

## Comparative Analysis of Financial Distress Models in Predicting Bankruptcy during Covid-19 Pandemic

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### ABSTRACT

This study aims to determine whether there is a difference between the financial distress models in predicting bankruptcy, and the most accurate financial distress models bankruptcy in construction and building companies listed on Indonesia's Stock Exchange for the 2020-2021 period. The financial distress models used in this research are Springate, Taffler, and Zmijewski. The research population consisted of 18 companies and the sample was taken as many as 16 companies using purposive sampling method. The data research was collected from the company's financial statement. This research uses a descriptive comparative method by conducting the Kruskal Wallis test to determine the difference between the Springate, Taffler, and Zmijewski. The results showed that there is a significant difference between the financial distress models in predicting bankruptcy predictions for the construction and building companies listed on Indonesia's Stock Exchange for the 2020-2021 period. The most accurate model in bankruptcy prediction is the Taffler model with an accuracy rate of 100% and the error rate of 0%. Zmijewski has 81,25% of accuracy rate and 18,75% of error. Then the lowest accurate model in bankruptcy prediction is the Springate model with 12,50% of accuracy and 87,50% of error rate.

Keywords: Covid-19, Financial Distress, Bankruptcy Prediction, Construction, Building Sector



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### INTRODUCTION

Corona Virus Disease or known as Covid-19 is a threat in various sectors, both in the health sector and non-health sector (Arafa et al., 2021; Paramita et al., 2021). Since its appearance in Wuhan, China at the end of 2019, the virus outbreak has continued to spread to almost all countries in the world. In Indonesia itself, the virus was detected in March 2020 and keeps increasing over time. The virus outbreak causes a significant change in the health and non-health sector. Economic activity was paralyzed due to restrictions on social mobility in the society that last long enough, so the economic productivity in various sectors decreased, especially the sectors closely related to social mobility, which one is the construction and building sectors. BCA economist research in 2020 shows that the impact of Covid-19 on various economic sectors is divided into 3 levels as follows:

**Table 1. The Level of the Pandemic Impact on the the Economic Sector**

No	Impact Levels	Affected Sector
1	High Impact (Turnover down > 30%)	<ul style="list-style-type: none"> <li>• Tourism</li> <li>• Manufacture</li> <li>• Building Construction</li> <li>• Property and consumption</li> <li>• Pharmacy</li> </ul>
2	Medium Impact (Turnover down 10-30%)	<ul style="list-style-type: none"> <li>• Multifinance</li> <li>• Automotive</li> <li>• Shopping Center</li> <li>• Livestock, fishery</li> <li>• Distribution sector</li> <li>• Plantation Commodities</li> <li>• Mining</li> </ul>
3	Low Impact (Turnover decreased < 10%)	<ul style="list-style-type: none"> <li>• Packaging</li> <li>• E-Commerce</li> <li>• Power Plant</li> <li>• Medical Tools</li> <li>• Distribution</li> <li>• Tobacco/Cigarette</li> <li>• IT/Communication</li> </ul>

Source: BCA Economic Research (2020)

The results of the research show that the construction and building sector is at a high impact level, so it can be said that the sector is heavily affected by a decrease in turnover of more than 30%. Meanwhile, the Central Statistics Agency (BPS) in Indonesia obtained data on the value and growth of Gross Domestic Product (GDP) in the construction sector which was very significant in 2019, the era before the COVID-19 pandemic hit Indonesia, then in 2020, and 2021. From 2019 to 2020, the GDP growth in the construction sector decreased quite dramatically to reach -3.26%, then gradually recovered in 2021 with a growth of 2.81% ([www.bps.go.id](http://www.bps.go.id)). Quoted from the Ministry of Public Works and Public Housing website, the Covid-19 pandemic has significantly reduced productivity in various sectors, including the construction services sector. The decrease in productivity is caused due to restrictions on social mobility and concerns about the risk of being exposed to the Coronavirus, which will make the situation is getting worse ([binamarga.pu.go.id](http://binamarga.pu.go.id)). This has affected in delayed construction projects and the cancellation of contract agreements. Then, the decrease in people's income during the pandemic era conduce in low people's purchasing power, especially purchasing power for tertiary needs such as property. The low level of people's purchasing power has increasingly pushed the condition of companies engaged in this sector to worsen and suffer a lot of losses.

In a decreased condition, companies must have strategies to recover from difficulty and improve their performance again. Because if the company can't afford it, they will run into financial distress either in the near term or in the future. In addition, the company will find difficulties to maintain its sustainability then doesn't rule out the possibility that the company will go bankrupt. (Hertina & Kusmayadi, 2020) mentions that "financial distress is marked by the company's inability to fulfill its obligations, especially in short-term liabilities including liquidity, also in the solvency category." Based on illustration of the company's condition above, it is necessary to evaluate the financial performance of companies that affected by the Covid-19 pandemic, which can be useful for companies in assessing the company's sustainability and assisting companies to prepare anticipation ways and improving their performance in the event of a significant decrease, both for short term or long term. Financial difficulties can arise due to several factors, such as insufficient capital, large amounts of liabilities, and interest or losses that hit the company.

Financial distress analysis can be done with various predictive models developed by several experts, such as Altman, Fulmer, Springate, Ohlson, Taffler, Zmijewski, and others. There are assessments of accuracy level and error for the prediction models in predicting bankruptcy, to find out the most appropriate model used in bankruptcy prediction. So that, the result can be used as a benchmark for companies in assessing their condition. Some previous studies have shown different results for each model used to predict bankruptcy, also with the accuracy level and error rate of the prediction models.

The results Prakoso et al., (2022) showed that there was a significant difference between the Grover, Springate, and Taffler models with the highest accuracy is Taffler model by 96% of accuracy and the error by 4%. While the results of the study Listyarini (2020) showed that Zmijewski model is the most accurate model for predicting manufacturing companies because it has 100% of accuracy rate and 0% of error. The same thing is also shown by Faisal (2022) that Zmijewski model has the highest score with 83,33% of accuracy and 16,7% of error when compared with Springate and Grover model. Kason et al., (2020) stated that the Grover Score, Springate Score, and Altman Z Score models have a significant and simultaneous effect, so they can explain the critical condition of companies in the mining sector listed in Indonesia Stock Exchange on 2013-2017 period. Then in comparing the Altman, Grover, and Springate models, it is found that Springate is the most appropriate model because it has the highest score of accuracy rate and has the lowest score of error rate.

Based on the description of the background and previous research, the author intends to conduct research related to the prediction of bankruptcy for companies engaged in construction and building using the Springate, Zmijewski, and Taffler models which are very rarely used in predicting financial distress. These prediction models will be assessed for accuracy and error rates to determine the most appropriate prediction model used to predict financial difficulties for companies in the construction and building sectors. The prediction model and sector chosen by the authors are based on the shortcomings and suggestions of previous research.

### **Financial Distress**

In the Advanced Financial Management module of the Indonesian Institute of Accountants, Black's Law Dictionary defines financial distress as "inability to pay one's debt, lack of means of paying one's debt. Such a condition of a woman's (or man's) assets and liabilities that the former made immediately available would be insufficient to discharge the latter". The explanation put forward by Black's Law Dictionary assesses financial distress based on the inability to pay debts in general, both in the short term or in a long term, also looking at the inability of assets to cover liabilities. Financial distress can be defined as the stage of declining financial conditions in a company before bankruptcy (Herlina & Murhadi, 2021). That is why an early introduction of the company condition is important. According to (Mulyati & Ilyasa, 2020), every company that through financial distress will not always go bankrupt, it depends on how the management of the company solves the problem, because financial distress is a signal of company bankruptcy. Several things may do by companies in financial distress condition, there are:

1. Selling their assets  
When the company is in financial distress condition, they can sell their assets to cover some or all of their liabilities and provide capital stock, so the company will increase their liquidity.
2. Merging with other companies  
Generally, companies merge with other companies to increase company's value, expand market share, etc. This can be used as a strategy for companies that through financial distress to strengthen the company's position so it will help the companies to out of the distress zone
3. Reducing capital expenditures for research and development  
The company can reduce capital expenditure, especially the unnecessary expenses by the company. Several companies reduce capital expenditure by cutting the marketing cost, salaries or bonuses.

4. Issuing shares or new bonds to the market  
By issuing shares or new bonds to the market, it will help the company to get capital for company operations from investors and market.
5. Arranging negotiation with banks or any institution that provide credits  
In this case, the company can ask banks or other creditors to restructure credit. This way can help the company to get relief, for example asking for interest reduction or extending credit time.
6. Converting debt into equity  
A debt for equity swap can be an effective strategy to companies that through financial distress in restructuring the company's capital and borrowing, also strengthening the company balance sheet and dealing with other issues.
7. Filing for bankruptcy  
This is one way for company that experience financial difficulties to get from under a crushing liabilities load, but this strategy has negative consequences that can last for years (When to Declare Bankruptcy, n.d.)

The first, second, and third ways are strategy that related with company's assets or known as asset restructuring. Asset restructuring defines as the process of buying or selling company's assets. The company can sell assets that are not related to the company's core business, for example selling their subsidiary or other division that does not contribute to the company. After asset restructuring, the company will have a new organizational structure that is more focused on their new strategy that is related with the company's core business. While the fourth, fifth, sixth, and seventh ways are strategy that related with the right side of the company's statement of financial position (company's funding) and it is kind of financial restructuring. Companies in financial distress can carry out asset restructuring and financial restructuring in one time.

### **Bankruptcy**

According to Resfitasari et al., (2021), bankruptcy is a company's failure to carry out activities to generate profits. Some indicators used to predict bankruptcy, there are internal indicator and external indicator. Internal indicators come from inside the company, such as management capabilities, cash flow, financial reports, and sales trends. Meanwhile, external indicators come from outside companies, such as the financial market, information from suppliers, and consumer (Gunawan & Warninda, 2022). According to Fauzi et al., (2021) Copeland and Weston (1988) in Financial Theory and Corporate Policy describe bankruptcy as:

1. Economic Failure  
Such a condition when the company's income is still deficient and cannot cover all expenses of the company.
2. Financial Failure  
Financial failure is described as insolvency, such a condition when the company hasn't resolved its financial position, for example, the company failed to meet the performance requirements from company benchmarks that have been set.

Based on some explanations above, bankruptcy can be explained by a bad financial condition of a company with difficulties in carrying out the company operations, achieving company goals, and making revenue and profit, which all those problems can be caused by internal and external factors. According to Kordestani in Anugrah (2019) stages of bankruptcy experienced by several companies are: (1) Latency stage, a condition when the company will experience a decrease in their Return on Asset (ROA); (2) Shortage of Cash stage, a condition when companies cannot pay their liabilities because doesn't have sufficient cash, but in this stage, the company still has a high level of profitability; (3) Financial distress stage, the company will experience emergency financial difficulties; (4) Bankruptcy stage, when the company is unable to pay their liabilities then going to bankrupt.

### Springate Prediction Model

Gordon LV Springate proposed a bankruptcy prediction method in 1978 known as the Springate Model or Canadian Model (Mulyati & Ilyasa, 2020). According to Priambodo and Pustikaningsih (2016) in Kason et al., (2020), the Springate model can use to predict bankruptcy. This model was created by following the method used in the Altman model (1968), namely step-wise Multiple Discriminant Analysis (MDA) to select the financial ratios, which can be used in predicting corporate bankruptcy. Then, Springate found 4 from 19 financial ratios that can be used to predict corporate bankruptcy with an accuracy rate of 92.5% (Hertina & Kusmayadi, 2020). Those 19 financial ratios tested with another model, namely Altman, it is known that there are only 4 ratios with an alleged bias in comparing companies that have the potential to experience or not experience bankruptcy (Prakoso et al., 2022). The Springate model has the following equation:

$$S = 1.03A + 3.07B + 0.66C + 0.4D$$

If the S-Score is  $< 0.862$ , the company is categorized in the distress zone and the company has the potential to go bankrupt, but if the S-Score is  $> 0.862$ , the company is categorized as healthy and has no potential to go bankrupt.

### Taffler Prediction Model

The Taffler model was first formulated by Taffler in 1983 to predict manufacturing companies bankruptcy on London Stock Exchange period 1969-1976 (Widiasmara & Rahayu, 2019). Taffler uses 4 financial ratio variables, these include profit before tax to current liabilities ratio, current assets to total liabilities ratio, current liabilities to total assets ratio, and net income after tax to total assets ratio. The Taffler model has 95.7% of accuracy rate for companies that are predicted to go bankrupt and 100% of accuracy rate for companies that are not predicted to bankrupt (Prakoso et al., 2022). Based on the results of research conducted by (Prakoso et al., 2022), the Taffler model is the most accurate prediction model if compared with Altman, Springate, and Grover, with 96% accuracy rate and 4% of error rate. The equation model of the Taffler method is:

$$'Z \text{ Taffler} = 3.20 + 12.18X_1 + 2.50X_2 - 10.68X_3 + 0.0289X_4$$

In the Taffler method if the T value  $< 0.2$  then the company is categorized in the distress zone and has the potential to go bankrupt, while if the T value  $> 0.2$  the company is categorized as a healthy company and has no potential to go bankrupt.

### Zmijewski Prediction Model

The Zmijewski model is the result of a review of bankruptcy studies based on the results of previous research for about 20 years. In his research, Zmijewski used 75 bankrupt companies and 73 healthy companies during 1972-1978 for being sampled which indicated by the F-test indicator to the group ratio (Nirmalasari, 2018). Zmijewski combines various financial ratios together and provide the suitable coefficient for combining independent variable, also this model has easy implementation. Those are become a strengths for the Zmijewski model. But, this model also has weaknesses that are the Zmijewski score can be manipulated or biased by wrong accounting principle or another financial manipulation. Zmijewski using only three ratios and has no strictness in assessing the bankruptcy rate (Permatasari et al., 2019). The equation model of the Zmijewski method is:

$$X = -4.3 - 4.5X_1 + 5.72X_2 + 0.004X_3$$

In the Zmijewski model, if the X-Score  $< 0$ , the company is categorized as a healthy company and is not predicted to go bankrupt. Meanwhile, if the X-Score  $> 0$ , the company is categorized in distress and predicted to go bankrupt.



## Hypothesis Development

Springate initially had 19 financial ratios, but after being tested with Altman model, Springate only use four financial ratios to classify bankruptcy companies and non-bankruptcy companies (Listyarini, 2020). Taffler used four financial ratios to predict bankruptcy which was developed from Altman Z-Score model (Prakoso et al., 2022). Zmijewski use three financial ratios, there are Return on Asset (ROA), debt ratio, and current ratio. Zmijewski used 840 samples of companies, and the result shown that 800 companies are not bankrupt and 40 companies are bankrupt (Mulyati & Ilyasa, 2020). According to the research of Prakoso et al., (2022), Hertina and Kusmayadi (2020), Mulyati and Ilyasa (2020), Tanjung (2020), Amalia (2019), Faisal (2022), there is a significant different between Springate, Taffler, and Zmijewski. Based on explanation above, author formulated the hypothesis as follow: There is difference between Springate, Taffler and Zmijewski models in predicting bankruptcy of construction and building companies listed in Indonesia Stock Exchange 2020-2021 period.

## METHODS

The research method used by the author in this study is comparative descriptive method by conducting a non-parametric test using the Kruskal-Wallis test. The Kruskal-Wallis test is used to determine the differences of financial distress models for predicting bankruptcy. The financial distress models used in this study consist of the Springate, Taffler, and Zmijewski model. This study also compares the result of bankruptcy prediction analysis by comparing the accuracy and error rate of each prediction model. In this study, secondary data were obtained from the financial statement of the company that published in Stock Exchange. The population is all construction and building companies listed in Indonesia Stock Exchange with total of 18 companies and 16 companies were selected as research samples. The sampling technique method used in this study is purposive sampling method with the following criteria:

1. Construction and building companies listed in Indonesia Stock Exchange (IDX).
2. Construction and building companies that report financial statements for 2020-2021 and published in Indonesia Stock Exchange (IDX) website ([www.idx.co.id](http://www.idx.co.id)).
3. Construction and building companies that attach financial statements in Rupiah.

### Descriptive Analysis

1. The technical of descriptive analysis in this study starts with showing the analysis calculation result of the Springate, Taffler, and Zmijewski model.
2. The analysis financial distress calculation result will be classified into a healthy and unhealthy condition of the company. The companies in healthy condition is predicted not to go bankrupt, while companies in unhealthy condition is predicted to go bankrupt.
3. Then, the result will be validated with the actual conditions of the company, whether the company is still operating and listing in IDX or not.

The hypothesis test will be conducted by Kruskal-Wallis test using IBM SPSS Statistic 25. The Kruskal-Wallis test is used to determine the difference between the prediction models, there are Springate, Taffler and Zmijewski.

After the prediction analysis and different test were done, the author compares the accuracy and error rate of bankruptcy prediction models, in order to show which prediction model that most suitable for predicting bankruptcy of construction and building companies. According to Bimawiratma (2016) in Prakoso et al., (2022), the indicator of a bankrupt company is a delisted company. The prediction result are considered accurate if the predicted company will be bankrupt then the company is delisted from Indonesia Stock Exchange and if the predicted company is not bankrupt then the company is not delisted from Indonesia Stock Exchange. The actual condition of all construction and building companies that used in this study is listed in Indonesia Stock Exchange.

In order to find out the most accurate models in predicting bankruptcy, calculate the result of bankruptcy prediction models with the actual condition of construction and building companies using this formula:

$$\text{Level of Accuracy} = \left( \frac{\text{Total of Correct Prediction}}{\text{Total Samples}} \right) \times 100\%$$

The most accurate prediction model is the model with the highest percentage of prediction accuracy rate or close to 100%. Another consideration is the error level of each prediction model researched using the error type level, the formula is:

$$\text{Type Error} = \left( \frac{\text{Total Error}}{\text{Total of Sample Distress}} \right) \times 100\%$$

## RESULTS AND DISCUSSION

### Kruskal-Wallis Test

**Table 2. Ranks**

	M odel	N	Mean Rank
Prediction Results	Springate	32	44.13
	Taffler	32	78.66
	Zmijewski	32	22.72
	Total	96	

Source: Data Processed (2022)

**Table 3. Test Statistics**

	Prediction Results
Kruskal-Wallis H	65,704
Df	2
asympt. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: Prediction Model

Source: Data Processed (2022)

Kruskal Wallis Test show that the Asymp value is known that Sig of  $0.000 < 0.05$ . This means that H1 is accepted and H0 is rejected, in other words, there are significant differences regarding the prediction results of the bankruptcy of the Construction and Building sector for the 2020-2021 period as measured by the Springate, Taffler, and, Zmijewski methods. The difference between the prediction results is because there are differences in the financial ratios used in each of these models. Springate uses financial ratios consisting of working capital to total assets, earning before interest and tax to total assets, earnings before tax to total assets, sales to total assets. Taffler uses financial ratios consisting of earnings before tax to current liabilities, current assets to total debt, current liabilities to total assets, earnings after tax to total assets. While the Zmijewski model uses financial ratios consisting of earnings after tax to total assets, total debt to total assets, current assets to current liabilities.

Another difference is the conclusion criteria. In the Springate model, if the X-Score  $< 0.862$  then the company is categorized as a company is categorized as unhealthy. But if the X-Score  $> 0.862$  then the company is categorized as healthy. In the Taffler method, if the T value  $< 0.2$  then the company is predicted to go bankrupt, while if the T value  $> 0.2$  then the company is categorized as a healthy company and not predicted to go bankrupt. Meanwhile, in the Zmijewski model, if the X Score  $< 0$ ,

then the company is categorized as healthy company and not predicted to go bankrupt, while if the X score > 0, the company is categorized as unhealthy company and predicted to go bankrupt.

The results of this study are in line with research conducted by Prakoso et al., (2022), Hertina and Kusmayadi (2020), Mulyati and Ilyasa (2020), Tanjung (2020), Amalia (2019), Widiasmara and Rahayu (2019), Faisal (2022) that there are differences in each method of bankruptcy prediction. The following are the results of calculations from each prediction method consisting of the Springate, Taffler, and Zmijewski methods for Construction & Building Companies for the 2020-2021 period:

**Table 5. Results of the Springate Prediction Model for Construction and Building Companies Period 2020**

No	Company List	Year		Average	Prediction Result	Actual Condition	
		2020	2021			2020	2021
1	ACST	-1.41	-0.66	-1.04	Bankrupt	Listing	Listing
2	ADHI	0.28	0.22	0.25	Bankrupt	Listing	Listing
3	CSIS	0.60	0.66	0.63	Bankrupt	Listing	Listing
4	DGIK	0.19	0.30	0.25	Bankrupt	Listing	Listing
5	IDPR	-0.94	-0.05	-0.50	Bankrupt	Listing	Listing
6	NRCA	1.07	1.03	1.05	Not Bankrupt	Listing	Listing
7	PBSA	1.23	1.34	1.29	Not Bankrupt	Listing	Listing
8	PTPP	0.30	0.28	0.29	Bankrupt	Listing	Listing
9	SKRN	0.42	0.30	0.36	Bankrupt	Listing	Listing
10	SSIA	0.34	0.28	0.31	Bankrupt	Listing	Listing
11	TAMA	-0.22	-0.07	-0.15	Bankrupt	Listing	Listing
12	TOPS	0.20	0.48	0.34	Bankrupt	Listing	Listing
13	TOTL	0.44	0.43	0.44	Bankrupt	Listing	Listing
14	WEGE	0.55	0.61	0.58	Bankrupt	Listing	Listing
15	WIKA	0.22	0.68	0.45	Bankrupt	Listing	Listing
16	WKST	-0.37	0.16	-0.11	Bankrupt	Listing	Listing

Source: Data Processed (2022)

**Table 6. Results of the Taffler Prediction Model in Construction and Building Companies Period 2020-2021**

No	Company List	Year		Average	Prediction Result	Actual Condition	
		2020	2021			2020	2021
1	ACST	8.13	5.46	6.80	Not Bankrupt	Listing	Listing
2	ADHI	13.12	13.88	13.5	Not Bankrupt	Listing	Listing
3	CSIS	12.88	13.23	13.06	Not Bankrupt	Listing	Listing
4	DGIK	8.93	9.86	9.40	Not Bankrupt	Listing	Listing
5	IDPR	-1.86	6.51	2.33	Not Bankrupt	Listing	Listing
6	NRCA	13.17	13.3	13.24	Not Bankrupt	Listing	Listing
7	PBSA	16.29	19.12	17.71	Not Bankrupt	Listing	Listing
8	PTPP	10.72	11.19	10.96	Not Bankrupt	Listing	Listing
9	SKRN	7.33	6.36	6.85	Not Bankrupt	Listing	Listing
10	SSIA	7.37	5.58	6.48	Not Bankrupt	Listing	Listing
11	TAMA	7.21	7.94	7.58	Not Bankrupt	Listing	Listing
12	TOPS	7.35	9.84	8.60	Not Bankrupt	Listing	Listing
13	TOTL	12.73	12.67	12.70	Not Bankrupt	Listing	Listing
14	WEGE	12.38	12.64	12.51	Not Bankrupt	Listing	Listing
15	WIKA	12.55	6.2	0.45	Not Bankrupt	Listing	Listing
16	WKST	6.89	6.74	-0.11	Not Bankrupt	Listing	Listing

Source: Data Processed (2022)



**Table 7. Results of the Zmijewski Prediction Model in Construction and Building Companies for the Period 2020-2021**

No	Company List	Year		Average	Prediction Result	Actual Condition	
		2020	2021			2020	2021
1	ACST	2.77	0.09	1.43	Bankrupt	Listing	Listing
2	ADHI	0.56	0.58	0.57	Bankrupt	Listing	Listing
3	CSIS	-1.55	-1.89	-1.72	Not Bankrupt	Listing	Listing
4	DGIK	-1.87	-2.31	-2.09	Not Bankrupt	Listing	Listing
5	IDPR	-0.38	-0.55	-0.47	Not Bankrupt	Listing	Listing
6	NRCA	-1.68	-1.82	-1.75	Not Bankrupt	Listing	Listing
7	PBSA	-3.24	-3.36	-3.30	Not Bankrupt	Listing	Listing
8	PTPP	-0.11	-0.1	-0.11	Not Bankrupt	Listing	Listing
9	SKRN	-0.74	-0.81	-0.78	Not Bankrupt	Listing	Listing
10	SSIA	-1.73	-1.48	-1.61	Not Bankrupt	Listing	Listing
11	TAMA	-0.18	-0.24	-0.21	Not Bankrupt	Listing	Listing
12	TOPS	-0.4	-0.65	-0.53	Not Bankrupt	Listing	Listing
13	TOTL	-1.02	-1.35	-1.19	Not Bankrupt	Listing	Listing
14	WEGE	-0.78	-1.04	-0.91	Not Bankrupt	Listing	Listing
15	WIKA	-0.02	-0.08	-0.05	Not Bankrupt	Listing	Listing
16	WKST	1.17	0.62	0.90	Bankrupt	Listing	Listing

Source: Data Processed (2022)

Based on table 5 companies are regarding the results of the Springate prediction model for the years 2020-2021, 14 of the 16 companies are predicted to go bankrupt, while the other 2 companies are predicted not to go bankrupt. Prediction results based on the Taffler model in Table 6 show that no company is predicted to go bankrupt. In other words, companies in the construction and building sector during 2020-2022 are in a healthy condition and are not experiencing financial difficulties. Meanwhile, based on the predictions of the Zmijewski model, 3 companies are categorized as bankrupt and 13 others are categorized as not bankrupt.

**Table 6. Comparison Result of Accuracy and Error Rate of each Prediction Models**

Prediction Result	Models		
	Springate	Taffler	Zmjewski
Bankrupt	14	0	3
Not Bankrupt	2	16	13
Total Sampel	16	16	16
% Accuracy Level	12,50%	100%	81,25%
% Type Error	87,50%	0%	18,75%

Source: Data Processed (2022)

Based on the results of the accuracy test and the type of error, it is known that the highest level of accuracy is the Taffler model with an accuracy rate of 100% and an error rate of 0%. The second is the Zmijewski model with an accuracy rate of 81.25 % and an error rate of 18.75%. Then the last is the Springate model with the lowest accuracy rate of 12.50% and an error rate of 87.50%.

## CONCLUSION

Calculation of the springate model prediction show that 14 companies are predicted to go bankrupt, and 2 other companies are categorized as healthy and not predicted to go bankrupt. The prediction results of the Taffler model show that all companies are indicated as healthy and not predicted to go bankrupt. Result of Zmijewski model show that 3 companies are predicted to go bankrupt and 13

others are categorized as healthy and not predicted to go bankrupt. Kruskal Wallis test result show that there is a significant difference between the Springate, Taffler, and Zmijewski models in predicting the bankruptcy of companies in the Construction and Building Sub-Sector listed on the IDX for the 2020-2021 period. The most accurate model in predicting financial distress is the Taffler model with an accuracy rate of 100% and an error rate of 0%. Then the Zmijewski model with an accuracy rate of 81.25 % and an error rate of 18.75%. The Springate model has the lowest accuracy rate, which is 12.50% and the error rate is 87.50%.

This research is inseparable from several limitations that limit the scope of the study, where the model used is only 3 which consists of Springate, Taffler, and Zmijewski with a span of only two years. There are several suggestions that can be used to improve further research. In future research, it is recommended to use more predictive models with a longer research period. Some models that are rarely used such as Fulmer, Ohlson, and Zavgren are also suggested to be used in future research.

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