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Analysis of Financial Distress Predictions Using Altman (Z-score), Zmijewski (X-score) and Grover (G-score) Methods

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Abstract

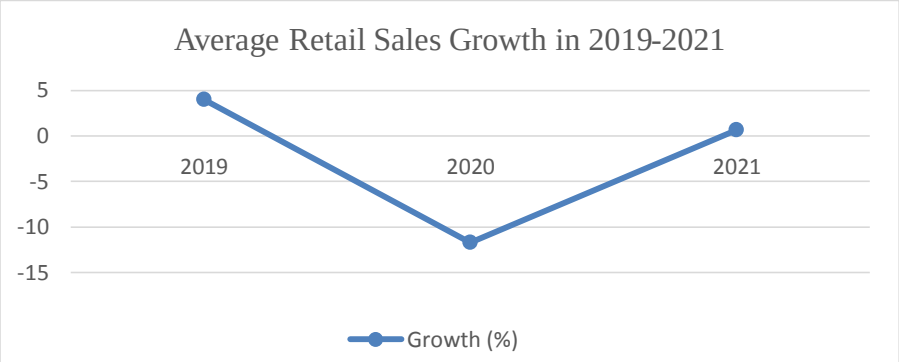
The purpose of this study is to determine the prediction of financial distress analysis using the Altman Z-Score, Zmijewski and Grover methods and to determine the most accurate prediction method of financial distress analysis and the error rate of the three methods used in predicting Retail Sub Sector Companies. The type of data in this study uses quantitative data and uses secondary data sources obtained from company financial reports on the Indonesian Stock Exchange website. The sampling procedure used was purposive sampling with predetermined criteria. The samples in this study were 21 Retail Sub Sector companies listed on the Indonesia Stock Exchange for the 2019-2021 period. The data analysis method used was Altman's Modified Z-Score, Zmijewski and Grover methods. The results of this study indicate that the Altman Modified Z-Score method has an accuracy rate of 63%, the Zmijewski method is 62% and the Grover method is 54%. It can be concluded that the Altman modified (Z-Score) method is a method that has the highest level of accuracy for analyzing financial distress in Retail Sub Sector companies for the 2019-2021 period.

Keywords *: Altman Z-Score; Zmijewski; Grover.*

Introduction

The retail sector is a sector that carries out activities that offer products or services in small quantities (retail) to end users in the form of household products, clothing and daily needs, the retail sector in Indonesia has a total of 40.4 thousand units in 2021. Based on data from the Central Bureau of Statistics, the retail trade sector (retail) is one of the sectors that has an important role in the acquisition of GDP with a contribution of above 10% annually (www.katadata.co.id).

However, in recent years, the condition of issuers in the retail sub-sector has begun to weaken due to the effects of the ongoing economic crisis resulting in substandard distribution of goods, domestic consumption and people's purchasing power which are still depressed and rising raw material prices. The weakening of the retail sector is reflected in a decline in performance and a decline in retail sales in the retail sector in 2021 which was recorded to have fallen 12% from the previous year (www.dataindonesia.id, 2022). According to Bank Indonesia, the average retail sales growth data for the retail sector for 2019-2021 is illustrated in the graph below as follows:

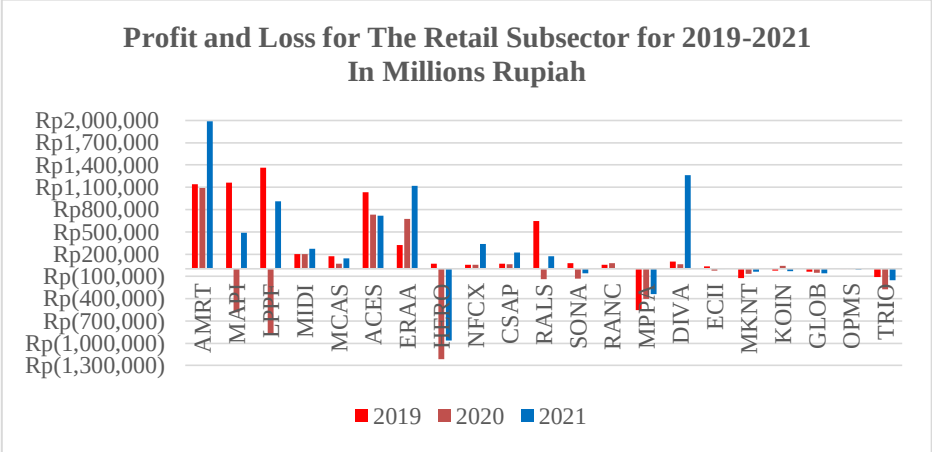


Source : (Bank Indonesia, 2021) Data is processed again

Figure 1 Graph of Average Retail Growth in the Retail Sub Sector for 2019-2021

In 2020 the average retail sales revenue decreased greatly by -11.7% and in 2021 it increased by 0.63% but this increase was still far from last 2019. This sales pressure was seen in the hypermarket and department store businesses, while sales in minimarkets were still limited.

Based on the financial reports of retail issuers on the Indonesia Stock Exchange, profits in several retail sector issuers also experienced a decline. The condition of declining profits in the retail sub-sector is illustrated in the graph below as follows:



Source : Data Processed

Gambar 2 Grafik Laba/Rugi Bersih Perusahaan Sub Sektor Ritel Tahun 2019-2021

The retail sub sector in 2019-2021 experienced fluctuations in net profit which tended to decline and even experienced a minus. The decrease in net profit was caused not only by the decline in sales but also by the company's increasing operating expenses, which resulted in the difficulty in paying off the company's debts. If negative profit conditions like this are ignored and proper preventive measures are not taken, it can cause the company to suffer*financial distress*.

Financial distress is the decline in financial conditions before the company experienced total bankruptcy.Financial distress or financial difficulties can become serious conditions that cause a company to go out of business if the company cannot control them (Prasetianingtias

& Kusumowati, 2019). Basically before the company experienced conditions*financial distress* The company is expected to be able to predict bankruptcy, in order to know the actual financial condition of the company. There are many ways to predict*financial distress* namely by analyzing the financial statements and calculating them with financial ratios.

Financial reports are written reports containing company financial information in order to find out the company's performance that has been running and to obtain information as a benchmark for interested parties to determine policies that are implemented in accordance with the conditions of the company. (Supriati et al., 2019).

Ratio analysis is a technique often used to assess financial statements. The results of financial ratio analysis have weaknesses because they only emphasize one aspect only. Therefore the analysis of financial statements requires other analytical tools to be combined with various other financial aspects and the analysis in question is an analysis of financial difficulties. Analysis of financial difficulties is very important to detect company bankruptcy. There are several methods that can help make it easier to detect bankruptcy including the method Altman modification *Z-Score*, Zmijewski, as well as Grover.

Several researchers have conducted previous research including by (Wahyuni & Rubiyah, 2021) entitled "Analysis Financial Distress In Plantation Sector Companies "the results of his research are that there are differences in results between the four methods used. Altman's method is the most accurate for predicting financial difficulties in the plantation sector with an accuracy rate of 76.00%. The Zmijewski method has an accuracy rate of 70.67%, and the Springate and Grover method has the same accuracy rate of 69.33%. Research by (Sari & Yunita, 2019) entitled "Bankruptcy Forecasting Analysis and Accuracy Level of Metal and Other Mineral Subsector Companies Listed on the IDX in 2012-2016" it can be concluded that the results of his research are that the zmijewski and grover methods have higher accuracy and are more accurate in predicting financial difficulties in metal companies and other minerals by 100%. The accuracy rate of the Springate method is 75%. And research by (Asmaradana & Satyawan, 2022) with the research title "Analysis of Financial Difficulties in the Consumer Services Sub Sector Registered on the IDX" the results of his research stated that there were differences in the method financial distress used, the result is that the grover method is the most accurate and the best method for predicting financial difficulties in the consumer services sub-sector with an accuracy rate of 82%.

Research Purposes

(1) To find out the predictive analysis*financial distress* using the Altman method (Z-Score) for retail sub-sector companies listed on the Indonesia Stock Exchange for the 2019-2021 period.

(2) To find out the predictive analysis*financial distress* using the Zmijewski method (X-Score) for retail sub-sector companies listed on the Indonesia Stock Exchange for the 2019-2021 period.

(3) To find out the predictive analysis*financial distress* using the Grover method (G-Score) for retail sub-sector companies listed on the Indonesia Stock Exchange for the 2019-2021 period.

(4) To know the analysis prediction method*financial distress* which one has the highest level of accuracy among Altman (Z-Score), Zmijewski (X-Score) and Grover (G-Score) in retail sub-sector companies listed on the Indonesia Stock Exchange for the 2019-2021 period.

Research methods

Population and Sample

Based on research conducted by the population in this study, namely retail sub-sector issuers listed on the Indonesia Stock Exchange for the 2019-2021 period with a total of 35 companies. The sampling technique in this study used a purposive sampling technique which was selected with the following criteria:

(1) Retail sub-sector companies consistently listed on the Indonesia Stock Exchange in 2019-2021.

(2) Retail sub-sector companies reporting audited financial statements on the Indonesia Stock Exchange consistently for the 2019-2021 period.

(3) Retail sub-sector companies that publish annual financial reports and provide all the necessary data regarding research variables.

Data Collection Sources and Techniques

The source of data in this study is using secondary data. With data collection techniques that use literature and documentation. Literature study is used to obtain data and information through literature from writings, books, journals, articles, lecture notes and media publications to collect theoretical data that are still related to research. Documentation refers to concrete evidence of events that have occurred in the past in the form of documents or information in the form of text. The document used is the retail annual financial report which is available on the official website of the Indonesia Stock Exchange.

Data Analysis Method

The data analysis method used in this study to process and analyze research data is as follows:

1. Calculating Financial Ratios Using the Method*Altman*, *Zmijewski* and*Grover*. The data used is the annual financial statements of retail sub-sector companies listed on the Indonesia Stock Exchange for the 2019-2021 period.
2. Calculating predictions of financial distress. After calculating the value of financial ratios, the next step is to calculate predictions of financial distress using the three methods in this study, namely Altman Modification Z-Score, Zmijewski, and Grover.

Each method has a value limit to determine the company experienced financial distress or healthy.

Altman Modified Z-Score

$$Z'' = 6,56\ X_1 + 3,26\ X_2 + 6,72\ X_3 + 1,05\ X_4$$

Explanation :

X_1 = Working Capital to Total Assets

X_2 = Retained Earnings to Total Assets

X_3 = Earnings Before Interest and Taxes to Total Asset

X_4 = Book Value of Equity to Book Value of Total Debt

Score cut off :

Table 1 Cut Off Altman Modified Z-Score Method

Score Cut Off	Condition
Z" < 1,1	Financial Distress
1,1 < Z" <2,6	Grey Area
Z" > 2,6	Non Financial Distress

Zmijewski

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

Explanation :

X_1 = Profit After Tax to Total Assets

X_2 = Total Debt to Total Assets

X_3 = Current Assets to Current Liabilities

Score cut off :

Table 2 Cut Off Zmijewski method

Score Cut Off	Condition
X > 0	*Financial Distress*
X < 0	*Non Financial Distress*

Grover

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

Explanation :

X_1 = Working Capital to Total Assets

X_2 = Earnings Before Interest and Taxes to Total Asset

ROA = Net Profit to Total Assets

Score cut off :

Table 3 Cut Off Metode Grover

Score Cut Off	Condition
G ≤ -0,02	*Financial Distress*
G ≥ 0,01	*Non Financial Distress*

3. Calculating the Health Condition of the Company According to the Indonesian Stock Exchange Data for the 2019-2021 Period by calculating Debt to equity ratio. This is done to see the results between the prediction method and the original conditions of each company.

$$\text{Debt to Equity Ratio} = \frac{\text{Total Debt}}{\text{Total Equity}} \text{ X } 100\%$$

The greater the DER value, the more unprofitable it is so that the greater the risk of business failure that can be borne by the company. A company is said to be healthy if the DER is less than 80% or 0.8.

4. Calculating the Accuracy Level and Type of Error

At this stage the calculation of the level of accuracy for the method is carried out*Altman* modification*Z-Score*, *Zmijewski* as well as*Grover*. The accuracy of the three methods applied in this study was seen from the results of the accuracy level. The level of accuracy can be measured by the following formula:

$$\text{Accuracy Rate} = \frac{\text{Number of Correct Predictions}}{\text{Number of Sampels}} \text{ X } 100\%$$

Type error I occurs when the method of producing the sample under study does not occur financial difficulties (non financial distress) but in fact the sample experienced financial difficulties. The formula for calculating the type error I is:

$$\text{Type Error I} = \frac{\text{Number of Type Error I}}{\text{Number of Sampels}} \text{ X } 100\%$$

Type error II when the method of producing the sample under study is in a state of financial distress, but in fact the sample is a healthy company. The formula for calculating type II error is:

$$\text{Type Error II} = \frac{\text{Number of Type Error II}}{\text{Number of Sampels}} \text{ X } 100\%$$

Result

Descriptive Analysis

Descriptive statistics are carried out to provide an overview of the characteristics of data originating from a sample that is processed per variable to provide information such as maximum, minimum, mean, standard deviation, median and so on. As for part of the value of descriptive statistics in accordance with the variables in the study as follows:

Table 4 Descriptive Statistic Analysis

Variable	N	Minimum (Rp)	Maximum (Rp)	Mean (Rp)	Std. Deviation (Rp)
Current Assets	63	6,415,449,405	14,782,817,000,000	2,801,290,328,594	3,398,444,661,138
Current Liabilities	63	282,845,055	16,376,061,000,000	2,258,334,162,613	3,383,155,317,081
Working Capital	63	(2,164,158,000,000)	4,469,570,705,861	542,956,165,981	1,379,851,576,602
Total Assets	63	8,278,414,392	27,493,748,000,000	4,982,718,387,868	6,196,907,990,704
Retained Earnings	63	(8,299,501,245,362)	5,986,898,000,000	731,091,299,483	2,790,760,853,277
Earnings Before Interest and Tax	63	(1,154,575,000,000)	2,811,153,000,000	317,291,971,785	703,842,582,178
Book Value of Equity	63	(4,124,096,233,911)	8,989,798,000,000	1,838,815,057,647	2,724,155,642,793
Long Term Liabilities	63	317,472,435	3,940,405,000,000	873,086,024,752	1,088,504,397,966
Book Value of Total Debt	63	692,375,584	18,503,950,000,000	3,131,420,187,365	4,150,388,131,962
Profit After Tax	63	(1,214,602,000,000)	1,988,750,000,000	174,749,621,985	560,748,882,860
Total Debt	63	692,375,584	18,503,950,000,000	3,131,420,187,365	4,150,388,131,962
Net Profit	63	(1,214,602,000,000)	1,988,750,000,000	174,749,621,985	560,748,882,860
Valid N (listwise)	63				

Sumber : Data Diolah

Based on the results of the descriptive statistical analysis in the table above, information was obtained that the number of samples (N) in this study was 63, which is data from the financial reports of 21 retail sub-sector companies during the 2019-2021 period.

Calculation Results Altman Method Modified Z-Score, Zmijewski and Grover

1. Altman Modified Z-Score

Predictive analysis results altman modified Z-Score in 2019 as many as 13 companies belonging to non financial distress, 3 issuers belong to Grey Area and 5 issuers experienced financial distress. In 2020 there are 10 issuers classified as conditions non financial distress, 4 issuers belong to the category Grey Area and 7 issuers occurred financial distress. In 2021 as many as 11 issuers are included in non financial distress, 3 issuers belong to Grey Area and 7 issuers experienced financial distress.

2. Zmijewski

The results of Zmijewski's prediction analysis in 2019 were as many as 16 companies belonging to the non-financial distress category and 5 issuers experiencing financial distress. In 2020 there are 14 issuers classified as non-financial distress and 7 issuers experiencing financial difficulties. In 2021, 15 issuers are classified as non-financial distress and 6 issuers are experiencing financial distress.

3. Grover

The results of the analysis of Grover's predictions in 2019 were 18 issuers belonging to the non-financial distress category and 3 issuers experiencing financial distress. In 2020 and 2021 there are 16 issuers classified as in good health and 5 issuers experiencing financial difficulties.

Recapitulation of Financial Distress Analysis Results

Table 5 Recapitulation of Financial Distress Analysis Results

Method	Year	Predictions		Real BEI		Total Sample
		Financial Distress	Non Financial Distress	Financial Distress	Non Financial Distress	
Altman Modified Z-Score	2019	5	16	9	12	21
	2020	7	14	11	10	21
	2021	7	14	10	11	21
Zmijewski X-Score	2019	5	16	9	12	21
	2020	7	14	11	10	21
	2021	6	15	10	11	21
Grover G-Score	2019	3	18	9	12	21
	2020	5	16	11	10	21
	2021	5	16	10	11	21

Source : Data processed

The recapitulation results of the three Altman financial distress methods modified Z-Score, Zmijewski and Grover in retail sub-sector companies in 2019-2021, it is known that each of the three methods has predictive results that tend to be different from the actual reality found in the presentation of the Indonesian Stock Exchange.

Accuracy Rate, Type Error I and Type Error II

Table 6 Calculation of Accuracy Rate, Type Error I, Type Error II

Method	Period	Accuracy Rate	Type Error I	Type Error II
Altman Modifikasi Z-Score	2019	62%	19%	19%
	2020	62%	19%	19%
	2021	67%	14%	14%
Average		63%	17%	17%
Zmijewski X-Score	2019	62%	19%	19%
	2020	62%	19%	19%
	2021	62%	19%	19%
Average		62%	19%	19%
Grover G-Score	2019	52%	29%	29%

	2020	52%	29%	29%
	2021	57%	24%	24%
Average		54%	27%	27%

Source : Data processed

From the table above, it is obtained that the Altman Modified Z-Score method in 2019 has an accuracy rate of 62% and types errors I and II are 19%, in 2020 it has an accuracy rate of 62% with error types 1 and II, namely 19% and in 2021 has a 67% accuracy and error types I and II, namely 14%. The Zmijewski method in 2019 has an accuracy rate of 62% and types of errors I and II are 19%, in 2020 it has an accuracy rate of 62% and types of errors I and II are 19% and 2021 has an accuracy rate of 62% types of errors I and II i.e. 19%. And the Grover method in 2019 has an accuracy rate of 52% for types of errors I and II, namely 29%, in 2020 has an accuracy rate of 52% for types of errors I and II, namely 29% and in 2021 the Grover method has an accuracy rate of 57% for types errors I and II are 24%.

Discussion

The results of this study answer the formulation of the problem that the modified Z-Score Altman method, Zmijewski, and Grover are able to analyze predictions of financial distress in retail sector companies for the 2019-2021 period with the results of predicting companies in financial distress. The modified altman method of the Z-Score in 2019 resulted in 5 issuers in the retail sub-sector according to calculations being in financial distress. In 2020-2021 there are 7 issuers in the retail sub-sector in a state of financial distress with a Z-Score below 1.1. Altman's methodpmodification (Z-Score) has an accuracy of 63% and errors I and II (17%). Issuers in the retail sub-sector that are in a state of financial distress indicate that the company lacks working capital and even some companies experience minus working capital, and in some companies there is a continuous increase in debt.

The results of this study are in line with the findings of previous researchers namely (Mahardika & Setyawan, 2022) his research resulted that the Altman method is the best method in calculating predictionsfinancial distress in the automotive sector with the result that four issuers experienced financial difficulties. The results of this study also have compatibility with research (Supitriyani et al., 2022) The results of this study are that the Altman method has an accuracy rate of 85.70% and is the most reliable method for predicting financial difficulties in telecommunications companies.

Analysis of the Zmijewski method shows that in 2019 there were 5 companies in the retail sub-sector that sufferedfinancial distress, 7 companies in the retail sub-sector in 2020 sufferedfinancial distress and 6 companies in the retail sub-sector in 2021 that will sufferfinancial distress, where the X-Score result is greater than (0). The Zmijewski method has an accuracy of 62% and errors I and II (19%). Retail sub-sector companies whose X-Score is higher than zero is because retail sub-sector companies have high total debt each year.

The Grover method analysis predicts that in 2019 there will be 3 retail sub-sector companies that will suffer from the conditionfinancial distress. In 2020 and 2021, 5 retail sub-

sector companies will sufferfinancial distress. The Grover method has an accuracy of 54% and errors I and II (27%). The retail sub-sector companies detected by the Grover method belong tofinancial distress has a G-Score less than -0.02, this is due to the company's decreased ability to earn net profit from its total assets as a whole.

Conclusion

The prediction of financial distress analysis in the retail subsector for the 2019-2021 period by applying the Altman modified Z-Score method produce an average accuracy rate of 63% and an error rate of 17%.

The prediction of financial distress analysis in the retail subsector for the 2019-2021 period by applying the Zmijewski X-Score method has an accuracy rate with an average accuracy rate of 62% and an error rate of 19%.

The prediction of financial distress analysis in the retail subsector for the 2019-2021 period by applying the Grover G-Score method has an accuracy rate with an average accuracy rate of 54% and has the highest error rate of 27%.

The modified Altman method (Z-Score) produces the highest level of accuracy among the three methods of predicting financial distress analysis when predicting financial distress in the retail subsector listed on the Indonesia Stock Exchange for the 2019-2021 period.

Suggestion

For company management, the results of this study can be used as a warning to prevent and minimize the occurrence of financial difficulties in the retail sector.

For investors, the results of this study can be a reference for determining what to consider before investing in the retail sector.

For further researchers can add other prediction methods to predictfinancial distress including the Ohlson, Fulmer,Springate also added the study period as well as the number of samples.

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