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Analysis of Springate Method and the Altman Z-Score Method for Predicting the Financial Distress

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Abstract

This research was conducted to analyse and determine the bankruptcy prediction of PT Elang Mahkota Tbk for the 2017-2022 period using the Springate method and the Altman Z-Score method. The sample of this research is PT Eagle Mahkota Tbk. The data collection technique used is the documentation method. Data analysis techniques include Descriptive Statistical Analysis, Normality Test, Paired Sample T-Test and Accuracy Test of Methods and Error Types. The research results are based on calculations and analysis of the Springate and Altman Z-Score methods.

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INTRODUCTION

The economic movements that tend to fluctuate that Indonesia has experienced since the reform era until now, of course, have a very big impact, especially on macroeconomics and microeconomics. Various economic challenges participate in the process of solving problems faced by business actors, especially in Indonesia. Various problems that arise more or less cause serious problems in the financial condition of business actors. One of the domino effects caused is a decrease in financial performance or more commonly known as financial distress.
This phenomenon of financial difficulties occurs in many companies in Indonesia. This distress condition sometimes occurs not only in companies that have been operating in the long term, but can also occur in companies that are still operating in the short term. This is due to continuous financial problems in each period or at a certain period, either in the form of defaulted loan payments, losses on uncollectible accounts, and so on. If this situation of financial difficulties is left unchecked without optimal handling measures, it will disrupt the company's activities and the most fatal impact is bankruptcy. According to (Winaya et al., 2020) the financial difficulties experienced by companies are an early indication of bankruptcy. According to (Adnan & Arisudhana, 2017) bankruptcy is generally interpreted as the failure of a company in carrying out its business operations to make a profit. Meanwhile, according to (Lesmana & Surjanto, 2004), visible signs of difficulties experienced by a company include a decrease in income, profits, total assets and market prices.

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The Springate method and the Altman Z-Score method are two methods that are commonly used to predict potential company bankruptcy. Some of the elements taken for calculations in these two methods are different, but the results obtained are often in harmony and not infrequently different. The ratio used for calculating the Springate method itself uses financial ratios in the form of Working Capital of Total Assets, Net Profit Before Interest of Total Assets, Net Profit Before Taxes of Total Assets and Sales of Total Assets (Pebrian, 2020). As for the Altman Z-Score method includes Working Capital of Total Assets, Retained Earnings, Earning Before Interest, Market Value of Equity and Sales (Altman, 1968). The accuracy of the prediction methods above can be seen from the accuracy with the highest accuracy value. With these methods, it is hoped that they can assist in assessing the company's financial condition so that management can immediately make improvements so that the company can avoid potential bankruptcy. In addition, this prediction of financial condition can also be used by external parties as a basis for making financial decisions.

Several studies have proven that the Altman Z-Score model is the most appropriate model in predicting potential financial distress, but there are also several research results proving that the Springate model is more appropriate in predicting potential financial distress. This study will re-examine the Springate Method and the Altman Z-Score Method as a Tool for Predicting the Financial Distress of PT Elang Mahkota Teknologi Tbk.

METHODS

The scope of research

The data used in this study is company data from PT Elang Mahkota Teknologi Tbk, which is listed on the Indonesia Stock Exchange (IDX) for the period 2017–2022. IDX was determined as a research location because researchers considered IDX as a place to obtain the necessary data in the form of financial reports that were sampled in this study. This research is located on the Indonesia Stock Exchange (IDX) by downloading the company's annual financial report at the website address www.idx.co.id. The time of research was conducted from 30 March 2023 to 15 June 2023.

Population and Sample

The population is a generalization area consisting of objects/subjects that have certain qualities and characteristics determined by the researcher to be studied and then conclusions drawn. The population of this study are companies that are on the Indonesian Stock Exchange.

The sample is part of the number and characteristics possessed by the population. According to (Sugiyono, 2004:80), the sampling technique in this study was to use purposive sampling. Purposive sampling is a sampling technique with certain considerations. Of all the companies listed on the Indonesian stock exchange that listed their financial statements for 2017–2022, PT Elang Mahkota Teknologi Tbk.

Data Collection Techniques

The data collection used by researchers in this research is the documentation method, that is, researchers collect data from other party documents or secondary data; the collection techniques referred to by researchers include the following:

1. Literature study is by seeking information through other people's writings or reports that have been made by other people, such as books, research journals, and other sources that support it as a theoretical basis for research objects.

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2. The field study conducted by the researcher was to visit the library at the Kertanegara High School of Economics in Malang

Data analysis technique

This study used Descriptive Statistical analysis methods, normality tests, Paired Sample T-Tests and Tests for the Accuracy of Methods and Types of Errors.

RESULTS AND DISCUSSION

Results

Descriptive data analysis

Descriptive data analysis describes the personal data of each variable used in the research. In this study, the data analysis used is the financial ratios processed from each method and comparing each method to technique the value of financial distress. It aims to get an overview of these financial ratios and find out which method is the most accurate for analysing the financial distress potential for corporate bankruptcy.

a. Calculation results of the Springate Method of Financial Distress Prediction Method

Calculations in predicting financial distress using the Springate method can be formulated as follows:

S = 1.03X1 + 3.07X2 + 0.66X3 + 0.4X4

Z: Financial Distress

X1: Working capital to Total assets

X2: Net profit before interest and taxes to Total assets

X3: Net profit before taxes to current liabilities

X4: Sales to Total assets

The values obtained from the Springate method formulation can be grouped and assessed with the following criteria:

a. If the value of S > 0.862, then the company can be classified as a company in a safe zone with no potential to experience financial distress.

b. S <0.862, the company can be classified as a company that occupies a danger zone or is at high risk of experiencing financial distress.

Springate method calculations were carried out on the financial statements of PT Elang Mahkota Teknologi Tbk for 6 years, while the results obtained are as follows:

Table 1
Calculation results of the Springate Method at PT Elang Mahkota Teknologi Tbk for the 2017-2022 period

Year	WCTA	EBITTA	EBTCL	STA	S-Scores	Criteria
2017	0.38875	0.04166	0.46632	0.34188	0.97284	*Non Distressed*
2018	0.38645	-0.09607	-0.85249	0.45887	-0.27599	*Distress*
2019	0.33735	-0.11422	0.20940	0.62883	0.38654	*Distress*
2020	0.24969	0.20987	1.29236	0.66743	2.02140	*Non Distressed*
2021	0.25538	0.17131	2.00299	0.33642	2.24551	*Non Distressed*
2022	0.30076	0.14171	1.98651	0.34911	2.19557	*Non Distressed*

Source: Data processed by researchers, 2023

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Table 2
Description of Springate Method Data at PT Elang Mahkota Teknologi Tbk Period 2017-2022

Descriptive Statistics						
	N	Range	Minimum	Maximum	Means	std. Deviation
EBITTA	6	,32409	-,11422	, 20987	,0590433	,13897394
WCTA	6	,13906	,24969	,38875	,3197300	,06153400
EBTCL	6	2.85548	-,85249	2.00299	,8508483	1.12006874
STA	6	,33101	,33642	,66743	,4637567	,15031189
SScore	6	2.52150	-,27599	2.24551	1.2576450	1.06121406
Valid N (listwise)	6					

Source: Data processed by researchers, 2023.

Based on the results of calculations using the Springate method presented in the table above, it is illustrated that PT Elang Mahkota Teknologi Tbk is not experiencing financial difficulties or financial distress. The average S-Score obtained by PT Elang Mahkota Teknologi Tbk from 2017 to 2022 is 1.2576450. This value exceeds the value set by the Springate method formulation to assess the company's condition, namely 0.862. In addition, if seen in Table 1, PT Elang Mahkota Teknologi Tbk has experienced a decrease in its score which resulted in it being classified as a distress criterion or in this case described as experiencing financial difficulties. In 2018 and 2019, the calculation of the Springate method successively gives values of -0.27599 and 0.

b. Calculation results of the Financial Distress Prediction Method Altman Z-Score Method

Calculations in predicting financial distress using the Altman Z-Score method can be formulated as follows:

Z-Score = 6.56X1 + 3.26X2 + 6.72X3 + 1.05X4

Z: Bankruptcy index

X1: Working capital to Total assets (WC/TA)

X2: Retained earnings to Total assets (RE/TA)

X3: Earnings before interest and taxes to Total assets (EBIT/TA)

X4: Market value equity to Book value of total debt (MVE/BVD)

The score results obtained in this calculation can be grouped into several criteria as follows:

a. Z-Score > 2.60 is classified as a company that is in a safe zone, so it can be classified as a healthy company and not bankrupt.
b. 1.10 <Z-Score < 2.60 classified as a company that occupies the grey zone or is still uncertain whether to be included in a bankrupt company or not.
c. Z-Score <1.23 is classified as a company that is in the danger zone or at high risk of bankruptcy.

Calculation of the Altman Z-Score method is carried out on the financial statements of PT Elang Mahkota Teknologi Tbk for 6 years, while the results obtained are as follows

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Table 3
Calculation results of the Altman Z-Score Method at PT Elang Mahkota Teknologi Tbk for the 2017-2022 period

Year	WCTA	RETA	EBITTA	MVE to BVD	Z-Scores	Criteria
2017	0.38875	0.05004	0.04166	1.22913	4.28393	*Non Distressed*
2018	0.38645	-0.08313	-0.09607	1.16659	2.84342	*Non Distressed*
2019	0.33735	-0.17896	-0.11422	0.59628	1.48809	*Gray Area*
2020	0.24969	-0.06044	0.20987	1.44054	4.36380	*Non Distressed*
2021	0.25538	0.12245	0.17131	31.03160	35.80889	*Non Distressed*
2022	0.30076	0.22076	0.14171	13.79549	18.13020	*Non Distressed*

Source: Data processed by researchers, 2023

Table 4
Data Description of the Altman Z-Score Method at PT Elang Mahkota Teknologi Tbk for the 2017-2022 period

Descriptive Statistics

	N	Range	Minimum	Maximum	Means	std. Deviation
WCTA	6	,13906	,24969	,38875	,3197300	,06153400
RETA	6	,39972	-,17896	,22076	,0117867	,14696238
EBITTA	6	,32409	-,11422	, 20987	,0590433	,13897394
MVEtoBVD	6	30.43532	,59628	31.03160	8.2099383	12.28136488
ZScore	6	34.32080	1.48809	35.80889	11.1530540	13.50800548
Valid N (listwise)	6					

Source: Data processed by researchers, 2023.

Based on the results of calculations using the Altman Z-Score method presented in the table above, it is illustrated that PT Elang Mahkota Teknologi Tbk is not experiencing financial distress. The average Z-Score value obtained by PT Elang Mahkota Teknologi Tbk from 2017 to 2022 is 11.1530540. This value exceeds the value set by the Altman Z-Score formulation to assess the company's condition, namely 2.60. Nevertheless, the results of the score calculation in Table 3 state that PT Elang Mahkota Teknologi Tbk has experienced a decrease in its score, which resulted in it receiving the grey area criteria or in this case the condition is still unclear whether it is experiencing distress or non-distress. In 2019, the Altman Z-Score method gives a value of 1.

Normality test
Springate Method Normality Test

Table 5
Springate T Method Normality Test Elang Mahkota Teknologi Tbk Period 2017-2022
One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residuals
N		6
Normal	Means	0.0000000

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Parameters, b	std. Deviation	0.00000324
Most Extreme Differences	absolute	0.171
	Positive	0.149
	Negative	-0.171
Test Statistics		0.171
asymp. Sig. (2-tailed)		,200c,d

Source: Data processed by researchers, 2023.

Table 6
Springate Method Shapiro-Wilk Test PT Elang Mahkota Teknologi Tbk Period 2017-2022

Tests of Normality

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Unstandardized Residuals	0.171	6	,200*	0.932	6	0.595

Source: Data processed by researchers, 2023.

Based on the results in Table 6, it is found that the normality test for the Springate method of PT Elang Mahkota Teknologi Tbk for the 2017-2022 period is normally distributed. The basis for decision-making in the normality test is that if the significance value of the results of data processing is > 0.05, then the research data is normally distributed. Conversely, if the value of the results of data processing shows a significance of <0.05, then the research data is not normally distributed.
Based on input table 6, the significance value of the Springate method obtains a sig value of 0.595, which means it is normally distributed. This value is obtained by processing unstandardized residual data which is formed from the results of data processing in Table 5 resulting in an assessment decision stating that sig 0.595 > 0.05 so that the data can be assessed as normally distributed.

Normality Test of the Altman Z-Score Method

Table 7
Normality Test of the Altman Z-Score Method for PT Elang Mahkota Teknologi Tbk for the 2017-2022 period
One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residuals
N		6
Normal Parameters, b	Means	0.0000000
	std. Deviation	0.00000972
Most Extreme Differences	absolute	0.195
	Positive	0.145
	Negative	-0.195
Test Statistics		0.195
asymp. Sig. (2-tailed)		,200c,d

Source: Data processed by researchers, 2023

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Table 8
Shapiro-Wilk Test Altman Z-Score Method PT Elang Mahkota Teknologi Tbk
Period 2017-2022

Tests of Normality

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Unstandardized Residuals	0.195	6	,200*	0.917	6	0.482

Source: Data processed by researchers, 2023.

Based on the results in Table 8, it is found that the normality test on the Altman Z-Score method of PT Elang Mahkota Teknologi Tbk for the 2017-2022 period is normally distributed. The basis for decision-making in the normality test is that if the significance value of the results of data processing is > 0.05, then the research data is normally distributed. Conversely, if the value of the results of data processing shows a significance of <0.05, then the research data is not normally distributed.
Based on Table 8, the significance value of the Altman Z-Score method obtains a sig value of 0.482, which means it is normally distributed. This value is obtained by processing unstandardized residual data which is formed from the results of data processing in Table 7 resulting in an assessment decision stating that sig 0.482 > 0.05 so that the data can be assessed as normally distributed.

Paired Sample T-Test
The Paired to Different T-Test is a data test to compare the differences between the two means of normally distributed paired data. The Paired Sample T-Test is used as an alternative to the Wilcoxon Signed Ranks Test if the data presented meet the assumptions of normality. The following is a different test table for the Paired Sample T-Test from the data that has been analyzed in this study:

Table 9
Paired Sample T-Test Springate Method – Altman Z-score method
PT Eagle Mahkota Teknologi Tbk
Period 2017-2022

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Means	std. Deviation	std. Error Means	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	SScore - ZScore	-9.89540900	12.80853030	5.22906060	-23.33713719	3.54631919	-1,892	5	0.117

Source: Data processed by researchers, 2023.

Based on the calculation results of the Paired Sample T-Test, the significance value listed in Table 9 is 0.117. The basis for decision-making for the Paired Sample T-Test is if the value of Asymp. Sig (2-tailed) < 0.05 then there is a difference between the initial variable and the final variable, whereas if the value of Asymp. Sig (2-tailed) > 0.05, so there is no significant difference between the initial variable and the final variable. Based on Table 9, it can be concluded that there is no difference between the Springate method

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and the Altman Z-Score method in predicting financial distress at PT Elang Mahkota Teknologi Tbk for the 2017-2022 period.

Test the Accuracy of Methods and Error Types
The method of predicting potential financial distress is said to have the best results if the method has the highest accuracy value with the smallest error rate. The level of accuracy describes how precise a method is to correctly predict the condition of a company based on the real conditions of the company mentioned as the object of the research. Calculation of the level of accuracy can be calculated using the following formula:

$$\text{Tingkat Akurasi} = \frac{Jumlah\ Prediksi\ Benar}{Jumlah\ Sampel\ Penelitian}\ x\ 100\%$$

In addition to calculating the percentage accuracy of each prediction method, this study also includes the results of error rate analysis using Type 1 error. Type 1 error is needed in research to increase confidence in determining which predictive model is the best in assessing a company. Type 1 error states that the prediction method shows the result that the company is not experiencing distress when in reality the company is experiencing distress. This type of error can be calculated as follows:

$$\text{Type } Error\ 1 = \frac{Jumlah\ Prediksi\ Salah}{Jumlah\ Sampel\ Penelitian}\ x\ 100\%$$

The following is a test table for the accuracy of the method and the type of error from the data that has been analyzed in this study:

Table 10
Comparison of Prediction Results of the Springate Method with Real Conditions
PT Eagle Mahkota Teknologi Tbk
Period 2017-2022

Information	predictions		Total
	Distress	*Non-Distress*	
Springate Model Calculation Results	2	4	6
The real condition of the company	0	6	6
Level of accuracy		67%	
Error Type I		33%	

Source: Data processed by researchers, 2023.

Based on the table above, the results of calculating the data that has been processed, the Springate method has an accuracy rate of 67% and a type I error of 33%. In Table 10 there is a predictive value which states that PT Elang Mahkota Teknologi Tbk is in a state of distress. From the data in the table above it can also be seen that the actual condition of the company is not experiencing distress but the prediction method states that the company is experiencing distress, giving rise to a type I error value of 33%.

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Table 11
Comparison of Prediction Results of the Altman Z-score Method with Real Conditions
PT Eagle Mahkota Teknologi Tbk
Period 2017-2022

Information	Predictions			Total
	Distress	*Gray Area*	*Non-Distress*	
Altman Model Calculation Results	0	1	5	6
The real condition of the company	0	0	6	6
Level of accuracy	83%			
Error Type I	0			
Gray Area	17%			

Source: Data processed by researchers, 2023.

Based on Table 11, the results of calculating the data that has been processed, the Altman Z-Score method has an accuracy rate of 83% and a type I error of 0%. This is reinforced by the company's always being listed on the floor of the Indonesia Stock Exchange during the current year so that the company is monitored in a non-distress position in real conditions. In Table 11 there is a predicted value which states that PT Elang Mahkota Teknologi Tbk is in the Gray Area. The Gray Area is not included in the calculation of the level of accuracy and type of error because these criteria do not clearly describe the condition of the company.

Discussion

The results of the research data analysis show that the Springate method predicts that there are two years of the current year that place the company in a state of distress. On the other hand, the Altman Z-Score method predicts that in the current year period, there will be one year whose position cannot be determined because it is located in a grey zone which is very difficult to describe, while for the remaining year period, it predicts that the company will not experience financial difficulties. This result is inversely proportional to research conducted by (Al Ayubi et al., 2022) which obtained the result that there was no difference between the two methods, both the Altman Z-Score method and the Springate method. The results of this study also support the results of research conducted by (Mulya, 2020) and (Wahidah,

Based on the results of the research conducted, the results show that of the two financial distress analysis methods used, the Springate method and the Altman Z-Score method have different levels of accuracy. The Springate method correctly predicts the four running years in accordance with the real conditions of the company and gets results that are not in accordance with placing the current two years in a distressed position which is not in accordance with the real conditions of the company. Springate method calculations have an accuracy rate of 67% with an error type of 33%. Different results are actually obtained in calculations using the Altman Z-Score method which predicts exactly five years running according to the real conditions of PT Elang Mahkota Teknologi Tbk and places one year in a grey zone where conditions cannot be determined. thus obtaining an accuracy rate of 83% with a type I error rate of 0% and a Gray Area 17%. The prediction results can be used as indicators so that investors and creditors are more careful in conducting investment and other funding activities for the companies they will invest in.

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CONCLUSION

In this study using the Springate method and the Altman Z-Score method at PT Elang Mahkota Teknologi Tbk for the period 2017-2022 as a research sample, it was concluded that descriptively the data from each financial ratio that the Springate method and the Altman Z-Score method can be applied as one of the predictors in predicting the potential for financial distress at PT Elang Mahkota Teknologi Tbk for the period 2017 to 2022. The results of calculations using the Altman Z-Score method and the Springate method have differences in the level of accuracy of each of these methods. The Springate method has an accuracy rate of 67% with a type error of 33%, while the Altman Z-Score method has an accuracy rate of 100% and an error type of 0%.

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