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FINANCIAL DISTRESS ANALYSIS USING THE SPRINGATE AND ALTMAN Z-SCORE METHODS IN MANUFACTURING COMPANIES LISTED ON THE INDONESIA STOCK EXCHANGE

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Abstract:
This study analyzes the ability of the Springate and Altman Z-Score methods in predicting financial distress in manufacturing companies listed on the Indonesia Stock Exchange (IDX) for the period 2018 to 2022. Although the Indonesian capital market shows positive growth, external challenges such as global economic fluctuations and geopolitical pressures (The Perfect Storm) emphasize the importance of early detection of financial distress to prevent the risk of bankruptcy. This study uses an associative quantitative approach. The research sample consists of 75 financial reports from 15 manufacturing companies, selected through a purposive sampling technique over five years of observation. Data analysis involves descriptive statistics, normality tests, and hypothesis testing (F-Test and t-Test) using SPSS 23.0. The results of the hypothesis testing indicate that both the Springate and Altman Z-Score methods simultaneously and partially have a positive and significant effect in predicting financial distress in manufacturing companies on the IDX. However, based on the accuracy analysis (R-Square), the Springate model (S-Score) is proven to be superior with an accuracy level of 73% (or 73.7%), which is categorized as having very strong closeness. Meanwhile, the Altman Z-Score model had an accuracy rate of 42.3%, categorized as having a strong correlation. The superior accuracy of the Springate model is supported by the use of the Earnings Before Taxes to Current Liabilities (EBTCL) ratio, which is considered more representative. This study concluded that the Springate method was the most accurate model in predicting financial distress in manufacturing companies on the Indonesian Stock Exchange (IDX) during the study period.

Keywords: Financial Distress, Springate (S-Score), Altman Z-Score, Manufacturing Company Minimum.

INTRODUCTION

The Indonesian capital market has experienced a revival since its reactivation in 1977. Over time, this positive growth has become increasingly evident in the increasing number of listed companies (issuers) on the Indonesia Stock Exchange (IDX), reaching 833 entities by early 2023. According to a report from the Indonesian Central Securities Depository (KSEI), the number of capital market investors reached over 10 million at the end of 2022, with the majority being domestic investors. This trend indicates increasing public participation in the investment world.

However, capital market growth is not without external and internal challenges that can impact a company's financial stability. These challenges include increasing business competition, global economic fluctuations, and geopolitical pressures, such as the Russia-Ukraine and Israel-Palestine conflicts, global climate change, rising commodity prices, and the high cost of living known

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as "The Perfect Storm." These factors place significant pressure on business continuity, particularly for manufacturing companies that rely heavily on stable demand and production efficiency.

As a concrete example, PT Northcliff Citranusa Indonesia Tbk (SKYB) showed signs of financial distress due to its inability to adapt to changing consumer consumption patterns and intense competition. The company recorded losses of up to IDR 1.23 billion at the end of September 2018 and was threatened with delisting from the stock exchange. This phenomenon demonstrates the importance of early detection of financial distress to prevent the risk of bankruptcy.

A company's inability to manage internal and external pressures will result in declining financial performance, disrupted cash flow, and ultimately bankruptcy. Failure to research predicting financial distress can result in companies, investors, and creditors missing out on the opportunity to take preventative measures to mitigate these risks. However, early detection of financial distress is crucial for accurate and timely decision-making.

Several previous studies have been conducted to identify companies experiencing potential financial distress, including using the Altman Z-Score and Springate methods. Studies by Azizah (2017), Gupita et al. (2020), and Tan & Wibisana (2020) indicate that both models have fairly good accuracy in predicting financial distress. However, previous studies still have limitations, such as limited observation periods, unrepresentative sample sizes, and the lack of in-depth comparisons of the accuracy of the two models simultaneously in the current manufacturing sector in Indonesia.

For these reasons, this study is crucial to assess the ability of the Springate and Altman Z-Score methods to more comprehensively predict financial distress in manufacturing companies listed on the IDX. It is hoped that this will contribute significantly to financial risk management and more informed investment decision-making.

METHODS

This study uses a quantitative, associative approach. The data source is the Indonesia Stock Exchange, focusing on financial statements of manufacturing companies listed on the Indonesia Stock Exchange between 2018 and 2022 through access at www.idx.co.id.2023. The population of this study includes manufacturing companies listed on the Indonesia Stock Exchange. This study focuses on the 2018-2022 period, spanning five years of observation, allowing researchers to conduct in-depth analysis and observe company developments over that period. The sample size was determined by multiplying the total number of indicators used. In this study, observations were conducted on 15 companies over five years. As a result, the sample size reached 75 financial statements (15 companies x 5 years of observation). The data used in this study is quantitative and secondary data accessed through the official website of the Indonesian Stock Exchange. The data falls into the time series category, taken from 2018-2022. The data sources used in this study are secondary data, derived from the financial reports of manufacturing companies listed on the Indonesia Stock Exchange for the years 2018-2022, primarily annual financial reports, which can be obtained from the official website, http://www.idx.co.id. The data collection methods used were documentation, literature review, and internet searches. The data analysis methods used were descriptive statistics, data normality testing, and hypothesis testing.

RESULT AND DISCUSSION

Data Instrument Testing. The data processing method in this study employed SPSS 23.0 for Windows. This process involved several stages to test the suitability of the model. The following are some of the tests used.

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Descriptive Statistics. The purpose of descriptive statistics was to identify the minimum, maximum, mean, and standard deviation values of two financial distress prediction models applied to manufacturing sector companies listed on the Indonesia Stock Exchange (IDX) during the 2018-2022 period. Detailed descriptive statistical test results for each model can be seen in the table below:

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
X1	75	-.4540	3.3470	1.221800	.9080221
X2	75	.0100	5.3430	2.331707	1.3465412
Valid N (listwise)	75				

Source: data processed by SPSS 23, 2023

Descriptive Statistics of the Springate Method. The Springate model scores show a wide range of values, with the lowest value reaching -4.540 in 2022, recorded for PT Prima Alloy Steel Universal Tbk. Interpretation of this minimum value indicates that the company is in a state of severe distress (s-score <0.682). Conversely, the highest value in the Springate model reached 3.3470 in 2018 for PT Unilever Indonesia Tbk, and this maximum value indicates that the company is in the healthiest condition compared to other companies.

Overall, the mean value of the Springate model reached 1.221800, indicating that, on average, the companies observed were in a state of non-financial distress (s-score >0.682). In addition, the standard deviation value of this model is around 0.9080221, indicating that the data distribution is relatively consistent because the standard deviation value is lower than the average value (0.9080221 < 1.221800).

Descriptive Statistics of the Altman Z-Score Method. The minimum value of the Altman model score reached 0.0100 for PT. Prima Alloy Steel Universal Tbk in 2022. Under this condition, the company is interpreted or predicted to be in severe distress (z-score <1.10). Conversely, the maximum value of the Altman model reached 5.3430 for PT. Akasha International in 2021, predicting that the company was in the healthiest condition compared to the others.

The average Altman model score was 2.331707, indicating that overall, these companies tended to fall within the gray area. The standard deviation of the Altman model was 1.3465412, indicating that the data spread was relatively low, reflecting a more limited variation compared to the average value.

Data Normality Test. The data normality test is used to determine whether the data population is normally distributed. This test is also used to measure data on an ordinal, interval, or ratio scale, as explained by Ghozali (2018). In this study, the normality test used the One-Sample Kolmogorov-Smirnov test with a significance level of 0.05.

According to Sugiyono, data is considered normally distributed if the significance level is greater than 5% or 0.05. Similarly, if the significance level is below 0.05, the data is considered non-normally distributed. The data normality test in this study used SPSS 23 software.

Table 2. Kolmogorov-Smirnov Test

	X1	X2
N	75	75

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Normal Parameters[a,b]	Mean	1.221800	2.331707
	Std. Deviation	.9080221	1.3465412
Most Extreme Differences	Absolute	.136	.060
	Positive	.136	.054
	Negative	-.083	-.060
Test Statistic		.136	.060
Asymp. Sig. (2-tailed)		.002[c]	.200[c,d]

Source: data processed by SPSS 23, 2023

Based on the results of the data normality test, it shows that the data is not normally distributed, as seen in the Asymp.Sig. (2-tailed) of 0.002 < 0.05 for the Springate method (X1). At the same time, the Altman z-score method (X2) shows an Asymp.Sig. (2-tailed) value of 0.200 > 0.05, which means the data is normally distributed.

Hypothesis Testing. Statistically, this hypothesis testing can be measured using the F-statistic and t-statistic values. A statistical calculation is considered statistically significant if the test statistic falls within the critical range. Conversely, it is considered insignificant if the test statistic falls within the non-critical range. The following explains the results of the data analysis test.

Simultaneous Test (F Test). The F test is a significance test of the equation used to determine the extent of the influence of the independent variables (X_1, X_2) simultaneously on the dependent variable (Y). The basis for making this decision is as follows:

1) If the calculated F > F table and the probability value (Sig. F) < α (0.05), then there is a significant simultaneous influence between variable X and Y.
2) If the calculated F ≤ F table and the probability value (Sig. F) ≥ (0.05), then there is no simultaneous influence between variable X and Y.

Table 3. Springate Model F Test

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	13.794	1	13.794	204.426	.000[b]
Residual	4.926	73	.067		
Total	**18.720**	**74**			

a. Dependent Variable: Y1
b. Predictors: (Constant), Springate
Source: data processed by SPSS 23, 2023

Based on the table above, it can be seen that the sig. value is 0.000 < 0.05, and the calculated F value is greater than the F table, namely 204.426 > 3.12. Therefore, there is a significant simultaneous influence between variable X and variable Y. This means that the independent variables of the Springate Method in predicting financial distress have a simultaneous and significant influence.

Table 4. Altman Z-Score Model F Test

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	7.855	1	7.855	53.429	.000[b]
Residual	10.732	73	.147		
Total	**18.587**	**74**			

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a. Dependent Variable: Y2
b. Predictors: (Constant), Altman Z Score
Source: data processed by SPSS 23, 2023

Based on the table above, it can be seen that the sig. value is 0.000 < 0.05, and the calculated F value is greater than the F table, namely 5.429 > 3.12. Therefore, it can be concluded that there is a simultaneous significant influence between variable X and variable Y. This means that the independent variables using the Altman z-score method have a simultaneous and significant influence in predicting financial distress.

Paired Sample t-Test. The t-test is used to test the level of significance of the influence between the independent and dependent variables. Ghozali (2018) states that the criteria for this test are determined based on probability. If the significance level used is 5 percent or 0.05, the following conclusions can be drawn:

1) If the sig. value is < 0.05 or the calculated t-value is > t-table, then there is an influence of variable X on variable Y.
2) If the sig. value is > 0.05 or the calculated t-value is < t-table, then there is no influence of variable X on variable Y.

Table 5. Springate Model t-Test

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	-.061	.051		-1.207	.231	-.162	.040
Springate	.475	.033	.858	14.298	.000	.409	.542

Source: data processed by SPSS 23, 2023

Based on the table above, the significance value is 0.000 < 0.05 or 14.2988 > 1.66629, which means the calculated t-value is greater than the table t-value. Therefore, it can be concluded that there is a positive influence between variable X and variable Y. This means that the Springate method is able to predict financial distress in companies listed on the Indonesia Stock Exchange.

Table 6. Altman Z-Score Model t-Test

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	-.111	.089		-1.246	.217	-.288	.067
Altman Z Score	.242	.033	.650	7.310	.000	.176	.308

a. Dependent Variable: Y2
Source: data processed by SPSS 23, 2023

Based on the table above, the significance value is 0.000 < 0.05, or the calculated t-value of 7.310 > the t-table value of 1.666. It means the calculated t-value is greater than the table t-value. Therefore, it can be concluded that there is a positive influence between variable X and variable Y. This means

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that the Altman z-score method is able to predict financial distress in companies listed on the Indonesia Stock Exchange.

Test of Determination (R2). According to Sujarweni (2015), the correlation coefficient is a value used to measure the strength or closeness of a relationship between variables. The correlation strength can be grouped as follows:

1. 0,00 – 0.20 indicates a very weak correlation.
2. 0.21 – 0.40 indicates a weak correlation.
3. 0.41 – 0.70 indicates a strong correlation.
4. 0.71 – 0.90 indicates a very strong correlation.

The magnitude of the R2 value reflects the extent to which the independent variable can influence the dependent variable. A low R2 value indicates that the independent variable's ability to explain variation in the dependent variable is insignificant. Conversely, an R2 value approaching one indicates that the independent variable provides almost all the information needed to predict variation in the dependent variable.

Table 7. Determination Test (R2) of the Springate Model

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	.858[a]	.737	.733	.260

a. Predictors: (Constant), Springate

Source: data processed by SPSS 23, 2023

Based on the table above, the R-Square value of the Springate model is 0.737, or 73.7%. This value indicates the Springate model's ability to predict a company's financial condition. This figure indicates that the dependent variable can be explained by independent variables with a very strong correlation, as it falls within the range of 0.71–0.90.

Table 8. Determination Test (R2) of the Altman Z Score Model

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.650[a]	.423	.415	.383	.423	53.429	1	73	.000

a. Predictors: (Constant), Altman Z Score

Source: data processed by SPSS 23, 2023

Based on the table above, the R-Square value of the Altman z-score model is 0.423, or 42.3%. This value indicates the Springate model's ability to predict a company's financial condition. This figure indicates that the dependent variable can be explained by independent variables with strong correlations, as they fall within the range of 0.41–0.70.

All collected datasets were then analyzed to provide solutions to the problems focused on in this study. Data analysis was performed using SPSS version 23.0 for Windows to enhance the validity of the results. The following are the results of the analysis process.

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Based on the various analytical tests conducted, the next step will involve discussing the data processing results. The purpose of this stage is to provide a deeper understanding of the impact of the variables in the study, both in the form of direct and indirect relationships influenced by other factors. The variables focused on in this study include the Springate method (X_1), the Altman z-score method (X_2), and financial distress (Y).

Financial Distress Analysis Using the Springate Method in Manufacturing Companies Listed on the Indonesia Stock Exchange. The research results presented indicate that the Springate method simultaneously has a positive effect in predicting financial distress in manufacturing companies listed on the Indonesia Stock Exchange with a fairly high degree of accuracy. However, these results will be definitively proven after observing the company's condition in the following year. The researchers' processed data identified several companies' financial reports that were predicted to be categorized as having a high potential for bankruptcy based on the calculation of bankruptcy potential using the Springate model (S-Score). Several companies were also found to fall into the grey area category in the Altman method, but were declared unhealthy by the Springate method. Differences partly influence it in the indicators used in each method.

Overall, several previous studies indicate that the Springate method is reliable in providing early signals regarding a company's potential for financial distress. The high level of accuracy of this method can serve as a guide for stakeholders, including investors and creditors, to take appropriate steps to manage financial risk better (Amanda et al., 2019).

Financial distress analysis using the Springate method provides two benefits in this study. First, this method helps reduce uncertainty and information asymmetry between management and stakeholders, thereby creating clarity regarding the company's financial health after reviewing the company's condition in the following year. Second, the positive and significant prediction results of this method can serve as a signal to management to take proactive action to address potential financial issues.

In this regard, this research aligns with the concept presented by Michael Spence in 1973. Spence (1973) argued that through signaling, the party possessing information attempts to provide useful data to the recipient. The recipient of the information will then adapt their actions based on their interpretation of the signal.

In the context of Signaling Theory, it explains how company management takes steps to convey information to investors or creditors regarding the company's condition. The information provided can be in the form of the company's financial statements, and if these financial statements reflect less than positive results, investors may choose to invest their funds in other companies (Pertiwi, 2018).

The results of this study are supported by research (Azizah, 2017), which shows that the springate method has a positive effect in predicting financial distress by showing an accuracy level of seventy-two percent and likewise research by (Tan and Wibisana, 2020), which shows that the springate model has a fairly high level of accuracy. It is also in line with research conducted by researchers showing that the springate method is able to predict financial difficulties with a fairly high level of accuracy, but for proof it can be ascertained after the following year by observing the company's condition whether it is in accordance with the predictions that categorize the company as healthy or unhealthy (financial distress) with the springate method used previously.

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Financial Distress Analysis Using the Altman Z-Score Method in Manufacturing Companies Listed on the Indonesia Stock Exchange. Based on the research results presented, researchers presented differing findings regarding the accuracy of the Altman Z-Score, which predicted the model had a low level of accuracy. Nevertheless, it does indicate that the Altman Z-Score has a positive effect in predicting financial distress in manufacturing companies listed on the Indonesia Stock Exchange. However, this can be confirmed after the following year by assessing whether the company's condition aligns with the predictions, which categorize it as healthy, in the gray area, or unhealthy (financial distress) using the previously used Altman Z-Score method (Heykal et al., 2024).

Jensen's (1992) agency theory suggests that management may have an incentive to provide information that supports the perception that the company's condition is more stable, even when this is not actually the case. It can be a strategy to minimize risk and safeguard their own interests.

While this practice may protect the company's reputation, it creates information asymmetry that can harm shareholders by providing an inaccurate picture of the risk of financial distress. Therefore, calculating financial distress using this method can provide a forecast of financial conditions and avoid agency conflicts related to the company's internal financial condition. Positive and significant prediction results from this method can serve as a signal to management to take proactive action to address potential financial problems.

Several previous studies have shown that the Altman Z-Score method can be relied upon as an effective bankruptcy prediction tool, particularly in manufacturing companies. This finding is further supported by research (Wardani et al., 2022), which found that the Altman Z-Score method is able to predict companies in the manufacturing sector. It aligns with the researchers' findings that the Altman Z-Score method can positively predict financial distress. However, further confirmation remains to be seen after examining the company's financial condition in the following year.

The Springate method has a higher level of accuracy in predicting financial distress in manufacturing companies listed on the Indonesia Stock Exchange. Based on the research results presented, the Springate model demonstrates a higher level of accuracy in predicting financial distress. This superiority is based on the use of a specific ratio in calculating the S-value in the model. In contrast, the Altman model does not include this specific ratio in calculating the Z-value. The ratio in question is Earnings Before Taxes to Current Liabilities (EBTCL), which is used to evaluate a company's ability to generate profits to cover short-term obligations. EBTCL is considered a more representative indicator of a company's condition because it encompasses aspects of profitability, operating costs, and debt servicing, all of which play a dominant role in determining the S-value.

This high level of accuracy is thought to be crucial for analyzing financial distress prediction, ensuring that the analytical model used is not misleading and can be applied appropriately to the conditions of companies in Indonesia (Gupita et al., 2020). A previous study concluded that analysis of two models, the Altman Z-Score and Springate, indicated that nine companies were potentially experiencing financial distress. The research findings also revealed that the Springate model had the highest level of accuracy in predicting the likelihood of financial distress (Azizah, 2017).

Research by Rahmani (2023) explains that the findings indicate variations in the health status of manufacturing companies listed on the Indonesia Stock Exchange (IDX) during the 2006-2015 period when several methods were tested. Of the various models applied, the Springate model proved to be superior to other predictive models. Several previous studies also align with the results

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of the researchers' data processing, which showed the Springate method to have a higher level of accuracy than the Altman Z-Score method. However, it should be noted that the accuracy of the results of this level of accuracy will be clearly visible after observing the company's condition the following year and proving that the Springate prediction model is able to provide strong signals according to the predicted results.

CONCLUSION

This study raises the title Financial Distress Analysis Using the Springate Method and the Altman Z-Score Method in Manufacturing Companies Listed on the Indonesia Stock Exchange for the period 2018-2022. The number of samples used in this study is 15 companies with 75 financial reports for each company for the period 2018-2022. After hypothesis testing, it can be concluded that the Springate Method can predict financial distress in manufacturing companies listed on the Indonesia Stock Exchange. Calculation of bankruptcy potential using the Springate model (S-Score) shows that 39 companies' financial reports (52%) are predicted to be healthy, and 36 companies' financial reports (48%) predict that 8 companies are categorized as companies with a strong potential for bankruptcy. The Altman Z Score method can predict financial distress in manufacturing companies listed on the Indonesia Stock Exchange Calculations using the Altman Z score method show that 30 companies' financial reports (40%) are predicted to be healthy, 19 companies (25%) are predicted to be in a gray area and 26 financial reports (35%) are predicted to be unhealthy, namely 5 companies are predicted to experience financial distress very strongly. The Springate method is the most accurate method in predicting financial distress in manufacturing companies listed on the IDX. From the results of the analysis, it can be seen that the Altman Z-Score model has an accuracy rate of 42.3%, while the Springate (S-Score) model shows an accuracy rate of 73%. Therefore, the most accurate model for calculating the potential for bankruptcy in manufacturing companies on the IDX during the 2018-2022 period is the Springate (S-Score) model with an accuracy rate of 73%.

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