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Bankruptcy Prediction Analysis using Altman Z-Score, Springate, and Zmijewski Methods

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ABSTRACT

This study aims to predict the bankruptcy of retail companies listed on the Indonesia Stock Exchange for the period 2020-2022 using the Altman Z-Score, Springate, and Zmijewski methods, and test for significant differences between the prediction results of the three methods. The selection of retail companies is up due to sales fluctuations and downward trends during the period 2020-2022. This study uses a quantitative approach with the Kruskal-Wallis test assisted by SPSS 22 software. The research sample was selected through a purposive sampling method so that 35 companies were obtained. The results find that there were companies experiencing bankruptcy for three consecutive years according to the three methods. The data obtained is not normally distributed and heterogeneous so it uses the Kruskal-Wallis Test. The results of the Kruskal Wallis Test show a significant value, meaning that there is a significant difference between the bankruptcy prediction results of the three methods. This is due to differences in financial ratios and bankruptcy criteria used in each method.

Keywords : Bankruptcy Prediction; Altman Z-Score; Springate; Zmijewski; Retail Company

ABSTRAK

Penelitian ini bertujuan untuk memprediksi kebangkrutan perusahaan ritel yang terdaftar di Bursa Efek Indonesia periode 2020-2022 dengan menggunakan metode Altman Z-Score, Springate, dan Zmijewski, serta menguji perbedaan yang signifikan antara hasil prediksi ketiga metode tersebut. Pemilihan perusahaan ritel dikarenakan adanya fluktuasi penjualan dan tren penurunan selama periode 2020-2022. Penelitian ini menggunakan pendekatan kuantitatif dengan uji Kruskal-Wallis yang dibantu dengan software SPSS 22. Sampel penelitian dipilih melalui metode purposive sampling sehingga diperoleh 35 perusahaan. Hasil penelitian menemukan bahwa terdapat perusahaan yang mengalami kebangkrutan selama tiga tahun berturut-turut menurut ketiga metode tersebut. Data yang diperoleh tidak berdistribusi normal dan heterogen sehingga menggunakan Uji Kruskal-Wallis. Hasil Uji Kruskal Wallis Test menunjukkan nilai signifikan, artinya terdapat perbedaan yang signifikan antara hasil prediksi kebangkrutan dari ketiga metode tersebut. Hal ini disebabkan oleh perbedaan rasio keuangan dan kriteria kebangkrutan yang digunakan pada masing-masing metode.

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Kata Kunci **:** ***Prediksi Kebankrutan; Altman Z-Score; Springate; Zmijewski; Perusahaan Retail***

INTRODUCTION

The retail sector in Indonesia is experiencing significant growth and transformation, driven by a large population, a growing middle class, and increasing purchasing power (A Anggraeni, 2021). This has an impact on the rapid development of the retail industry in Indonesia, as evidenced by the increasing number of retail businesses in various forms and types, as well as the number of foreign retailers entering Indonesia (Aryo & Trisnaningsih, 2021). This growth is also due to the fact that the retail sector is one of the sectors that can generate profits (Putra As'ari & Pertiwi, 2021). As an effect of the increasing retail sector in Indonesia, there is a significant increase in GDP and also employment (Astuty, 2023).

However, the Covid-19 event had an impact on the retail sector in Indonesia. The retail sector experienced a decrease in turnover during the covid 19 period (Lestari et al., 2024). This makes the retail sector experience problems in generating profits because profits in the company are highly dependent on company revenue. The earnings of retail companies that tend to decline from year to year in some companies will make the company experience Financial Distress or financial difficulties which will lead to bankruptcy. Bankruptcy is a state of business that is no longer able to operate financially due to financial difficulties faced by the business. Bankruptcy is a situation where a company is declared bankrupt based on a court decision if the debtor has two or more creditors and cannot pay at least one debt that is due (Aadilah & Hadi, 2022).

Companies that will experience bankruptcy can anticipate these conditions by developing a system that can provide early warnings using bankruptcy prediction analysis methods to be analyzed before bankruptcy occurs. There are many bankruptcy detection methods to choose from. The Altman Z-Score, Springate, Zmijewski, and Grover models are commonly used for financial distress analysis(Sutrisno, Anggi Prayoga, 2018). There is the Altman Z-Score method, which is a bankruptcy measurement method using five financial ratios(Marsenne, 2020). This method is considered an effective bankruptcy measurement tool for companies in Indonesia(Harun et al., 2021). It is also considered to have better significance compared to the Beneish M Score (Putra, 2021). Metode selanjutnya adalah metode Springate. This method is also considered one of the bankruptcy detection methods alongside the Altman Z Score (Silaen et al., 2020). The application of detection can be implemented in financial-based companies such as Islamic banks and insurance (Dodi Febrian et al., 2022; Nurlaila et al., 2021). Another method is the Zmijewski method, which is considered accurate for predicting bankruptcy conditions in construction companies (Permatasari, 2019). Another method, the grover method, is considered a good bankruptcy detector, especially in the banking sector (Aeni, 2020).

This research uses the three bankruptcy detection methods due to these three methods are used because they can detect potential bankruptcy early and will allow management to provide corrective treatment to restore financial conditions from an unhealthy state. Grover method was not chosen because based on previous research it is considered more suiTable for the banking sector. Based on the background that has been described, the formulation of this research problem is: how are the results of bankruptcy

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predictions in Retail Companies listed on the Indonesia Stock Exchange for the 2020-2022 period after being analyzed using the Altman Z-Score, Springate, and Zmiijewski methods, and are there significant differences between the results of bankruptcy predictions in Retail Companies listed on the Indonesia Stock Exchange for the 2020-2022 period using the Altman Z-Score, Springate, and Zmijewski methods.

RESEARCH METHOD

The type of data used in this research is quantitative descriptive research. Quantitative descriptive research primarily aims to summarize and interpret data to reveal trends, averages, and distributions without inferring causation. This method involves both descriptive statistics—such as means, medians, and frequencies—to provide a snapshot of the data, and inferential statistics to explore possible relationships or differences between groups. This research involves collecting and analyzing numerical data using descriptive and inferential statistical methods (Irfan Syahroni, 2023; Siregar, 2021). In the context of this study, quantitative descriptive research offers a structured way to analyze financial data from retail companies and gain insights into the financial health trends across the sector during the 2020-2022 period. The data source used in this study is a secondary data source. Secondary data is data that has been collected by someone else for a purpose other than the current research, and it is reused by researchers for their studies. Unlike primary data, which is gathered firsthand by the researcher through surveys, experiments, or observations, secondary data comes from pre-existing sources. Secondary data in this study is the company's Financial Statement data obtained from the Indonesia Stock Exchange website through the site www.idx.co.id, In this study the data used is the Financial Statements of Retail companies for the period 2020-2022. Population of this study is a Retail company listed on the Indonesia Stock Exchange for the period 2020-2022, namely 42 companies. The sample used in this study was Purposive Sampling. Purposive sampling is a data source sampling technique with certain criteria. So that the number of samples of this study were 35 companies with the 2020-2022 period that had been determined.

All Company data that has been collected will be calculated for potential bankruptcy using three methods, namely Altman Z-Score, Springer and Zmijewski. The Altman Z Score calculation uses the following Formula 1 (Altman, 1968).

$$\mathbf{Z = 1,2\ X1 + 1,4\ X2 + 3,3\ X3 + 0,6\ X4 + 1,0\ X5} \quad \textbf{(1)}$$

Based on Formula 1, where X1 = Working Capital / Total Assets, X2 = Retained Earnings / Total Assets, X3 = Earnings Before Interest & Taxes / Total Assets, X4 = Market Value of Equity / Total Liabilities and X5 = Sales / Total Assets. After obtaining the calculation results from Z value, it will be classified in Table 2.

Table 2. Classification Based on Z Score Value

Value	Description
Z Score > 2,99	Healthy
Z Score 1,81 < Z < 2,99	Gray Area
Z Score < 1,81	Bankrupt

Source: Altman, 1968

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Springate calculation uses the following Formula 2.

$$S = 1,03\,A + 3,07\,B + 0,66\,C + 0,4\,D \quad (2)$$

From Formula 2, where A = ratio of working capital/total assets, B = ratio of net income before interest and tax/total assets, C = ratio of net income before tax/short-term liabilities and D = sales/total assets ratio. After obtaining the calculation results from S value, it will be classified in Table 3.

Table 3. Classification Based on S Score Value

Value	Description
S Score > 0,862	Healthy
S Score < 0,862	Bankrupt

Source: Springate, 1978

Zmijewski calculation uses the following Formula 3.

$$X = -4,3 - 4,5X1 + 5,7X2 + 0,004X3 \quad (3)$$

Based on Formula 3, where X1 = Return on Assets, X2 = Leverage (total liabilities / total assets), X3 = Liquidity (current assets / current liabilities). After obtaining the calculation results from X value, it will be classified in Table 4.

Table 4. Classification Based on X Score Value

Value	Description
X Score > 0	Bankrupt
X Score < 0	Healthy

Source: Zmijewski, 1984

After obtaining the calculation results of the three methods, then proceed to test the difference between the three methods to see if there is a difference between the three bankruptcy calculation methods. Then, in this study using SPSS Statistics Version 22 software in conducting data analysis in the form of data analysis consisting of Descriptive Statistics, Normality Test, Homogeneity Test, and Kruskall Wallis Test. The flow of the research is described in Figure 2.

Source: Data Processed, 2024

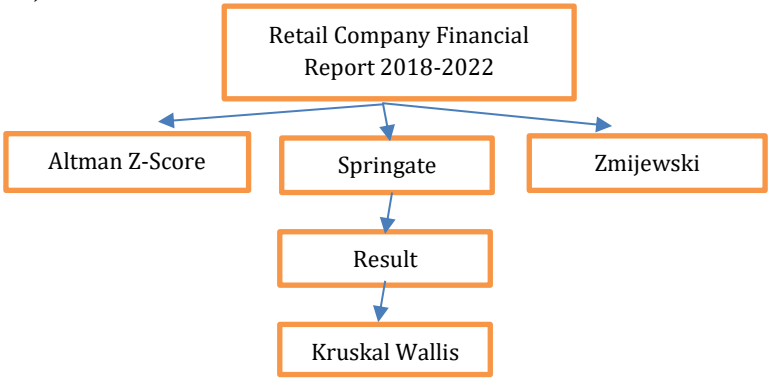

Figure 2. Conceptual Framework

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Based on Figure 2, the hypotheses of this study are: H0: There is no difference between the Altman Z-Score, Springate and Zmijewski models in predicting bankruptcy. H1 : There is a difference between the Altman Z-Score, Springate and Zmijewski models in predicting bankruptcy.

RESULTS AND DISCUSSION

Results of Bankruptcy Prediction Analysis of Altman Z-Score Method

From the results of the bankruptcy analysis calculations carried out from 2020 - 2022, fluctuations in the prediction results of 35 sample companies are obtained which are described in Table 5 .

Table 5. Altman Z-Score results 2020

No	Clasification	Amount
1	Healthy	16
2	Grey	6
3	Bankrupt	13

Source: Data Processed, 2024

From Table 5, it can be seen that companies that are predicted to be healthy are less than half of the total population, namely 45.7% in the healthy category, while companies that are predicted to go bankrupt are 37.1% and the gray category is 17.2%.

Table 6. Altman Z-Score results 2021

No	Clasification	Amount
1	Healthy	18
2	Grey	6
3	Bankrupt	11

Source: Data Processed, 2024

From Table 6, it can be seen that companies that are predicted to be healthy are more than half of the total population, namely 51.4% in the healthy category, while companies that are predicted to go bankrupt are 31,4% and the gray category is 17.2%.

Table 7. Altman Z-Score results 2022

No	Clasification	Amount
1	Healthy	17
2	Grey	6
3	Bankrupt	12

Source: Data Processed, 2024

From Table 7, it can be seen that companies that are predicted to be healthy are less than half of the total population, namely 48,6% in the healthy category, while companies that are predicted to go bankrupt are 34,2% and the gray category is 17.2%.

From the three-year development, it can be seen that there have been changes in terms of companies categorized as healthy and bankrupt. Meanwhile, the number of gray companies remained sTable for three years. This can be illustrated in Figure 3.

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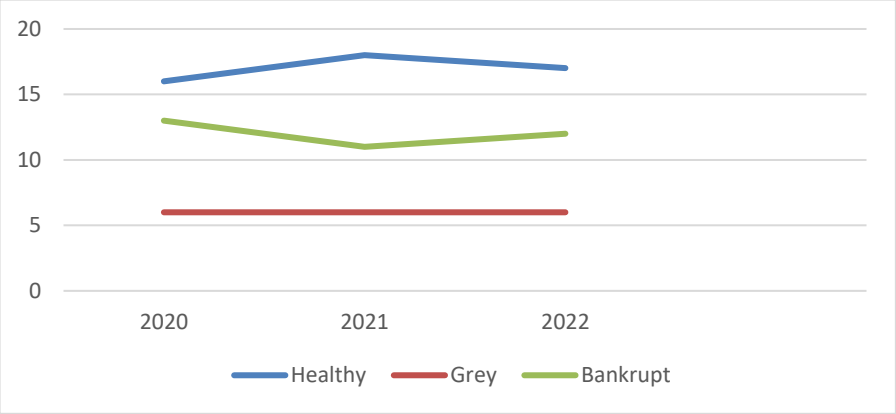

Source: Data Processed, 2024

Figure 3. Development of Altman Z Score Company 2020-2022

From Figure 3, it can be seen that there were changes in the prediction of bankruptcy of companies in the healthy and bankrupt categories during the research interval. The number of healthy companies rose from 16 to 18 and then fell back to 17, while bankrupt companies initially fell from 13 to 11 and rose to 12. Meanwhile, the gray category remained sTable at 6. For the development of the assessment of the 35 research samples can be described in Table 8.

Table 8. Z Score value of retail companies in 2020-2022

No	Company Code	Z Score 2020	Clasification	Z Score 2021	Clasification	Z Score 2022	Clasification
1.	ACES	9,2987	Healthy	10,6685	Healthy	11,9711	Healthy
2.	AMRT	1,0042	Bankrupt	1,5055	*Grey area*	2,0142	*Grey area*
3.	BOGA	3,7398	Healthy	3,7463	Healthy	3,5615	Healthy
4.	CARS	-0,2051	Bankrupt	0,3243	Bankrupt	0,9565	Bankrupt
5.	CSAP	1,3049	Grey area	1,4802	*Grey area*	1,3582	*Grey area*
6.	DAYA	-2,3603	Bankrupt	-2,9174	Bankrupt	-3,0849	Bankrupt
7.	DMND	9,7122	Healthy	9,0332	Healthy	8,6677	Healthy
8.	ECII	4,7219	Healthy	5,4978	Healthy	4,3467	Healthy
9.	EPMT	8,954	Healthy	8,9964	Healthy	8,6424	Healthy
10.	ERAA	4,0769	Healthy	4,8718	Healthy	3,1966	Healthy
11.	GLOB	-569,764	Bankrupt	-536,4922	Bankrupt	-912,0774	Bankrupt
12.	HERO	-2,5507	Bankrupt	-2,3755	Bankrupt	-1,8022	Bankrupt
13.	IMAS	-0,1915	Bankrupt	-0,3602	Bankrupt	-0,1651	Bankrupt
14.	KMDS	14,3146	Healthy	8,7226	Healthy	9,4913	Healthy
15.	LPPF	-0,1639	Bankrupt	3,3821	Healthy	3,6821	Healthy
16.	MAPA	4,4567	Healthy	5,8348	Healthy	6,8583	Healthy
17.	MAPI	1,3555	Grey area	2,484	*Grey area*	3,9009	Healthy
18.	MIDI	-0,1312	Bankrupt	0,208	Bankrupt	0,8439	Bankrupt
19.	MKNT	4,1169	Healthy	3,4774	Healthy	2,282	*Grey area*
20.	MLPL	-0,096	Bankrupt	1,1873	*Grey area*	0,9549	Bankrupt
21.	MPMX	4,3393	Healthy	3,7571	Healthy	5,236	Healthy
22.	MPPA	-3,4141	Bankrupt	-2,1113	Bankrupt	-3,9687	Bankrupt
23.	PCAR	1,2746	Grey area	1,3748	*Grey area*	1,7437	*Grey area*
24.	PMJS	5,5694	Healthy	4,5314	Healthy	5,4708	Healthy
25.	RALS	7,2867	Healthy	8,3011	Healthy	8,7038	Healthy
26.	RANC	2,5268	Grey area	0,9185	Bankrupt	0,1095	Bankrupt
27.	SDPC	1,5365	Grey area	1,5502	*Grey area*	1,5667	*Grey area*
28.	SLIS	4,596	Healthy	5,7082	Healthy	6,9282	Healthy
29.	SONA	10,1972	Healthy	13,3933	Healthy	5,5837	Healthy
30.	TELE	-155,062	Bankrupt	-101,1197	Bankrupt	-202,2754	Bankrupt

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31.	TRIO	-307,223	Bankrupt	-371,2919	Bankrupt	-384,1337	Bankrupt
32.	TURI	5,4629	Healthy	5,4703	Healthy	5,0752	Healthy
33.	WICO	-0,6079	Bankrupt	-3,6409	Bankrupt	-7,8085	Bankrupt
34.	YELO	59,9715	Healthy	159,2822	Healthy	2,4363	*Grey area*
35.	ZONE	2,3684	Grey area	3,8995	Healthy	5,0876	Healthy

Source: Data Processed, 2024

From Table 8, it can be seen that there are 15 companies that are predicted to remain sTable in a healthy position from 2020 to 2022. Then 2 companies are sTable in the gray position. 10 companies are sTable in a bankrupt position. The rest experience fluctuations from healthy, gray and bankrupt positions. One interesting thing is the company with the code LPFF where in 2020 the prediction results show that this company is predicted to go bankrupt. However, in the next two years the company can rise to a healthy position. This shows that there are improvements made by the company that have an impact on the company's predicted status.

Results of Bankruptcy Prediction Analysis of Springate Method

From the results of the bankruptcy analysis calculations carried out from 2020 - 2022, fluctuations in the prediction results of 35 sample companies are obtained which are described in Table 9.

Table 9. S-Score results 2020

No	Clasification	Amount
1	Healthy	14
2	Bankrupt	21

Source: Data Processed, 2024

From Table 9, it can be seen that companies that are predicted to be healthy are less than half of the total population, namely 40% in the healthy category, while companies that are predicted to go bankrupt are 60%.

Table 10. S-Score results 2021

No	Clasification	Amount
1	Healthy	21
2	Bankrupt	14

Source: Data Processed, 2024

From Table 10, it can be seen that companies that are predicted to be healthy are more than half of the total population, namely 60% in the healthy category, while companies that are predicted to go bankrupt are 40%.

Table 11. S-Score results 2022

No	Clasification	Amount
1	Healthy	22
2	Bankrupt	13

Source: Data Processed, 2024

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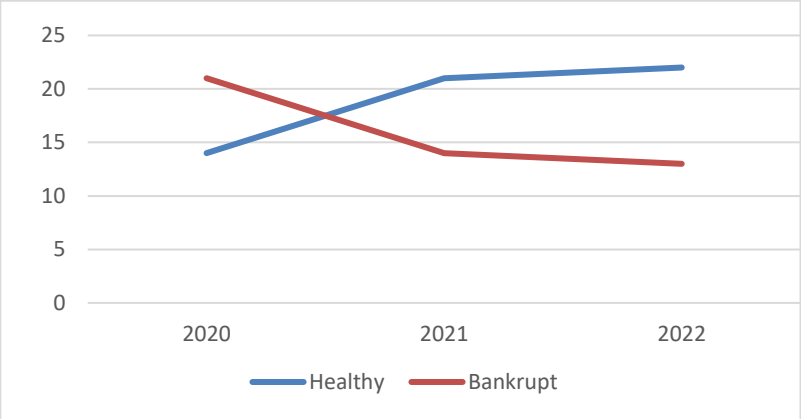
From Table 11, it can be seen that companies that are predicted to be healthy are more than half of the total population, namely 62,85% in the healthy category, while companies that are predicted to go bankrupt are 37,15%.

From the three-year development, it can be seen that there have been changes in terms of companies categorized as healthy and bankrupt. This can be illustrated in Figure 4.

Figure 4. Development of S Score Company 2020-2022



From the Figure 4, it can be seen that there is a decrease in both healthy and bankrupt companies through the Springate method. The company at the beginning of the prediction was 14 then rose to 21 and finally rose to 22. Meanwhile, bankrupt companies from the beginning as many as 21 companies decreased to 14 companies and finally to 13 companies.

For the development of the assessment of the 35 research samples can be described in Table 12 .

Table 12. S Score Value of Retail Companies in 2020-2022

No	Company Code	S Score 2020	Clasification	S Score 2021	Clasification	S Score 2022	Clasification
1.	ACES	2,1520	Healthy	2,1722	Healthy	2,2213	Healthy
2.	AMRT	1,3669	Healthy	1,5678	Healthy	1,7199	Healthy
3.	BOGA	0,5576	Bankrupt	0,7680	Bankrupt	0,7876	Bankrupt
4.	CARS	- 0,2832	Bankrupt	0,4000	Bankrupt	0,9396	Healthy
5.	CSAP	0,8643	Healthy	0,9504	Healthy	0,9044	Healthy
6.	DAYA	0,0413	Bankrupt	0,0867	Bankrupt	0,2563	Bankrupt
7.	DMND	1,2970	Healthy	1,3997	Healthy	1,4117	Healthy
8.	ECII	0,6485	Bankrupt	0,7946	Bankrupt	0,8545	Bankrupt
9.	EPMT	2,0611	Healthy	2,2267	Healthy	2,1908	Healthy
10.	ERAA	1,8563	Healthy	2,4252	Healthy	1,7208	Healthy
11.	GLOB	- 39,9331	Bankrupt	- 44,9700	Bankrupt	- 79,3900	Bankrupt
12.	HERO	- 0,2996	Bankrupt	- 0,3000	Bankrupt	0,0499	Bankrupt

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13.	IMAS	0,0676	Bankrupt	0,0998	Bankrupt	0,1990	Bankrupt
14.	KMDS	2,5737	Healthy	2,3655	Healthy	2,6874	Healthy
15.	LPPF	- 0,5270	Bankrupt	1,2335	Healthy	1,7352	Healthy
16.	MAPA	0,7002	Bankrupt	1,2059	Healthy	2,0320	Healthy
17.	MAPI	0,2802	Bankrupt	0,8066	Bankrupt	1,4739	Healthy
18.	MIDI	0,8486	Bankrupt	0,9028	Healthy	1,0990	Healthy
19.	MKNT	3,2209	Healthy	2,2428	Healthy	2,2943	Healthy
20.	MLPL	0,0220	Bankrupt	0,4410	Bankrupt	0,3918	Bankrupt
21.	MPMX	0,8135	Bankrupt	0,8782	Healthy	1,2438	Healthy
22.	MPPA	0,0161	Bankrupt	0,2588	Bankrupt	0,1418	Bankrupt
23.	PCAR	- 0,2942	Bankrupt	1,1416	Healthy	1,5800	Healthy
24.	PMJS	1,2590	Healthy	1,6278	Healthy	1,9996	Healthy
25.	RALS	0,4206	Bankrupt	0,9489	Healthy	1,2866	Healthy
26.	RANC	1,3912	Healthy	0,8104	Bankrupt	0,5851	Bankrupt
27.	SDPC	1,1639	Healthy	1,2597	Healthy	1,2066	Healthy
28.	SLIS	1,3344	Healthy	1,4910	Healthy	1,8047	Healthy
29.	SONA	- 0,8902	Bankrupt	- 0,7576	Bankrupt	0,1744	Bankrupt
30.	TELE	- 15,6221	Bankrupt	- 0,0752	Bankrupt	- 3,9360	Bankrupt
31.	TRIO	- 13,2401	Bankrupt	- 15,0031	Bankrupt	0,8043	Bankrupt
32.	TURI	0,9025	Healthy	1,4705	Healthy	1,6566	Healthy
33.	WICO	1,8136	Healthy	1,0379	Healthy	0,2553	Bankrupt
34.	YELO	0,3070	Bankrupt	13,8115	Healthy	0,9307	Healthy
35.	ZONE	0,1210	Bankrupt	0,9992	Healthy	1,5445	Healthy

Source: Data Processed, 2024

From Table 12, it can be seen that 11 sTable companies are in healthy predictions, 12 sTable companies are in bankrupt predictions and the rest are 10 companies experiencing changes in predictions from bankrupt to healthy and 2 companies experiencing changes in predictions from healthy to bankrupt, namely RANC and WICO companies.

Results of Bankruptcy Prediction Analysis of Zmijewski Method

From the results of the bankruptcy analysis calculations carried out from 2020 - 2022, fluctuations in the prediction results of 35 sample companies are obtained which are described in Table 13.

Table 13. X-Score results 2020

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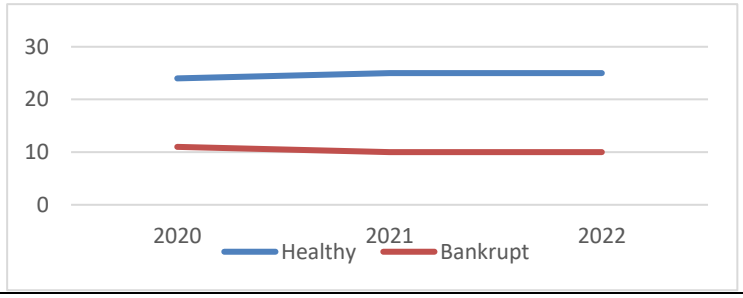

No	Clasification	Amount
1	Healthy	24
2	Bankrupt	11

Source: Data Processed, 2024

From Table 13, it can be seen that companies that are predicted to be healthy are more than half of the total population, namely 68,5% in the healthy category, while companies that are predicted to go bankrupt are 31,5%.

Table 14. X-Score results 2021

No	Clasification	Amount
1	Healthy	25
2	Bankrupt	10

Source: Data Processed, 2024

From Table 14, it can be seen that companies that are predicted to be healthy are more than half of the total population, namely 71,4% in the healthy category, while companies that are predicted to go bankrupt are 29,6%.

Table 15. S-Score results 2022

No	Clasification	Amount
1	Healthy	25
2	Bankrupt	10

Source: Data Processed, 2024

From Table 15, it can be seen that companies that are predicted to be healthy are more than half of the total population, namely 71,4% in the healthy category, while companies that are predicted to go bankrupt are 29,6%.

From the three-year development, it can be seen that there have been changes in terms of companies categorized as healthy and bankrupt. This can be illustrated in Figure 5.

Figure 5. Development of X Score Company 2020-2022

From the Figure 5, it can be seen that there is no significant change in company predictions using the Zmijewski method from year to year. Based on the calculation of healthy companies in 2020, there were 24 and increased to 25 in the following year and

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remained the following year. Meanwhile, companies that are predicted to go bankrupt in 2020 are 11 companies and drop to 10 the following year.

For the development of the assessment of the 35 research samples can be described in Table 16.

Table 16. X Score Value of Retail Companies in 2020-2022

No	Company Code	X Score 2020	Clasification	X Score 2021	Clasification	X Score 2022	Clasification
1.	ACES	-3,1854	Healthy	-3,5055	Healthy	-3,7160	Healthy
2.	AMRT	-0,4681	Healthy	-0,8896	Healthy	-1,1557	Healthy
3.	BOGA	-2,8654	Healthy	-2,0148	Healthy	-1,7009	Healthy
4.	CARS	1,2642	Bankrupt	1,2143	Bankrupt	0,2240	Bankrupt
5.	CSAP	-0,1772	Healthy	-0,2417	Healthy	-0,2020	Healthy
6.	DAYA	0,7408	Bankrupt	1,1399	Bankrupt	1,3769	Bankrupt
7.	DMND	-3,4518	Healthy	-3,4088	Healthy	-3,3473	Healthy
8.	ECII	-2,6826	Healthy	-2,8396	Healthy	-2,6584	Healthy
9.	EPMT	-3,0029	Healthy	-3,0142	Healthy	-2,8867	Healthy
10.	ERAA	-1,7671	Healthy	-2,2876	Healthy	-1,2958	Healthy
11.	GLOB	449,9947	Bankrupt	383,7604	Bankrupt	610,5005	Bankrupt
12.	HERO	0,3420	Bankrupt	1,2941	Bankrupt	0,5847	Bankrupt
13.	IMAS	-0,0375	Healthy	-0,0154	Healthy	-0,0528	Healthy
14.	KMDS	-4,2113	Healthy	-4,0035	Healthy	-4,0597	Healthy
15.	LPPF	1,4954	Bankrupt	-0,2849	Healthy	-0,2600	Healthy
16.	MAPA	-1,7768	Healthy	-2,2788	Healthy	-2,7584	Healthy
17.	MAPI	-0,5541	Healthy	-1,1638	Healthy	-1,7877	Healthy
18.	MIDI	-0,1006	Healthy	-0,3058	Healthy	-0,5031	Healthy
19.	MKNT	1,4667	Bankrupt	1,4561	Bankrupt	2,3021	Bankrupt
20.	MLPL	0,2383	Bankrupt	-0,3611	Healthy	-0,5739	Healthy
21.	MPMX	-2,5853	Healthy	-2,4082	Healthy	-2,9097	Healthy
22.	MPPA	1,5687	Bankrupt	1,0070	Bankrupt	1,6581	Bankrupt
23.	PCAR	-1,4286	Healthy	-1,8617	Healthy	-2,2173	Healthy
24.	PMJS	-2,8183	Healthy	-2,3483	Healthy	-2,6826	Healthy
25.	RALS	-2,5062	Healthy	-2,8316	Healthy	-2,9768	Healthy
26.	RANC	-1,2170	Healthy	-0,5444	Healthy	-0,1192	Healthy
27.	SDPC	0,2631	Bankrupt	0,2401	Bankrupt	0,2639	Bankrupt
28.	SLIS	-1,5731	Healthy	-1,8461	Healthy	-2,1812	Healthy
29.	SONA	-2,6328	Healthy	-3,2909	Healthy	-1,8985	Healthy
30.	TELE	109,5256	Bankrupt	112,2415	Bankrupt	207,2267	Bankrupt
31.	TRIO	216,0490	Bankrupt	250,6509	Bankrupt	225,9350	Bankrupt
32.	TURI	-2,4672	Healthy	-2,5200	Healthy	-2,4106	Healthy
33.	WICO	-0,0883	Healthy	1,3709	Bankrupt	2,5946	Bankrupt
34.	YELO	-4,2319	Healthy	-4,9425	Healthy	-2,0271	Healthy
35.	ZONE	-0,9398	Healthy	-1,7273	Healthy	-2,1444	Healthy

Source: Data Processed, 2024

From the Table 16, it can be seen that 23 sTable companies are in healthy predictions during 2020-2022. While 9 companies are sTable in bankrupt positions from 2020-2022. The rest are companies that have changed from bankrupt to healthy predictions as many as 2 companies, namely LPFF and MPPL and changes in predictions from healthy to bankrupt as many as 1 company, namely the company WICO.

Based on the results of the above research with three methods, there are 6 retail companies that are indicated to experience bankruptcy conditions during the 2020-2022 period by the three bankruptcy prediction analysis methods, namely: PT Duta Intidaya Tbk (DAYA), Global Teleshop Tbk (GLOB), Hero Supermarket Tbk (HERO), Matahari Putra

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Prima Tbk (MPPA), PT Tiphone Mobile Indonesia Tbk (TELE), and Trikomsel Oke Tbk (TRIO).

These companies are indicated to experience bankruptcy conditions in 2020-2022, because the company does not have sTable revenue and tends to decline from year to year, does not have sufficient current assets to cover its current liabilities, has an equity value that is lower than its liabilities so that it shows that the company has more debt than the assets it owns, then the company experiences losses every year so that the ROA value becomes negative, has a high ratio of total debt to total assets, this shows that the company is too dependent on debt to finance the company's operations, and has a low ratio of current assets to current liabilities so that the company does not have enough current assets to cover its current liabilities.

These things make the company in the bankrupt category based on the Altman Z-Score, Springate, and Zmijewski methods. This bankruptcy prediction analysis method is only an Early Warning System for companies on the condition of the company's financial health. Thus the company must pay much more attention to the condition of the company's financial health so that the company does not actually experience bankruptcy.

In addition, from these three calculation methods, it is also evident that the number of companies experiencing bankruptcy is higher when using the Springate method compared to the other two methods, namely Altman Z-Score and Zmijewski. In line with the research Melissa & Banjarnahor (2020) which shows that the accuracy of the Springate method is 98% compared to 90% and 80%. However, this is different from the research Melina & Susetyo, (2021) which states that the Zmijewski method has a greater bankruptcy assessment compared to the other two methods. This is also different from the research Dahni, (2019) which shows that the Altman Z Score produces more bankruptcy values compared to the Springate method. This difference in results may occur due to the differences in research objects and the size of the research sample conducted.

Descriptive Statistics

Descriptive statistics are statistics designed to provide a true picture of the subject under study, based on data from a sample or population, and to draw conclusions that apply to the public. Descriptive statistical analysis used includes minimum, maximum, mean, and standard deviation . The following Table 17 are the results of descriptive statistical tests for all research variables.

Table 17. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Altman *Z-Score*	105	-912,08	159,28	-28,6184	133,19029
Springate	105	-79,39	13,81	-,9468	10,21079
Zmijewski	105	-4,94	610,50	23,2739	92,72200
Valid N (listwise)	105				

Source: Data Processed, 2024

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Based on the data in Table 17, it can be explained about the results of descriptive statistics in this study, namely. Altman Z-Score Method results of the descriptive statistical test results, the Minimun value is -912.08, found in Global Teleshop Tbk (GLOB) in 2022, then the Maximun value is 159.28 found in PT Yelooo Integra Datanet Tbk (YELO) in 2021, the mean is -28.6184. Then the standard deviation is 133.19029.

Springate Method results of the descriptive statistical test results, the Minimun value is -79.39, also found in Global Teleshop Tbk (GLOB) in 2022, then the Maximun value is 13.81 which is also found in PT Yelooo Integra Datanet Tbk (YELO) in 2021, the Mean value is -.9468, then the Standard Devision in this Springate method is 10.21079.

Zmijewski Method results of the descriptive statistical test, the Minimun value is -4.94, found at PT Yelooo Integra Datanet Tbk (YELO) in 2021, then the Maximun value is 610.50 which is Global Teleshop Tbk (GLOB) in 2022, the Mean value is 23.2739, then the Standard Devision in this Zmijewski method is 92.72200.

Normality Test.

Normality test is a test carried out with the aim of whether the data distribution is normally distributed or not. The criteria for determining whether the data is normally distributed or not is by looking at the sig value, if the Kolmogorov-Smirnov sig value> 0.05 then the data is normally distributed. If the Kolmogorov-Smirnov sig value <0.05 then the data is not normally distributed. The following Table 18 are the results of the Normality test as follows.

Table 18. Normality Test

One-Sample Kolmogorov-Smirnov Test				
		Altman *Z-Score*	**Springate**	**Zmijewski**
N		105	105	105
Normal Parameters[a,b]	Mean	-28,6184	-,9468	23,2739
	Std. Deviation	133,19029	10,21079	92,72200
Most Extreme Differences	Absolute	,478	,436	,503
	Positive	,355	,342	,503
	Negative	-,478	-,436	-,380
Test Statistic		,478	,436	,503
Asymp. Sig. (2-tailed)		,000[c]	,000[c]	,000[c]

Test distribution is Normal. Calculated from data. Lilliefors Significance Correction.
Source: Data Processed, 2024

Based on Table 18, it can be seen that the Sig. value for the Altman Z-Score method, Springate method, and Zmijewski method is 0.000. This shows that the data distribution in the Altman Z-Score method, Springate method, and Zmijewski method is <0.05, which means that the data distribution in the Altman Z-Score method is not normally distributed.

Homogeneity Test

Homogeneity test is a test conducted to determine whether the data in a variable is homogeneous or not. The basis for decision making in the homogeneity test is: If the significant value (P-Value) < 0.05 then the data is not the same or not homogeneous. If the significance value (P-Value) > 0.05 then the data is the same or homogeneous. (Setyawan, 2021) The following are the results of the homogeneity test as follows.

Table 19. Test of Homogeneity

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Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Score Bankruptcy Prediction Analysis	Based on Mean	13,925	2	312	,000
	Based on Median	4,074	2	312	,018
	Based on Median and with adjusted df	4,074	2	188,230	,019
	Based on trimmed mean	5,257	2	312	,006

Based on Table 19, the results of the homogeneity test on the data, the Sig value of 0.000 is obtained, which means that the P value is <0.05, which indicates that the variants of the data are not equal or not homogeneous.

Hypothesis Test

Based on the results of the Normality test which shows that the data is not normally distributed and based on the results of the Homogeneity test shows that the results are not the same or not homogeneous, the next statistical test used is the Independent-Sample Test used is the Kruskall Wallis Test.

The Kruskal-Wallis test is a nonparametric test whose purpose is to determine whether there are statistically significant differences between two or more groups of independent variables. The Kruskal-Wallis test is used if assumptions such as normality and homogeneity assumptions are not met. The decision-making provisions are: If the Asymp.Sig value> 0.05 then there is no significant difference or H0 is accepted and H1 is rejected. If the Asymp.Sig value <0.05 then there is a significant difference or H0 is rejected and H1 is accepted. The following Table 20 are the results of the Kruskall Wallis test, as follows.

Table 20. Kruskal-Wallis Test

Ranks			
	Bankruptcy Prediction Analysis Method	N	Mean Rank
Score Bankruptcy Prediction Analysis	Altman *Z-Score*	105	198,09
	Springate	105	166,15
	Zmijewski	105	109,76
	Total	315	

Test Statistics[a,b]	
	Score Bankruptcy Prediction Analysis Method
Chi-Square	50,636
df	2
Asymp. Sig.	,000
a. Kruskal Wallis Test	
b. Grouping Variable: Bankruptcy Prediction Analysis Method	

Source: Data Processed, 2024

Based on the Kruskal Wallis test in Table 20, the significance value is 0.000 <0.05, which means that H1 is accepted, H0 is rejected because there are significant differences regarding the results of bankruptcy prediction analysis in retail companies listed on the Indonesia stock exchange for the 2020-2022 period using the Altman Z-Score, Springate, and Zmijewski methods. The difference in these results can be due to differences in the

financial ratios used in each method and there are also differences in the value of bankruptcy criteria in each bankruptcy prediction analysis method .

Based on the results of the difference test using the Kruskall Wallis test, Table 15 shows that the significant value is 0.000 <0.05, which means that H1 is accepted and H0 is rejected because there is a significant difference in the results of the bankruptcy prediction analysis of retail companies listed on the Indonesian Stock Exchange for the 2020-2022 period using the Altman Z-Score, Springate, and Zmijewski methods.

The difference in results can be due to differences in the financial ratios used in each method, where the Altman Z-Score method uses four financial ratios consisting of: working capital to total assets ratio, retained earnings to total assets ratio, earnings before interest and taxes to total assets ratio, and equity book value to total debt book value ratio. The Springate method also uses four types of financial ratios, namely: working capital to total assets ratio, earnings before interest and taxes to total assets ratio, earnings before taxes to total current liabilities ratio, and sales to total assets ratio. While the Zmijewski method uses three types of financial ratios, namely: ROA ratio, debt ratio, and liquidity ratio.

The difference in results can also be due to different bankruptcy criteria values, such as the Altman Z-Score method which has a criterion value if the Z-Score value> 2.6= Healthy, the Z-Score value between 1.1-2.6= Gray area, and the Z-Score value <1.1= Bankrupt. Then in the Springate method the criterion value is if S> 0.862= Healthy and S <0.862= Bankrupt. Then in the Zmijewski method the criterion value is if <0= Healthy and> 0= Bankrupt. So that from these two differences, it produces differences in bankruptcy prediction results between the three bankruptcy prediction analysis methods. Hal ini banyak didukung oleh penelitian-penelitian lainnya (Dahni, 2019; Melina & Susetyo, 2021; Melissa & Banjarnahor, 2020; Silaen et al., 2020; Wulandari & Fauzi (2022)). The results of this study are in accordance with research conducted which shows that there are significant differences between the Altman Z-Score, Springate and Zmijewski models.

CONCLUSION

Based on the research, there were 6 companies that experienced bankruptcy for three consecutive years according to the three methods. There are 6 sample companies that are always in a position of bankruptcy during the study year. Then the accuracy level of the Springate method is better than Zmijewski and Altman Z-Score. The results indicate a significant difference between the bankruptcy prediction results of the three methods, reflecting that each method utilizes distinct financial ratios and bankruptcy criteria. The impact of these findings is significant for stakeholders, as it underscores the importance of selecting an appropriate bankruptcy prediction method tailored to the specific financial context and needs of the retail industry. The choice of method may influence decisions in risk assessment, investment, and policy-making, providing tailored guidance for financial stability and risk mitigation strategies in fluctuating market conditions.

RECOMMENDATION

For further research, it is recommended to add bankruptcy methods because there are still many bankruptcy methods such as the Grover, Fulmer, Ohlson, Zavgen, Taffler methods, and other methods. Then to improve the research results, it is recommended that

further researchers increase the research period so that they can more clearly see the condition of the company if using a long time span. Then, for the use of samples in this study, only retail companies were used, it is suggested to further researchers to be able to use other types of companies, such as transportation, telecommunications, and so on.

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