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Abstract

This study aims at finding the accuracy level of financial distress prediction on companies in the property, real estate, and building construction sectors. The financial distress prediction models employed here are Z-score, Springate, and Zmijewski. The research population involved all property companies registered at the Indonesian Stock Exchange in the period of 2014-2018. Purposive sampling was used to collect 45 companies. The number of observations taken was 225. The data used were the secondary data taken from the Indonesian Stock Exchange website. The findings showed that the models with high accuracy to predict financial distress in the property, real estate, and building construction sector were the Altman Z-Score model, followed by Zmijewski and Springate models.

Introduction

Property, real estate, and building construction companies have a business encompassing any construction activities including building housing complex, office complex, apartments, and other structures. This type of company is sought after by investors as an alternative to investment. Until the beginning of 2020, 65 companies in the property, real estate, and building construction sector have been go-public. Property, real estate, and building construction sector is susceptible to the negative impacts of the economy which might result in decreasing community's purchasing power due to fluctuated interest rate and inflation. Between 2015 and 2017, there were an economic slowdown of 4 – 4.5% and Rupiah depreciation against the Dollar (Kompas.com, 2015). Such conditions led to the increase in the company production costs since the providers of the building materials used Dollar in selling their products to the property companies.

The high selling price of the properties downgraded people purchasing power in the property sector which also witnessed the decrease in property sales. The decrease in sales inevitably induced loss to the companies which also caused difficulties for the companies to settle their liabilities. The financial difficulties indicate that the companies are undergoing financial distress. Financial distress is one of the symptoms of company bankruptcy, especially if the company cannot get rid of it immediately. A company's financial distress can be predicted by investigating the company's financial performance by analyzing the information in the financial statement using profitability ratio, activity ratio, and liquidity ratio. The use of financial ratio is a detector of financial distress can also be used as a guideline for a company to improve its financial condition. Nustini and Amiruddin (2019) provide information for internal and external parties about the Altman ratio which is very dominant in predicting financial distress as well as providing information on which company is good for avoiding financial distress.

Financial distress can be predicted by the models developed by the experts, such as Z-Score, Springate, Zmijewski, Foster, Grover, Ohlson, and others more. Of the models, Z-Score, Springate, and Zmijewski have been the most frequently used models. However, the previous research did not show consistent results on which model had the highest level of accuracy to predict financial distress. Widiyawati et al. (2015) conclude that the Z-Score model is the best in predicting the bankruptcy potential of a company. Moreover, the research findings of Listyarini et al. (2016) reveal that the Zmijewski model is the model with high accuracy to detect financial distress, while the study of Wibisono et al. (2014) shows that the Springate model is the most accurate model to predict financial distress. Therefore, this study used the three models, namely Z-Score, Springate, and Zmijewski to find which model has the highest accuracy to predict financial distress of the companies in the property, real estate, and building construction sector were registered at the Indonesian Stock Exchange between 2014 and 2018. The purpose of this research is (1) To prove whether there is a difference in the level of accuracy between the Altman Z-Score, Springate, and Zmijewski models in predicting financial distress conditions, (2) To find out which model has the highest level of accuracy.

Literature Review

Financial Statements

Financial statements are a report which is structurally presented containing the information of financial position and performance of an entity (PSAK, 2013). Financial statements are purposed to render the information needed by the users of the report to be used as a basis for decision-making. A report is also a form of accountability of the management for utilizing all resources trusted to them.

Financial Distress

Financial distress is defined as a stage of a decline in a financial condition that occurs before liquidation or bankruptcy (Platt & Platt, 2006). Financial distress can be predicted based on the difficulties faced by a company in settling its liabilities. The information on financial distress is important for the investors as the considerations for investment in a particular company.

Model Z-Score

Z-Score model is a linear analysis in which five components will be weighed objectively to draw the conclusion based on the overall results to classify the companies into distressed or non-distressed (Altman, 2013). Altman conducted a study to predict the financial distress condition in manufacturing and non-manufacturing companies.

Springate Model

The bankruptcy analysis of the Springate model was developed in 1978 by Gorgon L.V. Springate which conducted a study on the manufacturing companies by classifying them into distressed and non-distressed companies (Peter & Yoseph, 2011). Springate initially used 19 financial ratios to predict the financial distress conditions of the companies. Having conducted statistical multiple discriminant analysis.

Zmijewski Model

The model which was developed by Zmijweski (1984) employs a ratio analysis on profitability, liquidity, and financial leverage to predict the financial distress condition of a company. *Zmijewski* researched for 20 years by re-scrutinizing the previous research on financial distress. In the Zmijewski model, if the score achieved is more than 0 (zero), a company is predicted to suffer from financial distress; in contrast, if the score is less than 0 (zero), the company is free from financial distress.

Accuracy Level

There are two types of errors to determine the accuracy level of a model. Error type I is an error when a model predicts that a company does not suffer from financial distress, but in reality, the company shows an opposite condition. Contradictorily, error type II occurs when a model predicts that a company suffers from financial distress, but in the factual condition it does not (Altman, 2013).

Hypothesis Development

The prediction of financial distress can be conducted through several models already developed by the experts. There are three models which are frequently used by the researchers, namely Z-Score, Springate, and Zmijewski. Listiyarini et al (2016) predicting financial distress in the Zmijewski model in manufacturing companies has the highest level of accuracy than the Springate and Z-Score models. Wibisono et al (2014) predicting financial distress in the Zmijewski model in property and real estate companies has the highest level of accuracy than the Springate and Z-Score models. Sari and Yulianto (2018) predicting financial distress in the Z-Score model in property and real estate companies has the highest level of accuracy than the Springate and Zmijewski models. Looking back at the results of the previous research, there was a discrepancy from one study to another study in the accuracy level of each model. Therefore, this research is performed to compare the accuracy levels of the three models, those are Z-Score, Springate, and Zmijewski with the proposed hypothesis as follows.
Hypothesis: There is a discrepancy in the accuracy level among Z-Score, Springate, and Zmijewski models in predicting the financial distress condition of the companies in the property, real estate, and building construction sectors.

Research Method

Population and Sample

The research population was all corporates in the property, real estate, and building construction sector listed at the Indonesian Stock Exchange for the period 2014-2018. The samples were selected using the purposive sampling technique with general criteria as follows.
1. The company operated in the sector of the property, real estate, and building construction.
2. The company published the financial statements during 2014 - 2018.
3. The company published the financial statements with the end period in December.
4. The company presented the financial statements in Rupiah.

This study also employed specific criteria to categorize distressed companies and non-distressed companies. The distressed companies were grouped in Category A with the criterium negative net income in the income statements in two or more consecutive years. The condition demonstrated that the company was suffering from financial distress, while the non-distressed companies were grouped in Category B with the criteria as follows.
1. The company did not experience negative net income in three or more consecutive years.
2. The company operated in the same sector as the companies in Category A.

Variable Definitions and Measurement

Z-Score model

Z-Score model is a model for predicting bankruptcy by combining certain financial ratios in a discriminant equation which will produce a certain score that will indicate the probability of bankruptcy. Z-Score is measured as follows:

Z" = 6.56 (X1) + 3.26 (X2) + 6.72 (X3) + 1.05 (X4)

Where:
X1 = Working capital/total assets
X2 = RE/total assets
X3 = EBIT/total assets
X4 = Total equity/total liabilities

Springate model

The Springate model is a model for predicting bankruptcy by combining several common financial ratios given different weights from one another. The Springate model is measured as follows:

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

Where:

$$X1 = \frac{(current\ assets - current\ liabilities)}{total\ Assets}$$

$$X2 = \frac{EBIT}{total\ assets}$$

$$X3 = \frac{EBIT}{current\ liabilities}$$

$$X4 = \frac{sales}{total\ assets}$$

Zmijewski model

Zmijewski's model is a model for predicting bankruptcy using ratio analysis that measures company performance, leverage, and liquidity. Zmijewski model is measured as follows:

X = -4.3 – 4.5X1 + 5.7X2 - 0.004X3

Where:
X1 = *ROA*
X2 = *debt ratio*
X3 = *current ratio*

Data Analysis Method

SPSS was used as the data analysis method to produce a set table of data with the conclusion on the analysis result. The data were then analyzed using descriptive statistical analysis, normality test, and two-sample independent t-test. Besides, this study also calculated the financial ratios to predict the financial distress using Z-Score, Springate, and Zmijewski. After all, calculations were conducted on the models, the next step was determining the accuracy levels of the three models by comparing the prediction results with the real samples' conditions.

Descriptive Statistical Analysis

Descriptive statistics is one of the statistical methods in collecting and presenting data, determining statistical values, and making a diagram of a particular issue so that the data can be presented in such a way for easy reading and understanding (Nasution, 2017). Descriptive statistical analysis was conducted to give the understanding and description of the general characteristics of the data which can be seen from the maximum, minimum, mean, and standard deviation values of the research variables (Z-Score, Springate, Zmijewski).

Normality Test

A normality test is a data testing to see whether or not the residual value is normally distributed (Gozhali, 2011). This study employed the Kolmogorov-Smirnov test for normality test based on the assumption that if the significance value > 0.05, the data were normally distributed, and if the significance value < 0.05, the data were not normally distributed.

Two-sample Independent T-test

The samples of the study were categorized into two, namely Category A for the companies suffering from financial distress and Category B for the companies not suffering from financial distress. The samples were categorized using the pair matching test. The two-sample independent t-test was performed to find out whether or not there was a difference in total assets average between the samples in category A and those in category B. T-test is used to test the data normality, if the data are normally distributed. However, if the data are not normally distributed, the Mann-Whitney test will be employed with the provision if the significant value > 0.05, the samples of categories A and B have relatively similar total assets.

Results and Discussion

Table 1 presents a recapitulation of the number of samples used in this study.

Table 1. Result of Sample Selection Based Purposive Sampling Method

No.	Criteria	Number
1	Companies operating in the sector of the property, real estate, and building construction.	65
2	Companies did not publish the complete financial statements during 2014 - 2018.	(20)
3	Companies did not publish the financial statements with the end period in December.	0
4	Companies did not present the financial statements in Rupiah.	0
	Number of samples meeting the criteria	45
	Number of observations (45 x 5)	225

Result of Descriptive Statistical Analysis

Table 2 shows the results of the analytic descriptive analysis of each variable.

Table 2. Result of Descriptive Statistical Analysis

Model	N	Min.	Max.	Mean.	Std. Dev.
Altman Z-Score	225	-.8064509	720.8056979	18.85644458	81.5828545
Springate	225	-.7290392	13.5134076	.797896349	1.0883976
Zmijewski	225	-5.200602	.3578823	-2.22190919	1.23797849

Result of Normality Test

Table 3 presents the results of the normality test.

Table 3. Result of Normality Test

	Kolmogorov-Smirnov		
	Statistics	df	Sig.
Sample A	0.251	9	0.108
Sample B	0.219	9	0.200

Based on Table 3, it can be seen that the significance value of the samples in Category A (companies suffering financial distress) was 0.108 > 0.05, so it can be concluded that the data were normally distributed. Similarly, the significance value of the samples in Category B (companies not suffering from financial distress) was 0.2000 > 0.05 which means that the data were also normally distributed.

Result of Two-sample Independent T-test

Table 4. Result of Two-Sample Independent T-test

Sample	t-test		
	t	df	Sig. (2-tailed)
Equal variances assumed	-1.437	43	0.158
Equal variances not assumed	-2.468	40.034	0.018

From Table 4, it can be depicted that the significance value obtained was 0.158 > 0.05 which can be concluded that the samples of both categories A and B had relatively similar total assets. Both samples fulfilled the criteria; as a result, the study can further to the subsequent stage.

Result of Accuracy Level Measurement

Z-Score model

Table 5 shows the result of measurement for the Z-Score model which predicted correctly 12 of 34 companies. In terms of the companies which did not suffer from financial distress, the Z-Score model predicted correctly 187 of total 191. Based on the number of predictions, it could be measured that the Z-Score model accuracy level was 88.44% with an error rate of 11.56%.

Table 5. Result of Accuracy Level Measurement of Altman Z-Score Model

Recapitulation		Prediction		Total
		Distress	Non-distress	
Real	Distress	12	22	34
	Non-distress	4	187	191
Total		16	209	225
Accuracy level		88.4444		
Error rate		11.5556		

Springate model

It can be seen in Table 6 that the total correct predictions of the Springate model for financially distressed companies were 33 out of a total of 34 companies, and only 76 of 191 non-distressed companies could be correctly predicted by this model. Based on the number of predictions, the Springate model was measured to have an accuracy level of 48,44% with an error rate of 51,56%.

Table 6. Result of Accuracy Level Measurement of Springate Model

Recapitulation		Prediction		Total
		Distress	Non-distress	
Real	Distress	33	1	34
	Non-distress	115	76	191
Total		148	77	225
Accuracy level		48.4444		
Error rate		51.5556		

Zmijewski model

As can be seen from the recapitulation in Table 7, the Zmijewski model predicted correctly only 1 from 34 distress companies. However, the model could predict 187 of 191 correctly for non-distressed companies. Hence, the accuracy level of the Zmijewski model was 83.56% with an error rate of 16.44%.

Table 7. Result of Accuracy Level Measurement of Zmijewski Model

Recapitulation		Prediction		Total
		Distress	Non-distress	
Real	Distress	1	33	34
	Non-distress	4	187	191
Total		5	220	225
Accuracy level		83.5556		
Error rate		16.4444		

Recapitulation of Accuracy Level Measurement Results

Table 8. Recapitulation of Accuracy Level Measurement

Model	Prediction		Accuracy level	Error rate
	Correct	Incorrect		
Z-Score	199	26	88,44%	11,56%
Springate	109	116	48,44%	51,56%
Zmijewski	188	37	83,56%	16,44%

Based on the recapitulation shown in Table 8, it can be seen that there is a difference in the accuracy levels of Z-Score, Springate, and Zmijewski models in predicting the financial distress condition of the companies in the property, real estate, and building construction sector. The Z-Score model has the highest level of accuracy compared to Springate and Zmijewski models. Z-Score model might have the highest level of accuracy because the Altman model has three types of modifications which are categorized based on the types of the predicted company.

The first type of Altman model (Z-Score) is used to predict the financial distress condition in the manufacture and go-public company, while the modified Altman model (Z'-Score) is used to predict financial distress condition in manufacture company which is not go-public. The last model of modified Altman (Z''-Score) is the most accurate model to predict non-manufacture companies either go public or not, including the companies in the sector of the property, real estate, and building construction.

Conclusion

Based on the calculation and measurement above, it can be concluded that there is a difference in the accuracy levels among Z-Score, Springate, and Zmijewski models in predicting the financial distress condition of companies. Z-Score model is the model with the highest accuracy level to predict financial distress in companies, amounting to 88.44% with an error rate of 11.56%. The second highest is the Zmijewski model with 83.56% and an error rate of 16.44%. In this research, the Springate model has the lowest level of accuracy, namely 48.44% with an error rate of 51.56%, so this model is not recommended to be used to predict financial distress in property, real estate, and building construction companies.

Based on the findings, it can be concluded that the Z-Score model is the model with the highest accuracy level to predict the financial distress condition of a company. Z-Score model can be used by the investors as a means to predict accurately the financial distress of companies in the property, real estate, and building construction sector, thus utilize the information as the considerations to invest. This model can also be used by companies to accurately measure and determine their financial conditions. The accurate results then can be evaluated by the companies to improve their performance to minimize the risk of financial distress.

Suggestions for further studies examine the industrial sectors other than property, real estate, and building construction sectors, like manufacturing company, service company, trading company, and other sectors. Further studies are also suggested to apply other predictive models than Z-Score, Springate, and Zmijewski, such as the Ohlson model, Grover model, Foster model, and others in the longer period.

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