramayana Lestari Sentosa
6	SONA	Song Topas Tourism Industry Tbk.
7	TRIO	Trikomsel Oke Tbk.
8	ZONE	Mega Perintis Tbk.

Source : www.idx.co.id (data processed, 2023)

This research uses data sourced from the annual financial statements of retail companies listed on the Indonesia Stock Exchange (IDX) in 2020-2022, so that this research data is secondary data. The data used in this research was obtained from www.idx.co.id websites that can be accessed via the internet. The type of data used is quantitative data presented in the form of numbers that describe the magnitude of variables.

The data collection technique used in this research is the documentation technique. Documentation refers to the method used in collecting information and data in the form of archives, documents, and records in the form of reports and information that can help support the research process. Furthermore, it was followed by searching and digging data in the form of financial statements of each company on

the Indonesia Stock Exchange (IDX).

This study analyzes financial statement data using the Altman Z-Score Modified and Springate methods with data processing through Microsoft Excel. The analysis began with a descriptive statistical test to describe the characteristics of the data, such as minimum, maximum, mean, and standard deviation, which were used to compare data between groups and periods.

Furthermore, a normality test was carried out using the Kolmogorov-Smirnov method to determine the distribution of data. If the p-value > 0.05, the data is declared to be normally distributed, while the p-value < 0.05 indicates abnormal data. Based on the results of this test, appropriate different test techniques are applied. For normal data, the Paired Sample t-Test was used to compare the average of two paired samples. Meanwhile, for abnormal data, the Wilcoxon Signed Rank Test was carried out as a non-parametric alternative.

The study also includes accuracy and error tests, which aim to measure the extent to which prediction methods reflect actual financial conditions. The accuracy level is calculated based on the number of correct predictions, while the error is calculated to evaluate the error rate of the prediction. Finally, the results of the analysis are interpreted to provide conclusions that answer the objectives of the study, thus providing an overview of the effectiveness and differences between the two methods in evaluating the level of financial distress of companies.

3. RESULT AND DISCUSSION

Retail companies that are listed on the Indonesia Stock Exchange (IDX) and report financial statements periodically in 2020-2022 are the objects used in the research. Companies that are indicated to be experiencing financial distress are used as a research sample criterion, namely when the company shows a negative profit value in 2020-2022.

Company Overview
1. PT Electronic City Indonesia Tbk (ECII): A pioneer in electronics retail in Indonesia, established in 2001. It has 64 stores throughout Indonesia and an e-commerce platform since 2012. Offers electronic products such as audio-video, home appliances, gadgets, and IT. Listed on the IDX since 2013.
2. PT Global Teleshop Tbk (GLOB): Focusing on telecommunications and electronics products. Established in 2007, the company has been an official agent of Nokia since 1997 and was listed on the IDX in 2012.
3. PT Indomobil Sukses Internasional Tbk (IMAS): Engaged in the automotive sector, including vehicle distribution and financing. Founded in 1976, the company holds international brands such as Suzuki, Hino, and Volvo.
4. PT Mitra Komunikasi Nusantara Tbk (MKNT): Focus on trading mobile phones, gadgets, and credit. It was established in 2008 and listed on the IDX in 2015.
5. PT Ramayana Lestari Sentosa Tbk (RALS): A self-service retail company established in 1983. It has around 100 outlets throughout Indonesia, focusing on clothing, food, and household necessities. Listed on the IDX since 1996.
6. Sona Topas Tourism Industry Tbk (SONA): Originally a travel agency, it is now known as the largest duty-free shop operator in Indonesia. It was established in 1978 and has been listed on the IDX since 1992.

7. PT Trikomsel Oke Tbk (TRIO): Distributor and retailer of telecommunication products such as mobile phones and accessories. It was established in 1996 and listed on the IDX in 2009.
8. PT Mega Perintis Tbk (ZONE): Men's clothing retail, including brands such as Manzone and Ollo. Established in 2005, the company was listed on the IDX in 2018.

Description of Research Variables

This study analyzes the performance of retail companies listed on the Indonesia Stock Exchange (IDX) during the 2020–2022 period using two methods for predicting financial distress: Altman Z-Score Modification and Springate. This analysis aims to evaluate the risk of bankruptcy in retail companies, map their financial condition, and identify potential risks or financial stability.

1. Altman Z-Score Calculation Results:
   a. The highest score was obtained by PT Song Topas Tourism Industry (SONA) with an average of 9.78, which reflects a stable financial condition and far from the risk of bankruptcy.
   b. The lowest score was found in PT Global Teleshop (GLOB) with an average of -661.21, indicating a significant potential risk of bankruptcy.
   c. Overall, there are several companies with negative Z-Scores that indicate difficulties in meeting short-term financial obligations.
2. Springate Calculation Results:
   a. PT Mitra Komunikasi Nusantara (MKNT) showed significant positive results with an average of 2.59, indicating financial stability.
   b. On the other hand, PT Global Teleshop (GLOB) has an average score of -49.83, which again strengthens the results that

this company is in a condition of financial distress.
3. Descriptive Statistics:
   Data from both methods show high variation (heterogeneous), with standard deviations greater than average, signaling significant differences in financial conditions among companies.
4. Hypothesis Test (Mann-Whitney):
   The results of the hypothesis test showed that there was no significant difference between the prediction results of the two methods (Asymp. Sig. = 0.071 > 0.05). Thus, both methods are considered consistent in identifying financial distress risks.

Recommendations for company management include evaluation of operational strategies and debt burden reduction, especially for companies with negative scores, as well as the implementation of lean management to improve efficiency. For investors, it is recommended to focus on companies with high financial stability such as SONA and MKNT. Researchers are expected to conduct follow-up studies on the relationship between asset management efficiency and bankruptcy risk, while regulators need to tighten scrutiny of high-risk companies to protect investors.

Discussion
Prediction of financial distress in retail companies using the Altman Z-Score Method (Modified) in 2020-2022
Based on the results of data calculations with the Altman Z-Score (Modified) model equation, the results were obtained, namely that in 2020-2022 there were three retail companies that experienced financial distress, namely PT Global Teleshop (GLOB), PT Indomobil Sukses Internasional (IMAS) and PT Trikomsel Oke (TRIO). The three companies obtained a Z-Score

of < 1.1 for 3 consecutive years so that the average Z-Score was obtained, which was -661.21 (GLOB), -0.30 (IMAS) and -346.72 (TRIO), so in accordance with the cut-off point of Altman's model that the three companies were categorized into the distress zone. In addition, based on calculations, 5 retail companies with an average Z-Score of > 2.6 were obtained, namely PT Electronic City Indonesia (ECII), PT Mitra Komunikasi Nusantara (MKNT), PT Ramayana Lestari Sentosa (RALS), PT Song Topas Tourism Industry (SONA), and PT Mega Perintis (ZONE) with values obtained of 6.24 (ECII), 3.30 (MKNT), 8.01 (RALS), 9.78 (SONA) and 3.47 (ZONE). Therefore, the company is categorized into a safe or healthy zone. In 2020, PT Mega Perintis (ZONE) is in the gray area with a value of 1.85 (1.1<Z>2.6).

The company is in the financial distress zone or vulnerable because there are several companies that have a total current debt value greater than the total value of their current assets so that the company has difficulty paying its short-term obligations. Meanwhile, other calculations show that there are five companies in the safe zone because they have relatively stable values from year to year both in terms of profits generated and high liquidity.

Prediction of financial distress in retail companies using the Springate Method in 2020-2022
Based on the results of data calculations with the Springate model equation, the results were obtained that in 2020 there were seven companies that experienced financial distress, namely PT Electronic City Indonesia (ECII) with an S-Score of 0.65, PT Global Teleshop (GLOB) at -37.23, PT Indomobil Sukses Internasional (IMAS) at 0.04, PT Ramayan Lestari Sentosa (RALS) at 0.36, PT Song Topas Tourism Industry

(SONA) at -0.87, PT Trikomsel Oke (TRIO) by -8.35 and PT Mega Perintis (ZONE) by -0.12. All of these companies obtained an S-Score of < 0.862, so in the Springate model the value is included in the category of companies experiencing financial distress. In 2020 there is one company that is in the safe zone, namely PT Mitra Komunikasi Nusantara (MKNT) with an S-Score of 3.22 (S>0.862).

In 2021, six companies were obtained that fell into the distress category because they had an S-Score of < 0.862, namely, PT Electronic City Indonesia (ECII) with an S-Score of 0.80, PT Global Teleshop (GLOB) of -38.92, PT Indomobil Sukses Internasional (IMAS) of 0.08, PT Song Topas Tourism Industry (SONA) of -0.81, PT Trikomsel Oke (TRIO) of -10.96, and PT Mega Perintis (ZONE) by 0.78. In 2021, there is only one company that does not experience financial distress or can be said to be in the safe zone, namely PT Mitra Komunikasi Nusantara (MKNT) with an S-Score of 2.24 (S>0.862).

In 2022, four companies with an S-Score of < 0.862 were obtained, so that according to the assessment criteria of the Springate model, the company was included in the category of companies experiencing financial distress. The four companies are, PT Electronic City Indonesia (ECII) with an S-Score of 0.860, PT Global Teleshop (GLOB) at -73.32, PT Indomobil Sukses Internasional (IMAS) at 0.17, and PT Song Topas Tourism Industry (SONA) at 0.20. In addition, based on calculations, four companies were also in the safe zone because they had an S-Score of > 0.862 in 2022.

Based on the calculation of the Springate method, it can be seen that all companies that experience financial distress tend to have problems such as a decline in management

performance in paying their short-term obligations or debts. In addition, another factor in the occurrence of financial distress is because the profitability value of retail companies in 2020-2022 has decreased very significantly so that there are several companies that have experienced losses. Meanwhile, companies that are in the safe zone tend to have stable profit and sales values every year.

4. CONCLUSION

This study shows that the Altman Z-Score Modified and Springate methods have proven to be effective in identifying potential financial distress in retail companies listed on the Indonesia Stock Exchange (IDX) during the 2020–2022 period. The results of the analysis revealed that several companies, such as PT Global Teleshop (GLOB) and PT Trikomsel Oke (TRIO), are in the high-risk zone. This is due to consistently negative profit values and difficulties in meeting short-term financial obligations. In contrast, companies such as PT Mitra Komunikasi Nusantara (MKNT) and PT Song Topas Tourism Industry (SONA) have demonstrated good financial stability, supported by strong profitability and optimal asset management.

As a recommendation, management of high-risk companies is advised to immediately evaluate their operational strategies. Steps such as reducing debt burden and increasing operational efficiency through the implementation of lean management need to be taken to improve the company's financial condition. In addition, investors are expected to be more careful in choosing companies to invest in. It is recommended that they prioritize companies with stable and positive financial scores to minimize investment risks.

For regulators, stricter supervision of companies in the high-risk category is needed. This is important to protect the interests of investors and maintain the stability of the financial market as a whole. Further research is also recommended to delve deeper into external factors, such as government policies and macroeconomic conditions, that can affect a company's financial stability. This effort is expected to provide a more comprehensive understanding of the challenges faced by retail companies in Indonesia.

5. REFERENCES

Aadilah, S. R., & Hadi, T. P. (2022). Analisis Tingkat Kebangkrutan Sebelum Dan Saat Pandemi Dengan Menggunakan Metode Altman Z-Score Dan Springate S-Score (Studi Kasus Pada Perusahaan Retail Yang Terdaftar Di Bursa Efek Indonesia 2016-2020). *Dinamika Akuntansi Keuangan Dan Perbankan*, *11*(1), 81–91.

Aji, P. S., & Anwar, S. (2022). Pengaruh leverage, profitabilitas, likuiditas, sales growth dan firm size terhadap financial distress pada perusahaan pulp & kertas dan plastik & kemasan yang terdaftar di bursa efek indonesia. *Jurnal Bina Bangsa Ekonomika*, *15*(1), 43–51.

Azizah, F. (2019). *Analisis Perbandingan Model Altman Z-Score dan Springate Dalam Memprediksi Financial Distress Pada Perusahaan Tekstil Yang Terdaftar Di Bursa Efek Indonesia*. Universitas Brawijaya.

br Sembiring, O. S., & Nainggolan, H. (2022). PENERAPAN ALTMAN Z–SCORE MODIFIKASI DALAM MEMPREDIKSI KEBANGKRUTAN PADA PERUSAHAAN. *Prosiding Konferensi Nasional Social & Engineering Polmed (KONSEP)*, *3*(1), 598–606.

Curry, K., & Banjarnahor, E. (2018). Financial distress pada perusahaan sektor properti go

public di Indonesia. *Prosiding Seminar Nasional Pakar*, 207–221.

Febriana, S. K., & Wahidahwati, W. (2018). Analisis Perbandingan Model Altman Z-Score, Zmijewski, Ohlson, Dan Grover Dalam Memprediksi Financial Distress. *Jurnal Ilmu Dan Riset Akuntansi (JIRA)*, *7*(9).

Gultom, S. A., & Safrida, E. (2020). Analisis pengaruh fraud diamond dan gone theory terhadap academic fraud (studi kasus mahasiswa akuntansi se sumatera utara). *EKSIS*, *9*(3), 113–124.

Gupita, N., Soemoedipiro, S. W., & Soebroto, N. W. (2020). Analisis Perbandingan Model Altman Z-Score, Springate, Zmijewski dan Grover dalam memprediksi Financial Distress. *Jurnal Aktual Akuntansi Keuangan Bisnis Terapan (AKUNBISNIS)*, *3*(2), 145–162.

Harlen, Y. S. (2018). *Analisis Penggunaan Model Altman (Z-Score) Untuk Memprediksi Potensi Kebangkrutan (Studi Kasus pada Perusahaan Sub Sektor Pertambangan Minyak dan Gas Bumi yang Terdaftar di Bursa Efek Indonesia Tahun 2012-2016)*. Universitas Brawijaya.

Laksmana, K. A. R. I. (2019). *Analisis Akurasi Multivariate Discriminant Analysis (MDA) Altman dalam Memprediksi Kebangkrutan Perusahaan di Bursa Efek Indonesia*.

Loppies, L. S., Esomar, M. J. F., Turukay, E., Tubalawony, J., & Thesman, M. (2022). Pengaruh Financial Literacy Terhadap Keputusan Investasi Dengan Preferensi Investor Sebagai Variabel Moderasi. *Jurnal Pendidikan Dan Konseling (JPDK)*, *4*(3), 2676–2699.

Perdana, N. S., & Dillak, V. J. (2019). Pengaruh Likuiditas, Leverage Dan Sales Growth Terhadap Financial Distress (studi Kasus Pada Perusahaan Otomotif Dan Komponen Yang Terdaftar Pada Bursa Efek Indonesia Periode 2013-2016). *EProceedings of Management*, *6*(1).

Pratiwi, N. M., & Wiweko, H. (2022). Perbandingan Metode Altman Z-Score, Grover, Springate, dan Zmijewski dalam Memprediksi Financial Distress pada Perusahaan Sektor Pertanian yang Terdaftar Di Bursa Efek Indonesia. *E-Journal Field of Economics, Business and Entrepreneurship (EFEBE)*, *1*(1), 98–107.

Purwanti, E. (2016). Analisis Perbedaan Model Altman Z Score Dan Model Springate Dalam Memprediksi Kebangkrutan Pada Perusahaan Pertambangan Di Indonesia. *Jurnal STIE Semarang*, *8*(2), 131639.

Ramadhani, R., Yuliani, Y., Saputri, N. D. M., & Muthia, F. (2023). Prediksi Financial Distress: Analisis Metode Altman Z-Score, Zmijewski, dan Grover pada Perusahaan Sektor Transportasi dan Logistik. *Widya Cipta: Jurnal Sekretari Dan Manajemen*, *7*(2), 207–217.

Ratna, I., & Marwati, M. (2018). Analisis Faktor-Faktor Yang Mempengaruhi Kondisi Financial Distress Pada Perusahaan Yang Delisting Dari Jakarta Islamic Index Tahun 2012-2016. *Jurnal Tabarru': Islamic Banking and Finance*, *1*(1), 51–62.

Robiansyah, A., Yusmaniarti, Y., Sari, I. K., Novrianda, H., & Irwanto, T. (2022). Analisis Perbandingan Model Altman, Springate, Zmijewski, Dan Grover Dalam Memprediksi Kebangkrutan Perusahaan Di Bursa Efek Indonesia (Studi Empiris Pada Perusahaan Manufaktur Yang Terdaftar Di Bursa Efek Indonesia Periode 2012-2017). *EKOMBIS REVIEW: Jurnal Ilmiah Ekonomi Dan Bisnis*, *10*(S1), 25–36.

Sari, H., & Ariyani, V. (2022). Analisis perbandingan potensi kebangkrutan perusahaan manufaktur Periode 2020 dengan model Altman, Springate, dan Zmijewski. *Jurnal Riset Manajemen Dan Akuntansi*, *10*(01), 25–39.

Sudaryanti, D., & Dinar, A. (2019). Analisis prediksi kondisi financial distress menggunakan rasio likuiditas, profitabilitas, financial leverage dan arus kas. *Jurnal Ilmiah Bisnis Dan Ekonomi Asia*, *13*(2), 101–110.

Sugiyono. (2019). *Metode Penelitian*. CV Alfabeta.

Wahab, L. O. (2019). *Analisis Penerapan Metode Altman Z-Score dalam*

memprediksi *Financial Distress pada PT. Astra International. JURNAL EKONOMI & BISNIS Sekolah Tinggi Ilmu Ekonomi Port Numbay Jayapura, 42.*

Weston, J. F., & Copeland, T. E. (1997). Manajemen Keuangan, Edisi Kesembilan, Jilid 2. *Jakarta: Binarupa Aksara.*

Zamzami, B. (2021). ANALISIS PENGGUNAAN MODEL ALTMAN, SPRINGATE DAN ZMIJEWSKI DALAM MEMPREDIKSI KEBANGKRUTAN PT BUKIT ASAM (PERSERO) TBK PERIODE 2011-2015. *Jurnal Ilmiah Manajemen, Ekonomi Dan Akuntansi, 1*(3), 1–12.

126