

The Accuracy of Financial Distress Measurement on Altman Z-Score, Grover, Springate, and Zmijewski Methods (Study on Companies in LQ-45 Index Listed in Indonesia Stock Exchange During the 2015 - 2019 Period)

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ABSTRACT

The aim of this study is to identify the accuracy level of Altman Z-Score, Springate, Grover, and Zmijewski methods in predicting the financial distress condition and to see if there is distinctive result from each method in predicting potential financial distress. The population of this study comprised of the entire companies in LQ-45 index, listed in Indonesia Stock Exchange (BEI) during the 2015-2019 period. The technique in selecting the samples was purposive sampling. It was obtained from 28 companies in LQ-45 index during the 2015-2019 period. The technique analysis used in this research was paired sample t-test, which defined as a comparison of the significance of the four financial distress prediction methods that made of the company real condition. The result of the analysis indicated that there was a significant difference between several prediction methods of potential financial distress in LQ-45 index companies listed in Indonesia Stock Exchange (BEI), and it was unearthed by Grover prediction which showed the highest level of accuracy, in which the accuracy was at 100%, whilst the accuracy rate of the Springate method and the Altman Z-Score method are 96% and 75% respectively. Finally, Zmijewski's prediction method resulted an accuracy rate at 43%.

Keywords

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

Introduction

An LQ-45 stock index is a group of company stocks with high liquidity and market capitalization. It consists of companies that pass several selections and meet the criteria. According to Denny Bagus (2009), the LQ-45 index is the market capitalization value of the 45 that most liquid stocks and has a large capitalization value. The LQ-45 index uses 45 stocks selected. It is based on stock trading liquidity and is adjusted every six months (at the beginning of February and August). The continuing stocks contained in the index will always change. To be included in the LQ-45 index and stocks must meet the criteria. Essentially, Capital and financial risk factors play a role in explaining the phenomenon of bankruptcy or corporate financial stress. Detecting the company condition earlier, companies and investors take anticipatory steps to prevent financial difficulties from being handled immediately.

In an era of rapid industrial development, competition is getting harder among fellow businesses, both local and international

businesses. With the increasingly fierce competition, it requires companies to strengthen their company's financial fundamental condition. Even though companies in the LQ-45 stock index have a good reputation, it does not mean that companies in the LQ-45 stock index unrelated to bankrupt. To anticipate bankruptcy, the company must have early preparations to prevent unwanted things from happening. Researchers namely Susilawati (2012), Reza Wibowo (2015), Raffles and Endang (2015) analyzed company bankruptcy. It generally explains that the common cause of the risk of bankrupting for companies listed on the IDX, including LQ-45, is the level of reduction in sales. The decline in sales can cause a reduction in company revenue and have an impact on the decline in profitability, as well as the company's inability to anticipate economic developments and business competition, which in turn will cause the company to lose out in the business world which ultimately leads to bankruptcy. Before experiencing bankruptcy, the company will first experience financial difficulties or better known as financial distress.

According to Yeni Mustika (2015), financial distress is a condition, the company's finances are not healthy or critical. Financial distress has a close relationship with company bankruptcy because financial circumstances have decreased the risk of economic failure. According to Platt and Platt (in Hastuti (4), 2015), financial distress is a process of deteriorating financial conditions that occurs before bankruptcy or liquidation. Financial distress can measure with various bankruptcy prediction methods such as the Altman Z-Score, Springate, Grover, Zmijewski, and so on.

The four methods state to have a high degree of accuracy. There are inconsistencies in the results in several studies that different research objects or even the same research object provide different research results regarding which prediction method is the best and most appropriate for predicting bankruptcy on the objective. Therefore, this research aims to determine which method is the best and the most suitable for predicting bankruptcy in LQ-45 indexed companies listed on the Indonesia Stock Exchange for the 2015-2019 period. Seeing at some of the phenomena in previous research, the researcher is interested in knowing the most influential measurement method for predicting the component of bankruptcy with the title "The Accuracy of Financial Distress Measurement on Altman Z-Score, Grover, Springate, and Zmijewski Methods (Study on Companies in LQ-45 Index Listed in Indonesia Stock Exchange During the 2015 - 2019 Period)".

Literature Review

Financial Report

According to Kasmir (2016), financial statements contain the financial condition of an entity in the current period or for future periods. IAI (2015), the completing components of financial statements. They are financial position (end of period), profit and loss and other comprehensive income, reports of changes in equity, cash flow, notes to the economic, and financial position at the beginning of the nearest period before the entity. These statements apply accounting policies retrospectively.

Meanwhile, according to Hery (2017), the financial statements are the result of an accounting process that can use as a tool to communicate financial data or company activities to interested parties. This financial report serves as an information tool that connects the company with interested parties. It shows the company's financial health condition and company performance.

According to IAI (2015), financial statements are prepared with companies to fulfill particular objectives. They provide information related to company finances, performance results that have been carried out by company management, in addition, changes in financial position in a company. Financial reports also provide benefits for the wearers to use as a reference for making economic decisions.

The description above will conclude statements are records of financial information of a company in an accounting period that show the company's financial health condition and company performance used to make plans and forecasts for the future.

Financial Distress

According to Platt and Platt (Fahmi, 2015) defines financial distress is a stage of deteriorating economic conditions that occur before bankruptcy or liquidation occurs. Meanwhile, the definition of financial difficulties according to Hery (2016) is as follows: Financial difficulty is a situation in which a company experiences difficulties in fulfilling its obligations, a situation in which company revenues cannot cover total costs and incur losses. For creditors, this situation is an early symptom of debtor failure. Financial distress is a stage that approaches bankruptcy which is usually marked by uncertain company profitability in the following year (Putera et al., 2016).

Financial distress begins with the inability to meet its obligations, especially short-term liabilities within liquidity obligations. It includes in the solvency category of the bankruptcy prediction method. Financial distress in a company analyzed using indicators of the company's financial

performance so that financial distress exams before it occurs (Dewi & Dana, 2017; Saudi, 2018).

Many methods develop to predict bankruptcy. According to Lestari et al. (2016), financial ratios use to predict the potential for bankruptcy in a company's financial statements. One of the Altman Z-Score, Springate Score, and Zmijewski analysis can predict financial distress that occurs in the company.

Financial Distress Prediction Method Altman-Z Score Method

The Z-Score analysis was developed by Prof. Edward Altman. It can predict the financial health of a company and the possibility of experiencing bankruptcy. Therefore, this analysis employs as a measure of the level of a company's financial risk. Altman Z-Score is a method to determine the level of the financial soundness of a company. It uses to assess the success or failure of a company's management. Z-Score is a score is determined from the standard calculation times financial ratios that indicate the probability level of company bankruptcy. Altman's (1983) bankruptcy prediction method Z-Score is a method for predicting a company's financial health and the likelihood of going bankrupt.

Hanafi and Halim daam Tabunan et al. (2015) explain that in 1982 and 1984, the Altman Z-Score prediction method was developed again by the Altman Z-Score for several countries, from this research it was found that the new Z-value was for go-public companies, and in fact, Altman's Z-Score method has a validity level of up to 95%, with the following descriptive equation:

$$Z = 1,2X_1 + 1,4X_2 + 3,3X_3 + 0,6X_4 + 1,0X_5$$

There are:

Z = Bankruptcy Index

X_1 = Working Capital / Total Assets

X_2 = Retained Earnings / Total Assets

X_3 = Earnings Before Interest and Taxes / Total Assets

X_4 = Book Value of Equity / Total Liabilities

X_5 = Sales / Total Assets

The classification of healthy and bankrupt companies based on the Altman Z-Score method, namely:

- If the value of $Z < 1.81$, it is a bankrupt company.
- If the value of $1.81 < Z < 2.67$, it concludes in the gray area (it cannot be determined whether the company is healthy or going bankrupt).
- If the value of $Z > 2.67$, it is a company that is not bankrupt.

The ratios used are:

1. Net Working Capital to Total Assets

This ratio shows the company's ability to generate net working capital from the total assets it owns.

$$\text{NWC to Total Asset} = \frac{\text{Net Working Capital}}{\text{Total Asset}}$$

2. Retained Earnings to Total Assets

Retained earnings represent claims against assets, not assets per shareholder equity. Retained earnings occur because common stockholders allow the company to reinvest profits that have not been distributed as dividends and are not in the form of cash.

$$\text{RE to Total Assets} = \frac{\text{Retained Earnings}}{\text{Total Assets}}$$

3. Earnings Before Interest and Tax to Total Assets

Earnings Before Interest and Tax is income before it is added or reduced by interest and taxes.

4. Book Value of Equity to Total Liabilities Ratio
It uses to measure the extent to which the company's assets are financed from debt. It means how much debt burden the company bears compared to its asset. In a broad sense shows that this ratio uses to measure the company's ability to pay all of its obligations, both short and long terms if the company is dissolved or liquidated (Endri, 2009).

$$\text{BE to Total Liability} = \frac{\text{BVE}}{\text{Total Liability}}$$

Financial Distress Prediction Method Springate Method

This method was developed in 1978 by Gorgon L.V. Springate. Following a procedure has developed by the Altman Z-Score, Springate uses step-wise multiple discriminate analysis to select four of the 19 popular financial ratios. Therefore, it can differentiate between companies that are in a bankrupt or safe zone. This method considers four financial ratios to predict financial distress, the ratios of working capital / total assets, net profit before interest and taxes / total assets, net profit before taxes / current liabilities, and sales / total assets (Priambodo, 2017). According to Rudianto in Norita (2015), Springate Score is a method for predicting the survival of a company through combining several financial ratios with giving different quality of these ratios. The formula for the Springate method is as follows:

$$S = 1,03A + 3,078B + 0,66C + 0,4D$$

The financial ratios are analyzed financial ratios contained in the Springate method, namely:

A = Working Capital / Total asset

B = Net Profit Before Interest and Taxes / Total Asset

C = Net Profit Before Taxes / Current Liabilities

D = Sales / Total Asset

The method has a standard where:

1. Companies have a score of $S > 0.862$. They classify a healthy company.
2. Companies have a score of $0.862 < S < 1.062$. They classify companies in a vulnerable condition (Gray Area).
3. Companies have an S score < 0.862 . They classify as potentially bankrupt companies.
4. The cut-off value that applies to this method is 0.862. This method has an accuracy of 92.5%

Financial Distress Prediction Method Grover Method

The Grover method is a prediction method that forms of process scoring and redesigning the Altman Z-Score method. The Grover method uses a sample of the Altman Z-score method in 1968, using 70 companies with 35 bankrupt companies and 35 companies that do not go bankrupt from 1982 to 1996 (Putra & Rahma, 2016). Jeffrey S. Grover produced the following formula:

$$G = 1,650X_1 + 3,404X_2 + 0,016X_3 + 0,057$$

There are:

X_1 = Working Capital / Total Assets

X_2 = Earning Before Interest and Taxes / Total Assets

X_3 = ROA = Net Income / Total Assets

The criteria for a healthy and bankrupt company based on the Grover method score, namely:

1. If the index score is $\leq - 0.02$, the company predicts to go bankrupt.
2. If the index score is ≥ 0.01 , then the company in the category does not have the potential to go bankrupt.

Financial Distress Prediction Method Zmijewski Method

The expansion of the study on bankruptcy prediction carried out by Zmijewski in 1983 added the validation of financial ratios as a means of detecting corporate financial failures. Zmijewski conducted the study by re-examining the study of bankruptcy results from his previous research for twenty years. Financial ratios selected from previous research financial ratios and a sample of 75 bankrupt companies, as well as 3573 healthy companies during 1972 to 1978, the F-Test indicator against group ratios, Rate of Return, liquidity, leverage, turnover, fixed payment coverage, trends, firm size, and stock return volatility, indicate a significant difference between healthy and unhealthy companies. With the assessment criteria, the greater the X value, the greater the probability/probability that the company will go bankrupt. Methods developed (Fanny & Saputra, 2014):

$$X = -4,3 - 4,5X_1 + 5,7X_2 - 0,004X_3$$

The financial ratios analyzed in the Zmijewski method are:

$$X_1 = \frac{\text{EAT}}{\text{Total Assets}} \times 100\%$$

$$X_2 = \frac{\text{Total Debt}}{\text{Total Assets}} \times 100\%$$

$$X_3 = \frac{\text{Current Assets}}{\text{Current Liabilities}} \times 100\%$$

where

X_1 = Return on Asset or Return on Investment

X_2 = Debt Ratio

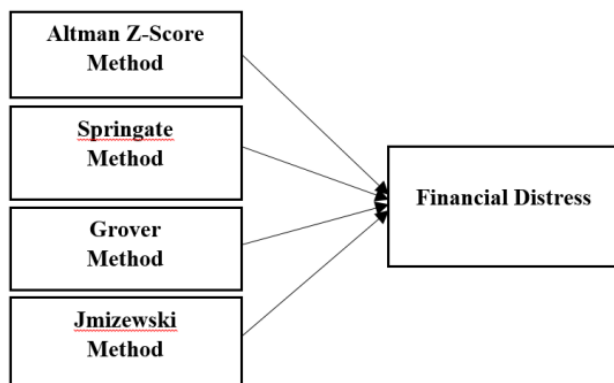
X_3 = Current Ratio

The method has standards, namely:

- The cut-off used in this method is 0.2.
- If the Z value is positive, the company will go potential bankrupt. If it is negative the company means healthy.
- The accuracy rate of the Zmijewski method is 94.9%.

Research Paradigm

This research-based on the influence between the dependent variable of Financial Distress and the independent variable, namely the Altman Z-Score, Springate, Grover, and Zmijewski method or as follows:



H1: There is a significant difference between the Altman Z-Score and the Springate score methods in predicting the level of potential financial distress of LQ-45 indexed companies listed on the Indonesia Stock Exchange (BEI).

H2: There is a significant difference between the Altman Z-Score and the Grover score methods in predicting the level of potential financial distress of the LQ-45 indexed companies listed on the Indonesia Stock Exchange (BEI).

H3: There is a significant difference between the Altman Z-Score and Zmijewski score methods in predicting the level of potential financial distress of LQ-45 indexed companies listed on the Indonesia Stock Exchange (BEI).

H4: There is a significant difference between the Springate and Grover score methods in predicting the level of potential financial distress of LQ-45 indexed companies listed on the Indonesia Stock Exchange (BEI).

H5: There is a significant difference between the Springate method and the Zmijewski score in predicting the level of potential financial distress of LQ-45 indexed companies listed on the Indonesia Stock Exchange (IDX).

H6: There is a significant difference between the Grover method and the Zmijewski score in predicting the level of potential financial distress of the LQ-45 indexed companies listed on the Indonesia Stock Exchange (BEI).

Methodology

The population in this study were all companies indexed by LQ-45 during the 2015-2019 period. While, the sample selection using purposive sampling method, with the following criteria:

- The company lists on the IDX during the 2015-2019 period
- The company publishes complete financial statement data during the 2015-2019 period
- The company is always listed in the LQ-45 index every year during the 2015-2019 period

Based on the criteria above, 28 companies were selected as samples.

The data obtained is secondary data contained in the annual financial statements of companies that are always listed as indexed LQ-45 during the 2015-2019 period, which can be obtained through the official website of the Indonesia Stock Exchange (www.idx.co.id) and the official website of each company. Other information is obtained through the internet, journals, and articles similar to this research.

To process the data, the writer uses the four bankruptcy prediction methods such as Altman Z-Score, Springate, Grover, and Zmijewski methods. The data analysis technique used paired sample t-test to see whether yes or not. It was a difference in values between the two groups of data for the bankruptcy prediction method. Statistical test paired sample t-test performed using the help of IBM SPSS Statistics software. The next stage is the calculation of the level of suitability or accuracy carried out to see the level of accuracy of the method in predicting the bankruptcy of a company by taking into account the type of error of each method. The calculation of the level of

suitability or accuracy will produce categorization prediction results to compare with the prediction results of the bankruptcy method. The formula for calculating the level of suitable is as follows (Nikmah & Sulestari, 2014):

$$\text{Level of Conformity} = \frac{\text{Number of Correct Predictions}}{\text{Number of Samples}} \times 100\%$$

Results and Discussion

Calculation of the Bankruptcy Prediction Method

Table 1. Calculation the Altman Z-score method bankruptcy analysis at LQ-45 for the 2015-2019 period

No.	Stock Code	Years					Average	Prediction
		2015	2016	2017	2018	2019		
1	SCMA	5,549	6,832	7,316	7,248	6,148	6,62	Not Bankrupt
2	SMGR	3,954	3,471	2,477	3,033	1,748	2,94	Grey Area
3	TLKM	2,841	3,332	3,228	2,966	2,667	3,01	Not Bankrupt
4	UNTR	3,395	3,310	2,907	2,416	2,829	2,97	Not Bankrupt
5	UNVR	5,169	3,588	3,335	4,404	3,423	3,98	Not Bankrupt
6	WIKA	1,975	1,604	1,542	1,599	1,539	1,65	Bankrupt
7	WSKT	1,599	1,302	1,215	1,235	0,935	1,26	Bankrupt
8	JMSR	1,014	0,970	0,809	0,772	0,939	0,90	Bankrupt
9	KLBF	6,098	6,480	6,933	7,004	6,544	6,61	Not Bankrupt
10	LPPF	6,742	5,223	4,863	4,140	4,491	5,09	Not Bankrupt
11	MNCN	3,072	3,369	4,528	3,443	6,092	4,10	Not Bankrupt
12	PGAS	1,614	1,581	1,724	1,808	1,505	1,65	Bankrupt
13	PTBA	2,705	2,419	4,088	4,275	3,898	3,48	Not Bankrupt
14	PTPP	2,258	1,613	1,497	1,470	1,344	1,64	Bankrupt
15	BMRI	1,571	13,291	11,061	10,353	13,023	9,86	Not Bankrupt
16	BSDE	2,330	2,585	3,092	2,264	2,671	2,59	Not Bankrupt
17	GGRM	4,143	3,614	3,698	3,828	4,021	3,86	Not Bankrupt
18	ICBP	3,755	3,572	3,437	3,889	4,384	3,81	Not Bankrupt
19	INCO	4,057	6,829	6,629	8,628	10,586	7,35	Not Bankrupt
20	INDF	2,309	2,162	2,148	2,037	2,144	2,16	Grey Area
21	INTP	6,604	7,199	5,814	5,101	5,566	6,06	Not Bankrupt
22	ADRO	1,165	2,085	3,720	3,998	3,909	2,98	Grey Area
23	AKRA	2,818	1,845	2,000	1,733	1,586	2,00	Grey Area
24	ASII	2,344	2,190	1,943	1,743	1,833	2,01	Grey Area
25	BBCA	2,681	2,946	2,998	3,043	3,131	2,96	Grey Area
26	BBNI	0,448	0,399	0,393	0,402	0,429	0,41	Bankrupt
27	BBRI	0,414	0,354	0,346	0,356	0,362	0,37	Bankrupt
28	BBTN	0,947	2,118	2,253	2,096	2,860	2,05	Grey Area

Source: Author Processed Data (2020)

Based on Table 1, there are 7 samples in companies that are on LQ-45 that have an average score below the cutoff value, which is below the value of 1.8 or the value is less than 1.8. Meanwhile, 21 other samples have an average score above the cutoff value. It indicates that the Altman Z-Score method predicts that 7 samples of companies will go bankrupt, and the rest are

predicted not to go bankrupt. If you use company data, it lists on the IDX for the 2015 - 2019 period, the prediction results of the Altman Z-Score method do not match the reality. Because the entire sample of companies includes in LQ-45 is still listed on the IDX and can still operate properly.

Table 2. Calculation of Grover method bankruptcy analysis at LQ-45 2015-2019 period

No.	Stock Code	Years					Average	Prediction
		2015	2016	2017	2018	2019		
1	SCMA	2,601	2,497	1,999	1,962	1,619	2,14	Health
2	SMGR	26,385	33,970	64,429	40,244	40,114	41,03	Health
3	TLKM	1,207	1,248	1,216	1,055	1,030	1,15	Health
4	UNTR	3,395	3,310	2,907	2,416	2,829	2,97	Health
5	UNVR	2,507	2,514	2,373	2,824	2,440	2,53	Health
6	WIKA	1,266	1,375	1,500	1,560	1,391	1,42	Health
7	WSKT	1,087	1,304	1,175	1,170	0,867	1,12	Health
8	JMSR	0,551	0,727	0,659	0,524	0,453	0,58	Health
9	KLBF	1,789	1,783	1,721	1,647	1,586	1,71	Health
10	LPPF	3,104	2,875	2,481	2,136	2,292	2,58	Health
11	MNCN	1,221	1,313	1,357	1,362	1,284	1,31	Health
12	PGAS	0,794	0,798	0,729	0,856	0,812	0,80	Health
13	PTBA	1,310	1,274	1,819	1,757	1,463	1,52	Health
14	PTPP	1,682	1,566	1,445	1,425	1,343	1,49	Health
15	BMRI	1,789	1,712	1,736	1,751	1,746	1,75	Health
16	BSDE	1,072	0,985	1,081	0,870	0,952	0,99	Health
17	GGRM	1,720	1,723	1,732	1,710	1,825	1,74	Health
18	ICBP	1,455	1,538	1,502	1,392	1,434	1,46	Health
19	INCO	0,610	0,527	0,489	0,667	0,635	0,59	Health
20	INDF	1,110	0,995	1,019	0,960	0,956	1,01	Health
21	INTP	1,474	1,266	1,023	0,929	1,064	1,15	Health
22	ADRO	0,557	0,773	1,019	0,869	0,839	0,81	Health
23	AKRA	1,171	1,095	1,169	1,168	1,078	1,14	Health
24	ASII	1,145	1,120	1,012	0,877	0,825	1,00	Health
25	BBCA	1,756	1,877	1,929	1,929	1,936	1,89	Health
26	BBNI	0,235	0,221	0,217	0,213	0,209	0,22	Health
27	BBRI	0,298	0,265	0,255	0,258	0,246	0,26	Health
28	BBTN	0,999	0,516	0,450	0,473	0,494	0,59	Health

Source: Author Processed Data (2020)

Based on Table 2 shows that the entire sample at the LQ-45 company has an average score above the cutoff value, which exceeded -0.02. It means that no company predicts to go bankrupt from the Grover method. If you use data from companies that are still listed on the IDX for the 2015 - 2019

period, the prediction results from the Grover method are suitable with the fact. Because the entire sample of companies in LQ-45 is still listed on the Indonesia Stock Exchange and is still operating well.

Table 3. Calculation of Springate method bankruptcy analysis at LQ-45 for the 2015-2019 period

No.	Stock Code	Years					Average	Prediction
		2015	2016	2017	2018	2019		
1	SCMA	3,931	3,630	3,350	3,096	2,399	3,28	Health
2	SMGR	14,460	17,372	19,968	15,279	22,001	17,82	Health
3	TLKM	12,911	13,717	14,928	17,185	18,878	15,52	Health
4	UNTR	11,191	9,009	8,136	9,162	9,610	9,42	Health
5	UNVR	8,310	8,826	8,735	8,504	8,396	8,55	Health

6	WIKA	9,684	10,880	10,919	9,040	9,338	9,97	Health
7	WSKT	11,966	10,200	9,382	9,483	22,506	12,71	Health
8	JMSR	34,990	17,312	17,059	26,623	32,723	25,74	Health
9	KLBF	7,569	7,641	7,997	8,371	8,876	8,09	Health
10	LPPF	6,008	5,847	6,595	6,254	6,430	6,23	Health
11	MNCN	9,561	9,747	9,653	10,294	10,095	9,87	Health
12	PGAS	1,158	1,003	0,977	1,006	0,909	0,12	Bankrupt
13	PTBA	9,386	9,654	7,731	8,069	9,249	8,82	Health
14	PTPP	6,730	8,382	9,811	9,957	13,872	9,75	Health
15	BMRI	6,095	8,630	7,306	6,769	6,964	7,15	Health
16	BSDE	12,902	15,025	11,707	19,043	13,997	14,53	Health
17	GGRM	7,711	7,739	7,558	7,721	7,150	7,58	Health
18	ICBP	8,710	8,312	9,209	10,001	9,673	9,18	Health
19	INCO	29,193	245,881	40,881	25,821	26,006	57,20	Health
20	INDF	12,555	12,896	12,559	13,048	14,523	13,12	Health
21	INTP	9,333	10,666	14,073	18,002	13,450	13,10	Health
22	ADRO	18,807	14,038	13,775	16,999	14,062	15,54	Health
23	AKRA	8,843	9,733	9,297	9,932	9,933	9,55	Health
24	ASII	9,117	9,423	10,236	11,581	12,040	10,48	Health
25	BBCA	6,258	6,235	6,197	6,289	6,391	6,27	Health
26	BBNI	59,570	71,040	76,500	79,627	80,505	73,45	Health
27	BBRI	50,232	63,610	68,165	64,070	69,661	63,15	Health
28	BBTN	9,588	13,212	15,335	14,907	14,629	13,53	Health

Source: Author Processed Data (2020)

The Springate method has a cutoff value of 0.086, which means if the company scores less than 0.862, the company predicts to go bankrupt, and vice versa. Table 3 explained that 1 sample of companies contained with LQ-45. It has an average score below the cutoff value. Those were the companies with the PGAS code. Meanwhile, 27 other samples had average scores above the cutoff value. They indicate the Springate method

predicts. The sample of companies will go bankrupt, and the remaining companies don't predict to go bankrupt. If you use company data, is lists on the IDX for the 2015 - 2019 period, the prediction results of the Springate method do not match the reality. Because the entire sample of companies in LQ-45 is still listed on the IDX and can still operate properly.

Table 4. Calculation of Zmijewski method bankruptcy analysis at LQ-45 2015-2019 period

No.	Stock Code	Years					Average	Prediction
		2015	2016	2017	2018	2019		
1	SCMA	-7,170	-7,324	-7,099	-7,083	-7,102	-7,16	Health
2	SMGR	7,393	6,473	4,254	4,243	6,152	5,70	Bankrupt
3	TLKM	4,565	5,850	6,778	8,118	7,925	6,65	Bankrupt
4	UNTR	0,769	-0,106	0,393	0,423	2,283	0,75	Bankrupt
5	UNVR	20,218	22,924	18,264	18,410	17,489	19,46	Bankrupt
6	WIKA	-2,007	-3,360	-3,374	-3,196	-3,862	-3,16	Health
7	WSKT	-3,077	-4,431	-3,874	-3,964	-4,783	-4,03	Health
8	JMSR	1,650	-3,440	0,310	1,700	-7,460	-1,45	Health
9	KLBF	6,141	6,147	6,157	6,015	6,162	6,12	Bankrupt
10	LPPF	13,458	10,752	10,963	10,983	12,757	11,78	Bankrupt
11	MNCN	-0,151	-1,367	0,706	0,162	0,674	0,00	Bankrupt

12	PGAS	-3,482	-3,281	-3,672	-3,154	-3,528	-3,42	Health
13	PTBA	3,171	2,579	3,903	4,086	4,525	3,65	Bankrupt
14	PTPP	-2,189	-3,381	-3,316	-3,665	-4,220	-3,35	Health
15	BMRI	-3,999	-3,997	-4,026	-4,034	-4,037	-4,02	Health
16	BSDE	-3,844	-3,574	-2,913	-3,839	-3,878	-3,61	Health
17	GGRM	2,580	3,746	4,225	5,560	5,614	4,35	Bankrupt
18	ICBP	6,724	6,414	6,088	8,899	8,427	7,31	Bankrupt
19	INCO	2,790	0,733	1,196	2,117	2,976	1,96	Bankrupt
20	INDF	1,590	5,825	4,887	4,053	6,065	4,48	Bankrupt
21	INTP	2,503	0,776	0,870	1,296	1,423	1,37	Bankrupt
22	ADRO	7,679	2,792	3,255	6,235	2,326	4,46	Bankrupt
23	AKRA	8,154	3,891	4,753	4,391	3,540	4,95	Bankrupt
24	ASII	2,421	1,418	1,709	2,099	4,279	2,39	Bankrupt
25	BBCA	-5,114	-5,091	-5,047	-5,049	-5,045	-5,07	Health
26	BBNI	-48,995	-58,039	-63,709	-65,444	-65,959	-60,43	Health
27	BBRI	-44,096	-54,348	-57,810	-53,751	-57,365	-53,47	Health
28	BBTN	-4,466	-4,498	-4,406	-4,609	-6,902	-4,98	Health

Source: Author Processed Data (2020)

The Zmijewski method has a cutoff value of 0 if a company has a score of more than 0 then the company is predicted to go bankrupt, and vice versa. Table 4 shows that the 16 samples at LQ-45 have an average score above the cutoff value. Meanwhile, 12 samples have an average score below the cutoff value. They indicate that the Zmijewski method predicts that 16 samples of companies will go bankrupt, and the rest are predicted not to go bankrupt. If you use data from companies in LQ-45 for the 2015-2019 period, Zmijewski's method prediction does not match the real situation. Because the entire sample of companies in LQ-45 is still listed on the Indonesia Stock Exchange and is still operating well.

Normality Test Results

This test is usually used to measure data on an ordinal, interval, or ratio scale. If the analysis uses the parametric method, the requirements for normality must be met, namely the data comes from a normal distribution. If the data is not normally distributed, or the number of samples is small and the type of data is nominal or ordinal, the method used is non-parametric statistics. In this discussion, we will use the One-Sample Kolmogorov-Smirnov test using a significance level of 0.05. The data is declared to be normally distributed if the significance is greater than 0.05. Following are the results of the normality test:

Table 5. Normalisation test
One-Sample Kolmogorov-Smirnov test

		Unstandardized Residual
N		28
Normal Parameters ^{a,b}	Mean	OE-7
	Std. Deviation	0,35115494
Most Extreme Differences	Absolute	0,143
	Positive	0,143
	Negative	-0,888
Kolmogorov-Smirnov Z		1,243
Asymp. Sig. (2-tailed)		0,071

Source: Author Processed Data (2020)

Based on Table 5 presents the significance value is 0.091. The significance value is $0.071 > 0.05$, which means that the data was distributed.

Significance of Differences in the Bankruptcy Prediction Methods

Table 6. Result Paired Sample T-test

	Std. Deviation	Paired Differences		t	df	Sig (2tailed)
		95% Confidence Interval of the Difference Lower	Upper			
Pair 1						
Altman - Springate	0,81621	0,88217	0,80573	7,271	75	0,000
Pair 2						
Altman - Grover	0,89281	0,87460	1,56724	8,372	75	0,000
Pair 3						
Altman - Zmijewski	2,39098	2,28323	3,42618	9,141	75	0,000
Pair 4						
Springate- Grover	0,36779	0,26745	0,48824	7,023	75	0,000
Pair 5						
Springate - Zmijewski	2,61586	1,44217	2,75431	8,364	75	0,000
Pair 6						
Grover- Zmijewski	2,98471	1,30062	2,73986	6,603	75	0,000

Source: Author Processed Data (2020)

a. First Hypothesis Testing

The results in Table 5 show the Sig value. (2-tailed) in pair 1, namely, the score between the Altman Z-Score and the Springate method is 0,000. These results indicate a probability <0.05 , which means a significant difference between the two sample groups. From these results, it can conclude that there is a score difference in predicting financial distress between the Altman Z-Score method and the Springate method with a confidence level of 95%.

b. Second Hypothesis Testing

The results in Table 5 show the Sig value. (2-tailed) in pair 2, namely, the score between the Altman Z-Score and Grover methods is 0,000. These results indicate a probability <0.05 , which means a significant difference between the two sample groups. From these results, it can conclude that there is a score difference in predicting financial distress between the Altman Z-Score method and the Grover method with a confidence level of 95%.

c. Third Hypothesis Testing

The results in Table 5 show the Sig value. (2-tailed) in pair 2, namely, the score between the

Altman Z-Score and Grover methods is 0,000. These results indicate a probability <0.05 , which means a significant difference between the two sample groups. From these results, it can conclude that there is a score difference in predicting financial distress between the Altman Z-Score method and the Grover method with a confidence level of 95%.

d. Fourth Hypothesis Testing

The results in Table 5 show the Sig value. (2-tailed) in pair 4, namely, the score between the Springate and Grover methods is 0,000. These results indicate a probability <0.05 , which means a significant difference between the two sample groups. From these results, it can conclude that there is a score difference in predicting financial distress between the Springate method and the Grover method with a confidence level of 95%.

e. Fifth Hypothesis Testing

The results in Table 5 show the Sig value. (2-tailed) in pair 5, namely, the score between the Springate and Zmijewski methods is 0,000. These results indicate a probability <0.05 , which means a significant difference between the two sample groups. From these results, it

can conclude that there are different scores in predicting financial distress between the Springate method and the Zmijewski method with a confidence level of 95%.

f. Sixth Hypothesis Testing

The results in Table 5 show the Sig value. (2-tailed) in pair 6 is between the Grover and Zmijewski method scores of 0,000. These

results indicate a probability <0.05 , which means a significant difference between the two sample groups. From these results, it can conclude that there are different scores in predicting financial distress between the Grover method and the Zmijewski method with a confidence level of 95%.

Accurate Bankruptcy Method

Table 7. Recap of Grover Method Bankruptcy Prediction, Altman Z-Score Method, Springate Method, and Zmijewski Method

Prediction	Grover	Altman Z-Score	Springate	Zmijewski
Bankrupt	0	0	0	0
No Bankrupt	28	21	27	12
Amount	28	21	27	12
% Accurate	100%	75%	96%	43%
Error type	0%	25%	4%	57%

Source: Author Processed Data (2020)

From a total sample of 28 companies used, the Grover method predicts that no company is bankrupt. In other words, all companies are declared healthy. None of the companies went bankrupt, so the Grover method did not have an error rate in predicting bankruptcy. Overall, it concludes that the Grover method has several correct predictions of 28 samples or an accuracy rate of 100%.

The Altman Z-Score method predicts that there are 7 bankrupt companies and 21 companies are predicted not to go bankrupt. Meanwhile, in reality, no company has gone bankrupt. Overall, it concludes that the Altman z-score method has errors in predicting corporate bankruptcy. Thus, this method only has an accuracy rate of 75%, with an error type of 25%.

The Springate method predicts that 1 company will go bankrupt while 27 companies are not predicted to go bankrupt. If they compared with reality, the Springate method had an error rate in predicting bankrupt, because in reality there are no company in the sample which have experienced bankruptcy. From the explanation of the table above, it can be concluded that this method has an accuracy rate of 96% with an error type of 4%.

Meanwhile, the Zmijewski method predicts that 16 companies will go bankrupt and 12 companies are not predicted bankrupt. If they compared with reality, the Zmijewski method had an error rate in predicting bankruptcy, because in reality there are no company in the sample which have experienced bankruptcy. From the explanation of the table above, it can be concluded that this method has an accuracy rate of 43% with an error type of 57%.

Conclusion

Based on the results of research and discussion of financial distress of the LQ-45 indexed companies listed on the Indonesia Stock Exchange in the 2015-2019 period, it concludes that the Grover method predicts that no company goes bankrupt. In other words, all companies are declared healthy, Altman Z-Score method predicted that 7 companies are bankrupt and 21 companies do not predict to go bankrupt. Moreover, the Springate method predicts 1 company will go bankrupt while 27 companies predicted not to go bankrupt. Meanwhile, the Zmijewski method predicts that 16 companies will go bankrupt and 12 companies predicted not to go into bankruptcy.

Based on all the prediction method calculations that have been done. The Grover method shows a high level of accuracy of 100%. Then, The

Springate method and The Altman Z-Score method of 96% and 75%, respectively. And the last is the prediction of Zmijewski's method with an accuracy rate of 43%. These results indicate that the Grover method is an appropriate predictive method to predict bankruptcy in companies listed on LQ-45 listed on the IDX.

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