

Analysis of Altman Z-Score and Zmijewski Bankruptcy Prediction in Telecommunication Sub-Sectors Registered in Indonesia Stock Exchange in 2016-2018

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ABSTRACT : Bankruptcy is a condition when a company suffers from insufficient funds to run its business. The initial symptoms of bankruptcy are usually characterized by financial distress experienced by each company. If the financial difficulties are not directly handled by the company, then bankruptcy will occur at the company. The purpose of this study was to determine whether telecommunications sub-sector companies in Indonesia experienced bankruptcy or not and whether there were differences in results from the bankruptcy prediction analysis model used. This research was conducted in telecommunications sub-sector companies listed on the Indonesia Stock Exchange. The number of samples taken were 5 companies, using all of the company's annual reports for the 2016-2018 period. The analysis technique used is the Altman Z-Score and Zmijewski bankruptcy analysis model. Based on the results of the analysis found that there are sub-sector telecommunications companies that are predicted to go bankrupt either through the analysis of the Altman Z-Score and Zmijewski models. This shows that there are still telecommunications companies that have not been able to manage their companies, especially in the financial sector. In addition, the results of the study also found that there were differences in analysis results obtained with the Altman Z-Score and Zmijewski models. This shows that each model has a different level of accuracy because the ratios used as variables in the analysis are different in each model.

KEYWORDS: *bankruptcy; telecommunications; altman z-score model; zmijewski model*

I. INTRODUCTION

The main purpose of establishing a company is to maximize corporate profits and also the prosperity of the company owner. From these main objectives, the management must be able to produce optimal profits and careful control of operational activities, especially those related to corporate finance. In addition to making a profit, the company's goal to survive and advance above other companies will create increasingly sharp competition which will have a strong impact on all companies on a national and international scale. Therefore, improving performance is something that must always be maintained by the company so that the company's condition remains stable and does not experience bankruptcy.

Bankruptcy is a condition when a company suffers from insufficient funds to run its business. Bankruptcy can also be said as a final or final condition of a company which is seen from the loss of opportunities in getting profits and continuing its business activities (Dawir, 2010). The above phenomenon provides information that bankruptcy is an event that can occur due to unfavorable economic conditions and other causes. The initial symptoms of bankruptcy are usually characterized by financial distress experienced by each company. If the financial difficulties are not directly handled by the company, then bankruptcy will occur at the company.

Indonesia classified as a developing country that is currently incessant in the development and growth of the industry, has companies spread across each island with a variety of diverse sectors. With these conditions, of course business competition in Indonesia is classified as high so that not a few companies have advanced surged up and companies that went bankrupt. The infrastructure, utilities, and transportation sectors are one of the sectors that is under the spotlight because infrastructure development is the focus of Indonesia which aims to ensure the smooth running of the Indonesian economy.

Table 1.List of 10 companies in infrastructure, utilities and transportation sector with the largest transaction value in trade

Code	Transaction Value(Rp)	PER	PBV
TLKM	289.577.219.000	19,48	3,49
FREN	202.358.858.000	-13,2	6,6
PGAS	183.462.001.000	13,74	1,2
ISAT	174.486.097.000	-9,92	1,57
EXCL	89.899.865.500	-113,89	1,02
TOWR	77.271.114.000	19	5,52
TRAM	73.905.059.100	61	1,62
DEAL	51.044.014.000	0	57,67
GIAA	45.187.013.800	-5,02	0,06597
LEAD	37.173.904.500	-2,39	0,24

Source: www.rti.co.id, 2019

Table 1 presents the 10 companies in the infrastructure, utilities, and transportation sectors with the largest transaction value in trade, this sector recorded a fairly high-performance growth with the majority of the infrastructure sector being filled by telecommunications sub-sector companies. The main telecommunications sub-sector company in Indonesia is one of the most dominating companies in the market and has a very rapid development at this time. But in its development, not all telecommunications companies can generate profits, some telecommunication subsidiary entities that dominate the market share, actually experienced a decrease in profits or even suffered losses.

Telecommunications company market competition in the tariff war is one of the causes of the unhealthy telecommunications industry, especially cellular. Each operator competes to attract customers by offering attractive and inexpensive data rates that are allegedly already below the production price due to the coercion from high market competition. Dramatic increase in traffic is not commensurate with the revenue received. As a result, this practice of loss-selling will threaten the financial condition of the operator. Operators can fall and end up harming the company, so if it is not anticipated as soon as possible, the telecommunications company will be threatened with bankruptcy. Based on the phenomena that have been described, the researchers decided to use the telecommunications sub-sector company as a research location.

The telecommunications company manager needs to do a bankruptcy prediction analysis to find out the development and financial condition of the company so that it can anticipate bankruptcy in the future (Khaddafi et al., 2017). Information to predict bankruptcy is needed to anticipate it in terms of decision making. With bankruptcy prediction information, a company can quickly make a decision to anticipate or prepare for a situation where the company will bankrupt and is also useful for investors to determine investment decisions in companies that are predicted to go bankrupt.

Bankruptcy prediction analysis is an analysis that can help companies to ask for consideration the company will increase bankruptcy caused by financial problems. Conditions of financial difficulties or even bankruptcy can be identified earlier before they occur using the model. Some bankruptcy analysis models that are often used are the Altman Z-Score Analysis (1968), Springate (1978) and Zmijewski (1984). This bankruptcy analysis is known as being easy, the accuracy in the selection of bankruptcy predictions is also quite accurate. Bankruptcy analysis is done to predict a company and consideration of a company in the future.

Research by Yuliastary (2014) aims to find out how the financial performance of PT. Fast Food Indonesia Tbk. by using the Altman, Springate, Zmijewski Z-Score method. The results of this study indicate that the financial performance analyzed by the Altman, Springate, Zmijewski Z-Score method at PT. Fast Food Indonesia Tbk. classified as healthy or not potentially bankrupt. In this study proves that the 3 prediction analysis models can predict according to the real conditions of the company appropriately.

Purnajaya (2014) examined whether there were differences in the potential for bankruptcy of the cosmetics industry listed on the IDX with the Altman, Springate and Zmijewski Z-Score methods. This study provides evidence that each bankruptcy prediction model can produce different results due to differences in potential bankruptcy. Therefore, in researching or analyzing the potential for bankruptcy of a company, more than 1 analysis model is needed to be able to compare the results obtained. Based on this research, the researcher decided to examine using 2 models, namely the Altman Z-Score and Zmijewski analysis because both models have almost the same level of accuracy.

The object of this study is the financial statements of companies in telecommunications sub-sector listed on the Indonesia Stock Exchange in 2016-2018 consisting of balance sheets and income statements of companies which are specifically related to capital, earning asset quality, profitability, and liquidity.

Signal theory is an action taken by company management that provides instructions to investors about how to manage the company's prospects. So, the results of bankruptcy predictions raised in this study can also be used as a signal to external parties or outsiders about how the conditions will occur in a company the following year in the year the company is bankrupt (Pangkey et al., 2018). The statement was reinforced by Andriawan and Salean (2016) who examined the analysis of the Altman Z-Score method as a prediction tool for bankruptcy and its effect on stock prices on pharmaceutical companies on the IDX. Relevant research results show that 59 companies are within the upper limit of the Z-Score so that the company is categorized as not experiencing bankruptcy (healthy), while the results of the regression test indicate that the stock price is positively influenced by the Z-Score by 52% while the rest have other variables. Based on research by Usmiar and Nurhidayah (2018) who analyzed bankruptcy predictions regarding 3 telecommunications sub-sector companies in the 2013-2016 period using the Altman Z-Score model. The study concluded that no telecommunications company had a Z value of > 2.99 classified as a healthy or bankrupt company. Based on these studies, the authors found that there were irregularities in the study that still uses the first or the original Altman Z-Score model which is used to predict bankruptcy potential in companies that are limited to go-public manufacturing, while the types of companies studied are telecommunications sub-sector companies that are type of non manufacturing company. In addition, in reality, all of the telecommunications sub-sector companies tested were still operating and not bankrupt. So the author's hypothesis regarding the bankruptcy predictions of telecommunications sub-sector companies in the 2016-2018 period using the Altman Z-Score model is:

H1: Telecommunications Sub-Sector Companies in the Period of 2016-2018 is not predicted bankrupt based on Analysis of the Altman Z-Score Model.

Wulandari and Tasman (2019) in comparing bankruptcy analysis to telecommunications companies listed on the Indonesia Stock Exchange in 2008-2017 using the Zmijewski model. The number of companies that experienced distress during the study period were PT Bakrie Telecom Tbk (BTCL) and PT Smartfren Tbk (FREN), and the company that was predicted to be safe or non-distress was PT Telekomunikasi Indonesia (TLKM). Prihanthini (2013) in predicting bankruptcy against Food and Beverage companies using the Zmijewski model, there were companies that went bankrupt. Based on research by Purnajaya (2014) which examines whether there are differences in the potential bankruptcy of the cosmetics industry listed on the IDX with the Z-Score Altman, Springate, and Zmijewski methods. The result is a difference in the potential for the bankruptcy of the cosmetics industry listed on the IDX with the Altman, Springate and Zmijewski Z-Score methods. Although there are differences in the results of potential bankruptcy in the study, the Altman Z-Score model and the Zmijewski model each provide results that are classified as the same, most of the cosmetics industry companies are predicted not to go bankrupt. Therefore, despite differences in results, the Zmijewski model only provides slightly different prediction results from the Altman Z-Score model. So, the author's hypothesis regarding the bankruptcy predictions of telecommunications sub-sector companies in the period 2016-2018 using the Zmijewski model is:

H2: Telecommunications Sub-Sector Companies in the Period of 2016-2018 is not predicted bankrupt based on Analysis of the Zmijewski Model.

Research by Purnajaya (2014) on whether there are differences in the potential for bankruptcy of the cosmetics industry listed on the IDX with the Z-Score Altman, Springate, and Zmijewski methods results in differences in potential bankruptcy between the three methods. Based on this research and connecting with statements from the previous hypothesis, even though each model provides results that state that most companies are not bankrupt, there are still differences in the results of a potential bankruptcy analysis of the three models. In addition, there are differences in the chances of results obtained from the Altman Z-Score model and the Zmijewski model. Where the Altman Z-Score model has 3 chance of results, while the Zmijewski model has 2 chance of results. Therefore, the potential for differences in results between the Altman Z-Score model and the Zmijewski Model is getting higher. Wulandari and Tasman (2019) compared bankruptcy analysis to telecommunications companies listed on the Indonesia Stock Exchange in 2008-2017 using the Altman Modification, Springate, and Zmijewski models concluded that each bankruptcy prediction model had different levels of accuracy. Research by Damayanti et al., (2019) which aims to compare the use of Altman Z-Score and Zmijewski bankruptcy prediction models in delisting companies on the Indonesia Stock Exchange in the period 2011-2015 concludes that the Altman Z-Score model more accurately predicts bankruptcy in the period leading up to bankruptcy compared to the model Zmijewski. Therefore, due to differences in accuracy there are certainly differences in the results of the two models. So, the author's hypothesis regarding the differences in the results of the analysis of the Altman Z-Score model with the Zmijewski model is:

H3: There is a Difference between the Results of the Altman Z-Score Model and the Zmijewski Model in Predicting Potential Bankruptcy in Telecommunications Sub-Sector Companies in the 2016-2018 Period.

II. LITERATURE REVIEW

1. Signalling Theory

Signalling theory is a theory that reveals that companies give signals to users of financial statements, both in the form of positive signals (good news) and negative signals (bad news) (Wolk et al., 2001: 81). Signalling theory emphasizes the importance of information provided by the company's management to investors and other parties outside the company about how management views the company's prospects, so that it will provide feedback from investors on the information (Watts, 2003). Signal is an action taken by company management that provides instructions to investors about how management views the company's prospects (Besley and Brigham, 2008: 517). The signal can be a promotion that is information about things that have been done by the agent to realize the principal objectives, or other information that states that certain companies are better than competitors. Based on the explanation of the signalling theory, the researcher argues that the signalling theory is related to this research, which has a relationship in determining the turnaround and non-turnaround companies. Because the information from the company's management is written in the company's financial statements that provide a signal to analyze the company's performance and can indicate and provide a failure or success in turnaround. As stated by Sunyoto (2013: 110) financial statements are a process of analysis and assessment that helps in answering questions as a means to an end. Financial statements are very important for every company, both companies that have gone public or not, because it can be used to determine the performance and financial condition of the company so that it can predict the potential for bankruptcy in the future.

2. Financial Statements

Financial statements will be more useful if the information contained in the financial statements can be used to predict what will happen in the future. According to Kasmir (2008: 7), in a simple sense, financial statements are reports that show the company's financial condition at this time or in a certain period. Meanwhile, according to Munawir (2014: 5), financial statements are a very important tool for obtaining information in connection with the financial position and results that have been achieved by the company concerned. With so the financial statements are expected to help for users to make financial decisions that are financial. From this definition it can be understood that management presents financial statements and outsiders use the information to help make decisions.

3. Bankruptcy

Business difficulties are continuum conditions ranging from mild financial difficulties (liquidity) to more serious difficulties, which are not solvable (debt is greater than assets). In this condition, the company is practically bankrupt (Hanafi, 2010: 638). According to Fahmi (2011: 15), bankruptcy is a risk experienced by a company because of its inability to meet its short-term obligations, so that it affects the disruption of company activities. Meanwhile, according to Kamal (2012), bankruptcy begins with financial distress, which is a situation where the company is unable to pay obligations when due which causes the company to go bankrupt. Bankruptcy can also be said as a failure of a company in carrying out company operations, at least to cover its debts with assets owned.

4. Analysis of the Altman Z-Score Model

Bankruptcy prediction models with multivariate approaches have been applied and developed in many countries. The Altman survey model (1968) cited by Foster (1986) has been applied in the United States, Japan, Germany, Switzerland, Brazil, England, Ireland, Canada, the Netherlands and France. In the survey directed at the similarity of financial ratios between bankrupt companies and non-bankrupt companies in their respective countries. The formula made by Altman, was initially very limited only to manufacturing companies that have gone public, while many companies are not public so they have no market value. Altman then created two more formulas to identify bankruptcy, namely the formula for manufacturing companies that have not gone public and non-manufacturing companies that have gone public and can also be used in general. For non-manufacturing companies and companies in general (generalize), Altman indicates bankruptcy using the formula:

$$Z = 6.56 (X1) + 3.26 (X2) + 6.72 (X3) + 1.05 (X4) \dots\dots\dots (1)$$

Information:

Z: Bankruptcy Index

X1: Working capital (current assets-current liabilities) / total assets

X2: Retained earnings / total assets

X3: Earnings before interest and taxes / total assets

X4: Book value of preferred and common equity / book value of total liabilities

Table 2. Table assessment criteria for non-manufacturing companies

Z-Score	Market value
Z < 1,10	Bankrupt

1,10 – 2,60

Grey Area

 $Z > 2,60$

Non-Bankrupt

Source: Azis, 2008

5. Analysis of the Zmijewski Model

Zmijewski (1984) criticized the sampling model used by his predecessors. According to him, matched-pair sampling techniques tend to bring up bias in the results of his predecessor research. Therefore, Zmijewski (1984) uses random sampling techniques in his research. Zmijewski (1984) requires one crucial thing. The proportions of the sample and population must be determined at the earliest, so that the frequency of financial distress is obtained. This frequency is obtained by dividing the number of samples that experience financial distress by the total sample size. The sample used by Zmijewski (1984) amounted to 840 companies, consisting of 40 companies that experienced financial distress and 800 who did not experience financial distress. Data obtained from the Compustat Annual Industrial File. Data collected from 1972-1978. The statistical model used by Zmijewski (1984) is the same as that used by Ohlson, namely logit regression. Using this model, Zmijewski (1984) produced the following model:

$$Z = -4,803 - 3,599 (X1) + 5,406 (X2) + 1,000 (X3) \dots\dots\dots(2)$$

Information:

X1: ROA (Net income / total assets)

X2: Leverage (Total debt / total assets)

X3: Liquidity (Current assets / current liabilities)

Zmijewski (1984) states that a company is considered bankrupt if the probability is greater than 0.5, in other words, the Z value is 0. Therefore, the cutoff value that applies in this model is 0. This means the company whose Z value is greater than or equal to 0 or positive, meaning the company is predicted to experience bankruptcy in the future. Conversely, companies that have a Z value less than 0 or increasingly negative then the company is predicted not to experience bankruptcy. Zmijewski (1984) has measured the accuracy of his own model, and obtained an accuracy value of 94.9%.

III. RESEARCH METHOD

The research method used in this research is descriptive research that is research conducted to determine the existence of an independent variable, either one variable or more variables (independent variables) without making comparisons or searching for the relationship of variables with each other (Sugiyono, 2018: 12). With this type of case study approach which aims to collect data. This research can present data from the company's financial statements, and then an analysis of potential bankruptcy will be carried out using several prediction models. This research was conducted by accessing the website www.idx.co.id which provides data on telecommunications sub-sector companies listed on the Indonesia Stock Exchange for the period of 2016 - 2018. The object of this study is financial reports on telecommunications sub-sector companies listed on the Indonesia Stock Exchange in 2016 -2018 which consists of balance sheets and income statements of companies which are specifically related to capital, earning asset quality, profitability, and liquidity. The stages of data analysis in this study are as follows:

- 1) Collecting data obtained from the financial statements of telecommunications sub-sector companies listed on the Indonesia Stock Exchange in 2016-2018 through the website www.idx.co.id.
- 2) Perform financial ratio analysis to obtain the variables needed from the Altman Z-Score and Zmijewski models.
- 3) Analyze bankruptcy predictions using the Altman Z-Score and Zmijewski models.
- 4) Calculate the level of accuracy and make a comparison based on the results of the analysis of the Altman Z-Score and Zmijewski models.

The level of accuracy is calculated to find the most accurate bankruptcy prediction analysis model in predicting bankruptcy of telecommunications sub-sector companies listed on the Indonesia Stock Exchange in 2016-2018 (Christianti, 2013).

$$\text{Accuracy Level} = \text{Number of Correct Predictions} / \text{Number of Samples} \times 100\% \dots\dots (3)$$

The number of true predictions is the number of predictions from the results of bankruptcy predictions in accordance with the real state of the company whether experiencing financial difficulties or potentially bankrupt or the company is experiencing a healthy financial condition.

IV. RESULT AND DISCUSSION

1. Altman Z-Score model analysis

Data on the financial statements of telecommunications sub-sector companies that have been reported on the Indonesia Stock Exchange in 2016-2018 are analyzed using the Altman Z-Score model. The results of the Z-Score that have been analyzed can be categorized in bankruptcy, gray or gray areas and not bankrupt. Based on the analysis results obtained can be seen in Table 3 as follows:

Table 3. Results of the Altman Z-Score model analysis

Period	Potentially bankrupt		Grey Area		Potentially not bankrupt		Total	
	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage
2016	4	80%	0	0%	1	20%	5	100%
2017	3	60%	1	20%	1	20%	5	100%
2018	3	60%	1	20%	1	20%	5	100%

Source: Primary Data, 2019

Based on Table 3, the analysis results are obtained using the Altman Z-Score model. In 2016 the number of companies in the telecommunications sub-sector that is predicted to go bankrupt amounted to 4 companies with a percentage of 80%, among them, Bakrie Telecom Tbk., XL Axiata Tbk., Smartfren Telecom Tbk., And Indosat Tbk. The telecommunications sub-sector companies that are predicted not to go bankrupt are as many as 1 company with a percentage of 20%, namely Telekomunikasi Indonesia Tbk.

In 2017-2018 the number of companies in the telecommunications sub-sector is predicted to go bankrupt at 3 companies with a percentage of 60%, namely Bakrie Telecom Tbk., XL Axiata Tbk., And Indosat Tbk. Gray area or gray condition is 1 company with a percentage of 20%, namely Smartfren Telcom Tbk. The telecommunications sub-sector companies that are predicted not to go bankrupt are as many as 1 company with a percentage of 20%, namely Telekomunikasi Indonesia Tbk.

Based on the results of the Altman Z-Score bankruptcy prediction analysis, it is found that there is only 1 company that is predicted to potentially not go bankrupt, namely Telekomunikasi Indonesia Tbk. in 2016-2018, while 4 other companies namely Bakrie Telecom Tbk., XL Axiata Tbk., Smartfren Telecom Tbk., and Indosat Tbk. predicted potentially bankrupt and predictable in the condition of the gray area (Smartfren Telecom Tbk. in 2017-2018). Based on the Altman Z-Score variables obtained from the analysis of financial ratios of the financial statements of each company, working capital to total assets and EBIT to total assets are two variables that have a significant difference in value between the 4 companies that are predicted to go bankrupt with Telekomunikasi Indonesia Tbk, which is predicted to not go bankrupt.

Working capital to total assets is used to measure the ability of a company to produce net working capital from its total total assets. Based on data from the analysis of the ratio, 4 companies that are predicted to go bankrupt tend to get negative scores compared to Telekomunikasi Indonesia Tbk. who obtained positive values. The negative nature of this ratio indicates that the 4 companies are still not able to manage and fulfill their short-term obligations properly.

EBIT to total assets is used to measure the ability of capital invested in total assets to generate profits for all investors. Based on data from the analysis of the ratio, 4 companies that are predicted to go bankrupt tend to get lower scores compared to Telekomunikasi Indonesia Tbk. Low values in this ratio indicate that in the year concerned the company cannot manage assets effectively in generating operating income which results in a low level of profitability.

Bakrie Telecom Tbk. is one of the companies that are predicted to go bankrupt with a very low Z value based on the results of the Altman Z-Score analysis when compared to the 3 other companies that are bankrupt. Based on the results of the ratio value of each variable in the Altman Z-Score, Bakrie Telecom Tbk. almost got an overall negative value of all the ratios used in the Altman Z-Score analysis. That is because Bakrie Telecom Tbk. has a very small number of assets or assets when compared to other telecommunications companies. Therefore, Bakrie Telecom Tbk. classified as a critical company on the verge of bankruptcy.

The results of this study are in line with the results of research conducted by Wulandari and Tasman (2019) in comparing bankruptcy analysis to telecommunications companies using the Altman Z-Score model. The number of companies that experienced distress during the study period is Bakrie Telecom Tbk. and Smartfren Telecom Tbk., and the company that is predicted to be safe is Telekomunikasi Indonesia Tbk. Prihanthini (2013) in predicting bankruptcy against Food and Beverage companies using the Altman model, there are companies that went bankrupt. Silaban (2014) examined 3 telecommunications companies using the Altman model giving the results that Telekomunikasi Indonesia Tbk. is a company with the best corporate health conditions.

The results of this study contradict the research conducted by Boedi and Tiara (2013) regarding the prediction analysis of bankruptcy of telecommunications companies using the Altman Revised model giving the results that 5 telecommunications companies listed on the Indonesia Stock Exchange are all in vulnerable and bankrupt areas. Andriawan and Salean (2016) who examined the analysis of the Altman Z-Score method in pharmaceutical companies showed that 59 companies did not go bankrupt. Yuliastary (2014) which aims to find out how the financial performance of PT. Fast Food Indonesia Tbk. by using the Altman method the company can be classified as healthy according to the real condition of the company. Usmiar and Nurhidayah (2018)

made bankruptcy predictions by using Altman Z-Score on 3 publicly traded telecommunications companies, the results of the study obtained 1 company in a vulnerable area namely Telekomunikasi Indonesia Tbk. and 2 other companies are in bankrupt areas.

2. Zmijewski Model Bankruptcy Prediction Analysis

Data on the financial statements of telecommunications sub-sector companies that have been reported on the Indonesia Stock Exchange in 2016-2018 are analyzed using the Zmijewski model. The results of the Z value that has been analyzed can be categorized in conditions of experiencing bankruptcy and not experiencing bankruptcy. Based on the analysis results obtained can be seen in Table 4 as follows:

Table 4. Results of the Zmijewski model analysis

Period	Potentially bankrupt		Potentially not bankrupt		Total	
	Amount	Percentage	Amount	Percentage	Amount	Percentage
2016	1	20%	4	80%	5	100%
2017	1	20%	4	80%	5	100%
2018	1	20%	4	80%	5	100%

Source: Primary Data, 2019

Based on Table 4, the results of the analysis using the Zmijewski model are obtained. In 2016-2018 the number of companies in the telecommunications sub-sector is predicted to go bankrupt at 1 company with a percentage of 20%, namely Bakrie Telecom Tbk. Telecommunications sub-sector companies that are predicted not to experience bankruptcy are as many as 4 companies with a percentage of 80%, including XL Axiata Tbk., Smartfren Telecom Tbk., Indosat Tbk., And Telekomunikasi Indonesia Tbk.

Based on the results of the Zmijewski model bankruptcy prediction analysis, it was found that there were 4 companies that were predicted to be potentially not bankrupt including Telekomunikasi Indonesia Tbk., XL Axiata Tbk., Smartfren Telecom Tbk., And Indosat Tbk. in 2016-2018, while there was only 1 company that was predicted to be potentially bankrupt, namely the Bakrie Telecom Tbk company. Based on the 3 financial ratio variables used in the analysis of the Zmijewski model, Bakrie Telecom Tbk. obtained significantly different ratio values when compared to the other 4 companies. Bakrie Telecom Tbk. obtain a relatively low ROA and liquidity ratio value and a relatively high leverage ratio value compared to the ratio value of 4 other telecommunications companies.

ROA is used to measure the company's profitability, leverage to test the extent to which companies use borrowed money, and liquidity to measure the ability of a company's ability to meet its short-term obligations. In this case based on the results of ratio analysis that has been done, Bakrie Telecom Tbk. does not benefit from the use of total assets for the company's operations, uses large amounts of loan capital to invest in assets to generate profits for the company, and is difficult to pay off short-term obligations. Based on this the authors concluded that Bakrie Telecom Tbk. can survive and run the company until now because of the debt and the amount of liabilities that are increasing. Therefore, Bakrie Telecom Tbk. need to tackle potential bankruptcy if you want to keep the company.

The results of this study are supported by research conducted by Prihanthini (2013) in predicting bankruptcy against Food and Beverage companies using the Zmijewski model, there are companies that go bankrupt. Purnajaya (2014) who examined whether there are differences in the potential for bankruptcy of the cosmetics industry listed on the IDX with the Z-Score Altman, Springate, and Zmijewski methods. In the Zmijewski model the results show that there are companies that go bankrupt.

The results of this study contradict the research conducted by Wulandari and Tasman (2019) in comparing bankruptcy analysis to telecommunications companies using the Zmijewski model. The number of companies that experienced distress during the study period is Bakrie Telecom Tbk. and Smartfren Telecom Tbk. Yuliastary (2014) which aims to find out how the financial performance of PT. Fast Food Indonesia Tbk. by using the Zmijewski method the company can be classified as healthy according to the real condition of the company.

3. Altman Z-Score and Zmijewski Model Accuracy

The level of accuracy is calculated to find out and compare the most accurate and precise bankruptcy prediction analysis models in predicting bankruptcy of telecommunications sub-sector companies listed on the Indonesia Stock Exchange in 2016-2018. The accuracy of the Altman Z-Score model can be seen in Table 5 as follows:

Table 5.The results of the Altman Z-Score model accuracy

Period	Number of predictions correct	Number of Samples	Accuracy
2016	1	5	20%
2017	1	5	20%
2018	1	5	20%
Median			20%

Source: Primary Data, 2019

Based on Table 5, the accuracy of the Altman Z-Score model is obtained. In 2016-2018 the Altman Z-Score model was able to correctly predict 1 telecommunications sub-sector company with an accuracy of 20%. Based on this explanation, the average accuracy of the Altman Z-Score model in predicting bankruptcy of telecommunications sub-sector companies listed on the Indonesia Stock Exchange in 2016-2018 was 20%.

The accuracy of the Zmijewski model is calculated as a comparison of the Altman Z-Score model in predicting bankruptcy of telecommunications sub-sector companies listed on the Indonesia Stock Exchange in 2016-2018. The accuracy of the Zmijewski model can be seen in Table 6 as follows:

Table 6.The results of the Zmijewski model accuracy

Period	Number of predictions correct	Number of Samples	Accuracy
2016	4	5	80%
2017	4	5	80%
2018	4	5	80%
Median			80%

Source: Primary Data, 2019

Based on Table 6, the accuracy of the Zmijewski model is obtained. In 2016-2018 the Zmijewski model was able to correctly predict 4 telecommunications sub-sector companies with an accuracy of 80%. Based on this explanation, the average accuracy of the Zmijewski model in predicting bankruptcy of telecommunications sub-sector companies listed on the Indonesia Stock Exchange in 2016-2018 was 80%.

Based on Table 5 and Table 6 there are also significant differences in accuracy between the Altman Z-Score model and the Zmijewski model. Based on the table, the average accuracy of the Altman Z-Score model is 20% and the average accuracy of the Zmijewski model is 80%. So based on its level of accuracy, the Zmijewski model more accurately and precisely predicts the bankruptcy of telecommunications sub-sector companies listed on the IDX compared to the Altman Z-Score model.

Based on the comparative data of the analysis results and the level of accuracy in the Altman Z-Score model and the Zmijewski model, there are differences between the Altman Z-Score model and the Zmijewski model both based on the results of the analysis and the level of accuracy. Based on the results of his analysis, the Altman Z-Score model only predicts 1 potential non-bankrupt company, namely the Indonesian Telecommunications Company Tbk. While the Zmijewski model predicts 4 potentially non-bankrupt companies, including, Telekomunikasi Indonesia Tbk., XL Axiata Tbk., Smartfren Telecom Tbk., And Indosat Tbk. Based on the accuracy, the average accuracy of the Altman Z-Score model is 20% and the average accuracy of the Zmijewski model is 80%.

Based on comparison of the results of the analysis and the level of accuracy. The author can draw the results that the Zmijewski model more accurately and precisely predicts the bankruptcy of telecommunications sub-sector companies listed on the IDX compared to the Altman Z-Score model. The difference is caused by differences in the use of financial ratios in the two models studied. Altman Z-Score uses 5 ratios, while Zmijewski only uses 3 ratios. In addition, the difference in weight given to each ratio used as an indicator is also very influential. Based on the two methods of analysis it appears that Altman is more stringent in assessing the potential level of bankruptcy compared to the Zmijewski model. The measurement of these two methods focuses on the company's ability to generate profit and loss and short-term liabilities using the ratio of profitability and liquidity.

The results of this study are supported by research conducted by Purnajaya (2014) on whether there are differences in the potential for bankruptcy of the cosmetics industry listed on the IDX with the Altman, Springate, and Zmijewski Z-Score methods resulting in differences in potential bankruptcy between the three methods. Wulandari and Tasman (2019) compared bankruptcy analysis to telecommunications companies listed on the Indonesia Stock Exchange using the Altman Modification, Springate, and Zmijewski models concluded that each bankruptcy prediction model had different levels of accuracy.

The results of this study are not in accordance with research conducted by Damayanti et al., (2019) which aims to compare the use of the Altman Z-Score and Zmijewski bankruptcy prediction models in delisting companies on the IDX conclude that the Altman Z-Score model more accurately predicts bankruptcy in the period leading up to bankruptcy compared to the Zmijewski model.

V.CONCLUSION

The results of this study confirm the signal theory that is giving signals to investors to be more precise in investing their funds, especially funds in the form of shares to companies that are in good health or have no potential to go bankrupt, and to creditors in determining credit decisions. Bankruptcy models such as Altman Z-Score and Zmijewski are proven to be able to urge a company to pay attention to accounts that have the potential to cause bankruptcy. Through the process of bankruptcy calculation, the company can anticipate the accounts that experience a decline in the financial statements each year and handle potential bankruptcy if the company is known to have the potential for bankruptcy. The results of this study provide information to telecommunications company management in managing financial performance better and timely in reporting. Investors and creditors will be interested in making investment and credit decisions and investing their funds in related companies, so that the company is expected to be better going forward. Based on the results of the research analysis and the results of the discussion in the previous chapter, the conclusions of this study are as follows.

The Altman Z-Score model predicts that in 2016 the number of companies in the telecommunications sub-sector is predicted to go bankrupt by 4 companies, and the telecommunications sub-sector companies that are predicted to not bankrupt by as many as 1 company. In 2017-2018 the number of companies in the telecommunications sub-sector is predicted to go bankrupt by 3 companies, the condition of gray area or gray conditions as much as 1 company, and the company of the telecommunications sub-sector which is predicted to not go bankrupt at 1 company. Zmijewski's model predicts that in 2016-2018 the number of companies in the telecommunications sub-sector is predicted to go bankrupt by 1 company, and the telecommunications sub-sector companies that are predicted to not go bankrupt are as many as 4 companies. There are differences in the results of the analysis between the Altman Z-Score model and the Zmijewski model. The Zmijewski model has a higher level of accuracy compared to the Altman Z-Score model with a percentage of 80%. In this case, the Zmijewski model is concluded to be more precise and accurate in predicting the potential bankruptcy of telecommunications sub-sector companies listed on the Indonesia Stock Exchange in 2016-2018. The use of the Altman Z-Score and Zmijewski models in this study is an alternative model that can be used to predict companies in addition to other prediction analysis models in studies of other predictive analyzes. But the calculation is sometimes not as reality happens, each model created is never perfect. Therefore, the results of this prediction should not be considered as absolute results. Prediction results are limited to indicators so that investors and creditors can be more careful about the company that is predicted to go bankrupt and explore additional information about the company concerned.

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