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Comparative Analysis of Financial Sustainability Using the Altman Z-Score, Springate, Zmijewski and Grover Models for Companies Listed at Indonesia Stock Exchange Sub-Sector Telecommunication Period 2014 – 2019

Samrony Eka Fauzi[1], Sudjono[2], Ahmad Badawi Saluy[3]

[1] Student of Magister Management, Mercubuana University, Jakarta, Indonesia. Email: samrony.fauzi@gmail.com.
[2] Magister Management, Mercubuana University, Jakarta, Indonesia. Email: sudjono@mercubuana.ac.id.
[3] Magister Management, Mercubuana University, Jakarta, Indonesia. Email: ahmad.badawi@mercubuana.ac.id

Correspondence: Samrony Eka Fauzi. Email : samrony.fauzi@gmail.

Abstract
This study aims to compare the best bankruptcy prediction models between Altman, Springate, Zmijewski and Grover models against companies listed on the Indonesian stock exchange in the telecommunications sub-sector for the 2014-2019 period. The purposive sampling method is used to obtain a sample of companies with the following criteria: Companies listed on the Indonesian stock exchange, the telecommunications sub-sector, the company has conducted an IPO in 2010, the company is obedient in reporting annual reports from 2014 - 2019 and the company is free from delisting issues. There are 4 companies that meet the purposive sampling criteria, namely PT. Telkom TBK, PT. Indosat TBK. PT. XL Axiata TBK and PT. Smartfren TBK. The data used in this research is secondary panel data. The results showed that only PT. Telkom which is in a healthy financial condition. Meanwhile, PT. Indosat, PT. XL Axiata and PT. Smartfren is consistently in an unhealthy condition based on the analysis of the Altman and Springate models. The calculation of Zmijewski's model and Grover's model gave inconsistent results. Comparative testing of the four bankruptcy analysis models resulted in the Altman, Springate and Grover models recording accurate results but Altman modelling is the best because it is an accurate, consistent, and tested model both descriptively and statistically.

Keywords: Bankruptcy Prediction Model, Altman, Springate, Zmijewski, Grover, Telecommunication Company

1. Introduction and Background

At the beginning of 2020, the Indonesian telecommunications society was shocked by the emergence of confirmed news where PT. Indosat. TBK (ISAT) scheduled a layoff plan (PHK) with more than 500 employees affected.

In an announcement to employees on Friday (14/02/2020), which was reported by CNBC Indonesia, President Director & CEO of Indosat Ooredoo Ahmad Al-Neama conveyed three vital changes to Indosat Ooredo's business, namely:

1. Strengthening regional teams so that work is more efficient and is transferred to closeness to customers.
2. Transfer of resources to third parties in the form of such as managed services or back-to-back business.
3. Organizational adjustments, especially in the field of human resources, in order to improve future competitiveness to improve customer satisfaction.

Furthermore, his party believes that this step will improve Indosat's performance, help the company remain competitive amid the challenges of disruption, optimize services, and provide a better experience for customers. "This is a strategic step in making Indosat Ooredo a leading trusted digital telecommunications company," (Asmara, 2020).

Figure 1: Telecommunication share (BPS 2018)

Sourcing from the publication manuscript of the SDPPI Research and Development team (2018), that based on 2018 BPS data, it can be seen that the telecommunications service sector provides the largest share of GDP in the Information and Communication sector compared to other sectors, with an increasing contribution value in rupiah. However, it seen from the trend, the share of telecommunication services to Information and Communication GDP has decreased. In 2010, the share of the telecommunications services sector reached 76.53%, and experienced a downward trend until 2017. This shows that the growth of telecommunications in Indonesia continues to decline. (Heppy, 2018)

When viewed from the number of users, the development of the Indonesian cellular telecommunications industry is starting to experience saturation: it can be seen from the teledensity of cellular subscribers which reached more than 140% in 2017. The current trend in telecommunications technology has shifted from voice and SMS to data traffic, and has had an impact on revenue growth. operator slowed down even more. In Indonesia, the telecommunications market (voice and data) is contested by several cellular operators, namely PT Hutchison 3 Indonesia (Tri), PT Indosat (Indosat), PT XL Axiata (XL), PT Sampoerna Telekomunikasi Indonesia (Ceria), PT

Telekomunikasi Selular (Telkomsel), PT Smartfren,. The number of telecommunication operators is considered inefficient, taking into account the proportion of the market share of each operator, where 90% of the market share is in the 3 largest cellular operators (Heppy, 2018).

We observed from the Net Profit Margin, the results achieved by telecommunication companies Telkom, Indosat, XL Axiata and Smartfren are reflected in the following figure.
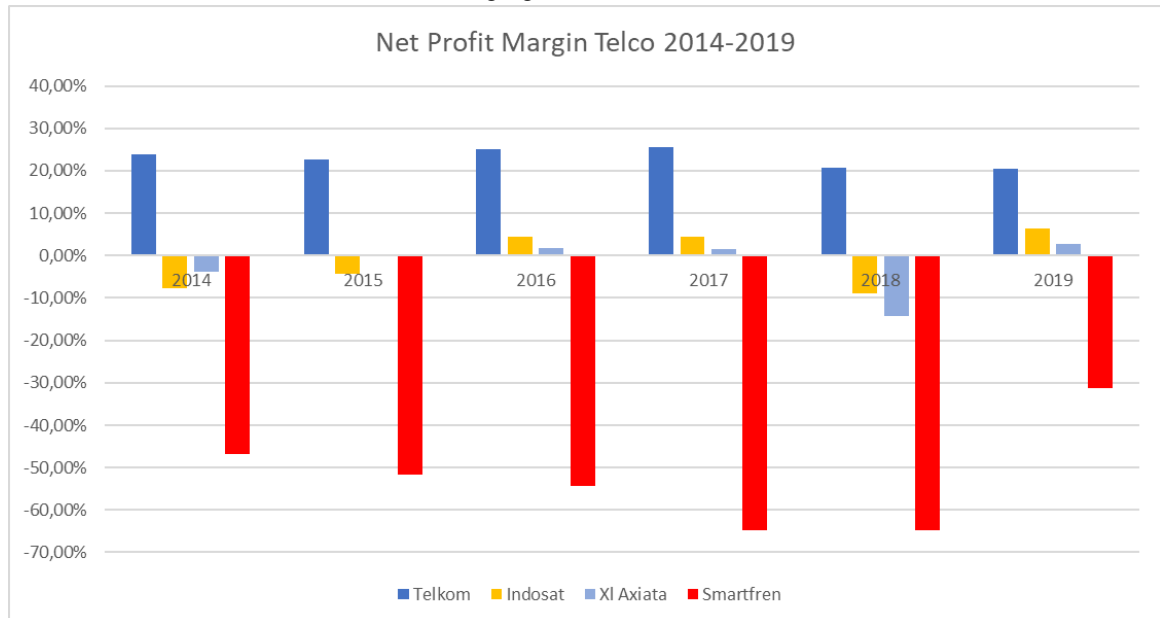

Figure 2: NPM Telco 2014 - 2019

From Figure 2, the percentage value of NPM which is consistently on the positive side is only PT. Telkom, where PT. Smartfren is always in a negative zone and PT. Indosat and PT. XL Axiata has sometimes been in the positive and negative zones and in 2018, both were in quite deep negative zones.

According to Mulyana and Nugroho (2018), Net Profit Margin (NPM) can be interpreted as a measurement of how much net profit is created from every one rupiah of sales achieved. High net profit margin illustrates good efficiency in the company and better management of costs. Conversely, low net profit indicates inefficiencies in cost management that could have been avoided.

PT. Telkom can show consistently positive performance against the background where PT. Telkom is the only state-owned company in a company listed on the Indonesia Stock Exchange in the telecommunications subsector and is involved in the cellular sector through its subsidiary, PT. Telkomsel with a share of 65%.

PT. Telkom, which was founded on July 6, 1965, has a telecommunications network that stretches from Sabang to Merauke and has a source of funding from the government (BUMN), resulting in a well-established network infrastructure and human resources. This is what fundamentally makes the difference between PT. Telkom and other telecommunication companies, namely efficiency and synergy in the use of Capex (Capital Expenditure) and Opex (Operational Expenditure) on infrastructure where PT. Telkom can use the infrastructure that has been built since 1965 while other telecommunication companies have to build new infrastructure or by leasing which of course becomes operational expenses.

Ariyanti (2016) states that based on data from Puslitbang SDPPI in 2015, PT. Telkomsel requires funds of ± 500 million rupiahs for the implementation of 1 e-nodeB where there is a possibility that other telecommunication companies require higher costs because they do not have a strong infrastructure as strong as PT. Telkom to create a new network or lease to a network infrastructure provider.

On the other hand, PT. Telkom also has several subsidiaries that are engaged in various fields, ranging from the telecommunications, property, infrastructure, and goods and services sectors that can maximize potential revenue in the event of a decline in the telecommunications sector (investment diversification).
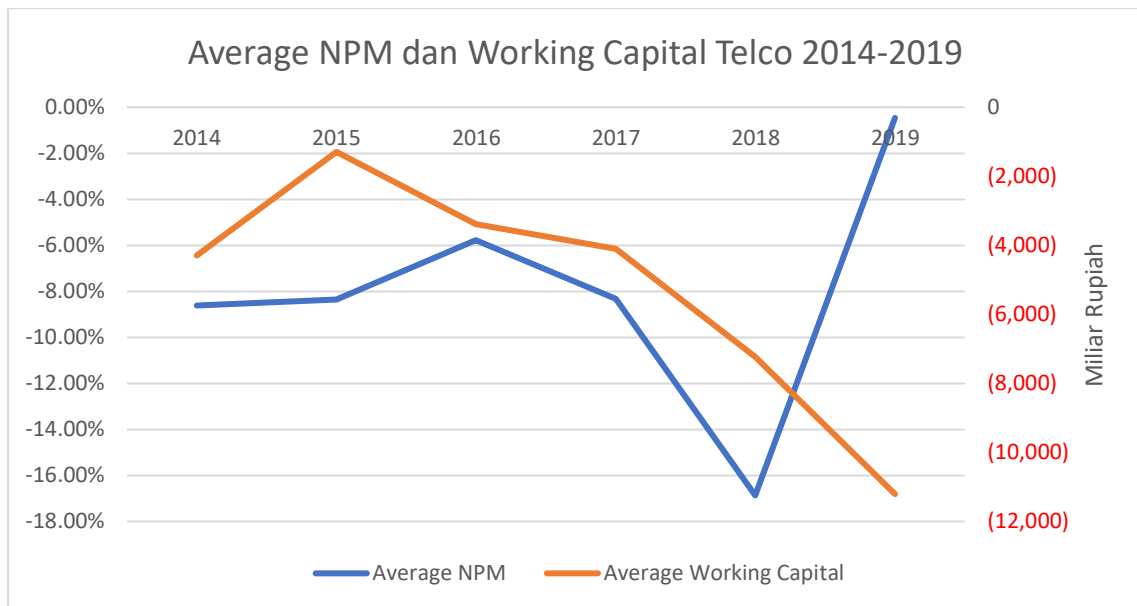

Figure 3: Average NPM and WC Telco

From Figure 3, it can be seen in general that the average net profit margin of telecommunication companies in Indonesia has decreased with an increase occurring in 2019 but it turns out that the average working capital of telecommunication companies has decreased to a level below minus 11 trillion rupiahs, which means that in the operation of telecommunication companies Indonesia relies heavily on short-term debt due to poor profitability. With this downward trend, it becomes a question whether telecommunications companies in Indonesia experience financial distress and whether these companies can survive in the future.

2. Theory and Hypotheses Development

This research uses the grand theory of financial distress with the Bankruptcy Prediction Model (BPM) which uses the Altman model analysis, Springate model analysis, Zmijewski model analysis and Grover model analysis. Middle theory to cover this research is the theory of corporate financial management (Corporate Financial Management) and Applied Theory in this research, especially in Working Capital, Total Asset, Total Sales and EBIT (Earnings Before Interest and Tax) to then get the calculation results of each bankruptcy prediction model analysis.

2.1. Financial Distress

Financial distress is a condition of a company that is experiencing problems in providing its financial needs and can be said to be in an unhealthy financial condition. An example is the difficulty in paying debts or difficulties in financing its operational activities.

Platt & Platt (2002) describe the condition of a company's financial difficulties as a stage of decline in financial conditions that occur before liquidation or bankruptcy occurs. The condition of the company's financial difficulties usually starts with difficulties in fulfilling the company's obligations, especially short-term liabilities, which include liquidity obligations, and also include obligations in the solvency category (solvable).

2.2. Bankruptcy Prediction Model

Prihadi (2016) states that bankruptcy can be interpreted as a company's failure to operate, manage, and earn profits. Bankruptcy can be described as a situation where a company is unable to settle its short, medium and long term obligations.

Copeland and Weston (1988) explain the definition of bankruptcy as described in their book Financial Theory and Corporate Policy, namely:

1. Economic Failure
    What is meant by economic failure is if the company's income is still insufficient and unable to cover all company expenses.
2. Financial Failure
    Financial failure is defined as insolvency, which is a financial condition that cannot be resolved, for example, failure to meet the performance requirements and company benchmarks that have been set, for example, the criteria for the current asset ratio (Quick Ratio) and the current debt ratio (Debt to Asset). Ratio).

From some of the explanations above, it can be concluded that the definition of bankruptcy is a condition in which the company is in a bad financial position and experiences difficulties in carrying out company operations which can result in the company losing business competition and consequently will experience decreased revenue and profits and ultimately cannot. achieve company goals.

Arini and Triyonowati (2013) explain that there are four indicator variables that can be used to observe a company's potential level of bankruptcy, namely (1) the level of company profits, (2) effectiveness and efficiency of debt, (3) efficiency of fixed and operational costs and (4) stock returns.

Investors are one of the parties who need bankruptcy predictions from a company because before investors make investment, financial data analysis is needed about how the company's prospects in the future and how it has achieved in the past, so that it can ensure that the investments of investors and investors are on the same path. expected, that is to provide appropriate benefits and returns. This is also in line with the opinion of Wulandari, Burhanuddin and Widayanti (2017) that the level of bankruptcy will have a bad impact and precedent not only on internal companies but also on external parties, in this case investors are also included. Amanah, Atmanto and Azizah (2014) explain in their research where the level of investor interest in the company is directly proportional to the value and return of stock prices. Therefore, the company will always try to maximize and optimize the value of its shares so as to increase investor interest in the company.

In this research, we used four (4) bankruptcy analysis models, namely (1) Altman Z-Score model analysis, (2) Springate S-Score model analysis, (3) Zmijewski X-Score model analysis, and (4) model analysis. Grover-G-Score.

1. Altman Z-Score revision 1995

In Z-Score revision 1995, Altman eliminates the X5 variable (sales to total assets) because this ratio is very varied in industries with different asset sizes.

$$Z = 6,56\ X1 + 3,26\ X2 + 6,72\ X3 + 1,05\ X4$$

X1	Working Capital/Total Asset
X2	Retained Earnings / Total Asset
X3	Earning Before Interests and Tax / Total Asset
X4	Book Value of Equity / Book value of Liability
Z	Z-Score Altman rev 1995

Z-Score Scale	Prediction
Z < 1.1	Bankrupt
1.1 < Z < 2.6	Grey Area
Z > 2.6	Not Bankrupt

2. Springate S-Score

Peter and Yoseph (2011) stated that Springate is a bankruptcy prediction model based on G. I. V. Springate's research in 1978, which became known as the Springate Model or Canadian Model. Springate's research in 1978 was made by following the procedure modeled by Altman, namely using a Stepwise Multiple Discriminant Analysis to select four of the nineteen popular financial ratios to distinguish well between a healthy company and a company that was bankrupt (failed).

$$S = 1.03A + 3.07B + 0.66C + 0.4D$$

A	Working Capital/Total Asset
B	Net Profit Before Interest and Tax/Total Assets
C	Net Profit Before Tax / Current Liability
D	Sales / Total Assets
S	Springate S-Score

S-Score Scale	Prediction
S > 0.862	Not Bankrupt
S < 0.862	Bankrupt

3. Zmijewski X-Score

Zmijewski (1984) in his research uses ratio analysis that measures the performance, leverage, and liquidity of a company for his prediction model, Zmijewski also requires one crucial point. The proportions of the sample and the population must be determined from the beginning, to obtain the prediction frequency of the company's financial distress. This frequency is obtained by dividing the number of samples that have gone bankrupt by the total number of samples.

The sample used by Mark Zmijewski amounted to 840 companies, consisting of 40 companies that experienced bankruptcy, 800 companies that did not go bankrupt. Data obtained from the Compustat annual industrial file. Data were collected from 1972-1978. The statistical method used is the same as that used by Ohlson, namely logit regression. By using this method, Zmijewski produced the following model:

$$X = -4,3 - 4,5X1 + 5,7X2 + 0,004X3$$

X1	ROA (Return on Asset)
X2	Leverage (Total Liabilities / Total Asset)
X3	Liquidity (Current Asset / Current Liabilities)
X	Zmijewski X-Score

X-Score Scale	Prediction
X > 0	Bankrupt
X < 0	Not Bankrupt

4. Grover

Grover's model (2001) is a model created by designing and reassessing the Altman Z-Score model. Jeffrey S. Grover used the sample according to the Altman Z-Score model in 1968, adding thirteen new financial ratios.

$$G = 1,650X1 + 3,404X2 - 0,016ROA + 0,057$$

X1	Working Capital / Total Asset
X2	Earnings Before Interest and Taxes / Total Asset
ROA	Return on Asset
G	Grover G-Score

G-Score Scale	Prediction
G ≤ -0,02	Bankrupt
G ≥ 0,01	Not Bankrupt

2. 3. Research Framework

This study aims to determine whether telecommunication companies in Indonesia are in good condition or on the contrary, are in a bad condition. For companies that are in bad shape, with the earliest possible detection of potential bankruptcies, managers and top leaders can react to the situation and take strategic steps to restore the situation and improve company performance so that the company can improve and get out of the bankruptcy zone.

As for companies that are in good condition, they can maintain their condition and continuously evaluate their company's performance to ensure that the company's goals remain at the desired rate and can map future needs in the company's winning strategy, in the case of current telecommunications companies, namely the implementation of 5G. and data monetization to further increase company revenue. This study compares the four bankruptcy prediction models, namely the Altman, Springate, Zmijewski and Grover models. To ensure the consistency of the results of the four analysis models and compares the level of accuracy to obtain the model with the highest accuracy for telecommunications companies in Indonesia listed on the Indonesia Stock Exchange over a period of time. 2014-2019.

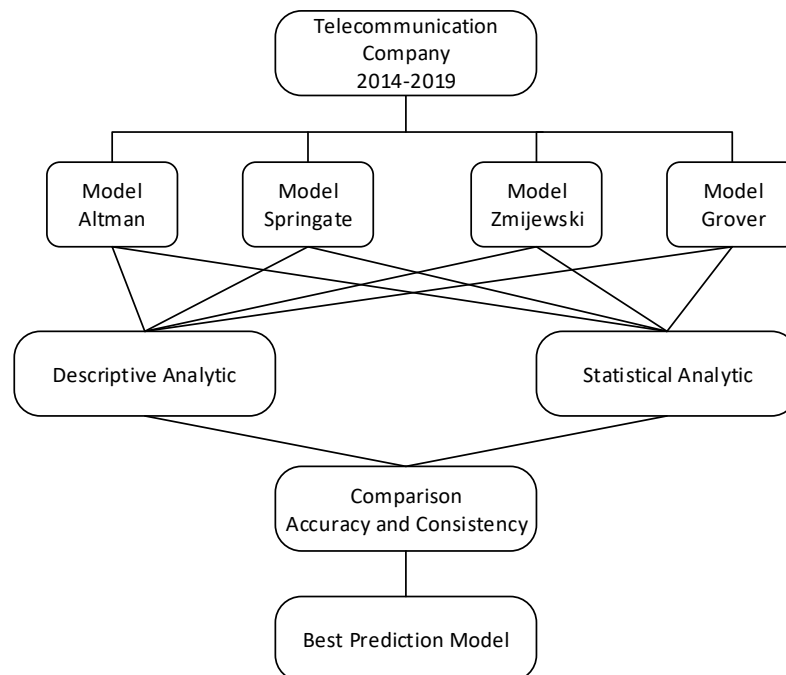Based on this, a conceptual framework is made as follows:

Figure 4: Conceptual Framework

2.4. Hypotheses Development

1. Altman's Model Hypothesis

Research by Fifriani and Santosa (2019) and Nandini et al (2018) states that the revised Altman model can be used to predict the possibility that telecommunications companies are in a healthy state or vice versa in an unfavourable state or bankruptcy.

H1: The revised Altman model can be used to predict the financial distress of telecommunications companies listed on the Indonesia Stock Exchange for the period 2014-2019

2. The Springate Model Hypothesis

Research by Ben, Dzulkirom and Topowijono (2015) states that the Springate model can be used to predict company bankruptcy.

H2: The Springate model can be used to predict the financial distress of telecommunications companies listed on the Indonesia Stock Exchange for the period 2014-2019.

3. Zmijewski's Model Hypothesis

Research by Manalu, Octavianus and Safarina (2017) and Salim (2016) states that the Zmijewski model can be used to predict company bankruptcy.

H3: The Zmijewski model can be used to predict the financial distress of telecommunications companies listed on the Indonesia Stock Exchange for the period 2014-2019

4. Grover's Model Hypothesis

Aminian, Mousazade and Khosko (2016) research on companies listed on the Tehran Stock Exchange, Iran states that Grover's research model shows better results when compared to Altman, Springate and Zmijewski in predicting financial distress.

H4: The Grover Model can be used to predict the financial distress of telecommunications companies listed on the Indonesia Stock Exchange for the period 2014-2019

5. Comparative Hypothesis of the Four Bankruptcy Prediction Models

This hypothesis is proposed to compare the accuracy of the Altman model, the Springate model, the Zmijewski model and the Grover model in predicting the bankruptcy of telecommunications companies listed on the Indonesia Stock Exchange for the period 2014-2019.

H5: There will be one model that is the most accurate among the Altman model, the Springate model, the Zmijewski model and the Grover model in predicting the bankruptcy of telecommunications companies listed on the Indonesia Stock Exchange for the period 2014-2019.

3. Research Methodology

The type of research chosen by the researcher is an ex-facto quantitative approach in which data is collected from various sources to be processed and analysed. The ex-facto method was chosen because the writer used factual data that had already occurred and was audited, and the writer did not have control over the independent variables.

3.1. Population and Sample

According to Sugiyono (2012) population is a whole collection of elements that are similar but different because of their characteristics. The population in this study are all companies listed on the Indonesia Stock Exchange, the telecommunications subsector for the period 2014-2019.

Table 1: Research Population

No	Emitten Code	Emiten Name	IPO
1	ISAT	PT. Indosat Tbk. *(d.h. Indonesian Satellite Corporation (Persero) Tbk.)*	19-Oct-94
2	TLKM	PT. Telekomunikasi Indonesia Tbk.	14-Nov-95
3	EXCL	PT. XL Axiata Tbk. *(d.h. Excelcomindo Pratama Tbk.)*	29-Sep-05
4	BTEL	PT. Bakrie Telecom Tbk.	03-Feb-06
5	FREN	PT. Smartfren Telecom Tbk. *(d.h. Mobile-8 Telecom Tbk.)*	29-Nov-06
6	JAST	PT. Jasnita Telekomindo Tbk.	16-May-19

The sample in Sugiyono (2012) explanation is part of the elements of a population. The sample is part of the population or representative of the population which is seen as representative of the object under study.

The criteria for selecting samples in the object of this study are as follows:

1. Companies listed on the Indonesia Stock Exchange in the telecommunications subsector.
2. Telecommunication sub-sector companies that have IPO in 2010.
3. The company is obedient to reporting annual reports for the 2014-2019 period.
4. The company is free from issues and potential delisting.

Based on the sample selection criteria above, what can be used as a research sample are as follows:

Table 2: Research Sample

No	Emiten Code	Emiten Name	IPO
1	ISAT	PT. Indosat Tbk. *(d.h. Indonesian Satellite Corporation (Persero) Tbk.)*	19-Oct-94
2	TLKM	PT. Telekomunikasi Indonesia Tbk.	14-Nov-95
3	EXCL	PT. XL Axiata Tbk. *(d.h. Excelcomindo Pratama Tbk.)*	29-Sep-05
4	FREN	PT. Smartfren Telecom Tbk. *(d.h. Mobile-8 Telecom Tbk.)*	29-Nov-06

Based on Table 2, the issuer PT. Bakrie Telecom Tbk. (BTEL) was eliminated from the population table due to (1) not being compliant with reporting the annual report and (2) having an issue delisting in 2020. Meanwhile, the issuer PT. Jasnita Telekomindo Tbk. (JAST) was eliminated because it was only IPO in 2019.

3.2. Data Collection

1. Types of Data

Basically, research is an activity of collecting information or data that is very useful to find out something, solve problems, or to develop knowledge. Information that has been scaled is called data.

The type of data used in this study is the type of panel data where the data taken is data from 2 or more telecommunication subsector companies listed on the Indonesia Stock Exchange for the period 2014-2019.

2. Data Collection Techniques

Secondary data is data that comes from research results or other people's presentations which are made for different purposes. Secondary data can also be interpreted as additional data that is not obtained first-hand but second, third or so on.

Because documents are usually written by third parties, such as journalists or screenwriters who are not scientific informants. The data used in the document is of course not first-hand.

Apart from being collected by the owner, secondary data is also collected by other parties, for example banking financial data. The data is of course stored and owned by each bank, but there are other parties that keep the data, for example Bank Indonesia or the Financial Services Authority. Even private institutions such as Infobank and Bisnis Indonesia maintain the data because it is an important commodity.

This study uses secondary data, namely data available on the official website of the Indonesia Stock Exchange (www.idx.go.id) and those on the official pages of each issuer.

3.3. Data Analytic

1. Descriptive Analysis

The technical descriptive analysis in this research can be described as follows:

1. Performing analysis calculations on the research sample using the Altman, Springate, Zmijewski and Grover models.
2. Classifying the calculation results in the first point. The classification is divided into 2, namely companies in a healthy and unhealthy condition. The possibility of classification confusion can arise because the Altman method has three possibilities, namely (1) Healthy, (2) Gray area and (3) Unhealthy. Based on research from Suwitno (2013), it is stated that 93% of companies located in the Gray area do not go bankrupt in the following year. Therefore, we categorize the gray area in an unhealthy condition.
3. Validate the analysis results with the actual conditions of the company.

2. Classical Assumption Test and Hypothesis

The panel data regression model can be said to be a good model if it meets the Best Linear Unbiased Factor (BLUE) criteria. BLUE can be achieved if it fulfils the classical assumptions. The classical assumption tests include normality test, autocorrelation test, multicollinearity test, and heteroscedasticity test. Arikunto (2013) states that not all classical tests must be done because:

1. Linearity test is hardly performed on every linear regression model. Because it has been assumed that the model is linear. Even if it is only done to ascertain and see the degree of linearity.
2. The normality test is basically not a BLUE requirement and some opinions do not require this requirement as something that must be met.
3. Autocorrelation only occurs in time series data. Autocorrelation testing on data that is not timeseries (cross-section or panel data) will be meaningless.
4. Multicollinearity needs to be done when linear regression uses one or more independent variables. If there is only one independent variable, multicollinearity is impossible.
5. Heteroscedasticity usually occurs in cross-section data, where panel data is closer to the characteristics of cross section data than to time series data.

Based on Arikunto (2013), this study will use (1) normality test, (2) multicollinearity test and (3) heteroscedasticity in testing its classical assumptions.

3. Comparison of Descriptive Analysis Results with Statistical Analysis

After the results of descriptive and statistical calculations are obtained, comparisons are made to ensure whether the results obtained in the study are consistent between the results of descriptive analysis and statistical analysis which shows that the modelling can be applied to companies listed on the Indonesia Stock Exchange in the Telecommunications subsector for the period 2014 - 2019.

4. Measurement Accuracy of Bankruptcy Prediction Models

In measuring the accuracy of the bankruptcy prediction model, we compare the results of the prediction model calculations to be compared with the company's Debt to Asset ratio.

The choice of the Debt to Asset ratio is because the DAR ratio is one of the ratios that includes the Solvency ratio which assesses whether a company can meet all its obligations or debts using its assets. The higher the DAR ratio, the higher the probability that the company is in a bad financial condition.

Ross (2019) states that from a risk point of view, DAR with a value below 40% or 0.4 is preferred. And because debt is always correlated with interest rates that are not related to profitability, too much debt can consume cash flow, which in turn leads the company to sell assets to pay debts or declare bankruptcy.

Sean Ross (2019) also said that investors prefer companies with DAR in the range of reference 0.3 (30%) to 0.6 (60%). With the reference from Ross (2019), we use the reference standard of a more conservative DAR ratio of 50% in the hope that the company's financial difficulties can be identified as early as possible and corrective steps can be taken quickly to avoid the possibility of bankruptcy.

5. Selection of the Best Bankruptcy Prediction Model

A bankruptcy prediction model that is consistent in its calculations both statistically and descriptively is then chosen which has the best level of accuracy. Which will then be further analysed descriptively with its relationship to NPM, Working Capital or DAR to get the best prediction results that can be used to predict financial distress conditions in companies listed on the Indonesia Stock Exchange in the Telecommunications subsector for the period 2014 - 2019.

4. Research Analysis

4.1. Descriptive Analytic Result

1. Altman

Alman model analytic result can be seen as follow:

Table 3: Altman Analysis Result

Altman Z-Score	2014	2015	2016	2017	2018	2019
Indosat	-1,419	-1,098	-0,793	-0,194	-1,664	-0,563
Telkom	3,417	3,410	3,493	3,132	2,719	2,068
XL Axiata	-0,024	-0,365	-0,233	-0,256	-0,979	-0,923
Smartfren	-1,891	-0,751	-1,172	-1,166	-0,925	-0,703

From table-3 above, we can observe that of the four companies included in the sample, only PT. Telkom

consistently produces a good Z-Score, is in 2014-2018 and in 2019 it is in the grey zone. For the other three companies, namely PT. Indosat, PT. XL Axiata and PT. Smartfren is consistently in the bankruptcy zone, which should become a concern for the management and top leaders of the company.

2. Springate

Springate model analytic result can be seen as follow:

Table 4: Springate Analysis Result

Springate S-Score	2014	2015	2016	2017	2018	2019
Indosat	-0,236	-0,153	0,177	0,296	-0,318	0,132
Telkom	1,471	1,487	1,591	1,550	1,300	1,122
XL Axiata	-0,065	-0,040	0,013	0,015	-0,279	0,054
Smartfren	-0,581	-0,655	-0,715	-0,726	-0,836	-0,573

From table-4 above, we can observe that of the four companies included in the sample, only PT. Telkom which consistently produces S-Score in the not bankrupt category.
For the other three companies, namely PT. Indosat, PT. Xl Axiata and PT. Smartfren is consistently in the bankruptcy zone, which should be a concern for the management and top leaders of the company.

3. Zmijewski

Zmijewski analytic model result can be seen as follow:

Table 5: Zmijewski Analysis Result

Zmijewski X-Score	2014	2015	2016	2017	2018	2019
Indosat	0,043	0,145	-0,287	-0,364	0,302	0,046
Telkom	-2,751	-2,448	-2,676	-2,557	-2,536	-2,135
XL Axiata	0,204	0,037	-0,833	-0,819	-0,234	-0,317
Smartfren	0,464	-0,144	0,325	-0,219	-0,782	-0,867

From table-5 above, we can observe that of the four companies included in the sample, only PT. Telkom which consistently produces X-Score in the not bankrupt category.

For the other three companies, namely PT. Indosat, PT. XL Axiata and PT. Smartfren is fluctuating in a bankruptcy zone which is of course a vigilance for the management and top leaders of the company.

The calculation anomaly is obtained for PT. XL Axiata in the 2018 period, which recorded a negative X1 and X2 which was in the 66% position, which means that it has a debt of 66% of the assets resulting in Zmijewski being in a good position or not bankrupt.

The anomaly is then obtained from calculations for PT. Smartfren where the value of X1 / ROA recorded a negative value throughout the observation period, but the results of the calculation of the Zmijewski model produced in 2015, 2017-2019 are in the category of not bankrupt.

With this anomaly, it is concluded that Zmijewski's analysis model calculations are not suitable for application to telecommunications companies in Indonesia.

4. Grover

Grover model analytic result can be seen as follow:

Table 6: Gover Analytic Result

Grover G-Score	2014	2015	2016	2017	2018	2019
Indosat	-0,457	-0,354	-0,181	-0,032	-0,521	-0,112
Telkom	0,764	0,821	0,851	0,804	0,632	0,514
XL Axiata	-0,051	-0,136	-0,162	-0,165	-0,450	-0,253
Smartfren	-0,631	-0,427	-0,514	-0,596	-0,654	-0,489

From table-6 above, above, we can observe that of the four companies included in the sample, only PT. Telkom which consistently produces G-Score in the not bankrupt category.
For the other three companies, namely PT. Indosat, PT. Xl Axiata and PT. Smartfren is consistently in the bankruptcy zone, which is a concern for the management and top leaders of the company.

4.2. Classic Assumption and Hypothesis Testing

The classical assumption test is used as a preparation for conducting statistical tests in this study, where in this research will make comparisons to the analysed model using two methods, namely statistical methods and descriptive methods. The following classical statistical assumption tests use SPSS software as one of the tested software for use in statistical analysis in scientific research.

A. Normality Test

The normality test in this study used the Shapiro Wilk method which was obtained through SPSS software. The variables used as input for the normality test process come from the calculation results of telecommunications companies listed on the Indonesia Stock Exchange for the period 2014-2019 for each analysis model, namely the Altman, Springate, Zmijewski and Grover models. So that we get 96 input data.

The results of the calculation of the Shapiro Wilk normality test are as follows:

Table 7: Shapiro-Wilk Normality Test

Tests of Normality

Perusahaan		Shapiro-Wilk		
		Statistik	df	Sig.
Altman	Indosat	0,982	6	0,959
	Telkom	0,839	6	0,127
	XL Axiata	0,861	6	0,193
	Smartfren	0,780	6	0,038
Springate	Indosat	0,912	6	0,450
	Telkom	0,931	6	0,589
	XL Axiata	0,811	6	0,073
	Smartfren	0,934	6	0,610
Zmijewski	Indosat	0,944	6	0,688
	Telkom	0,917	6	0,484
	XL Axiata	0,907	6	0,420
	Smartfren	0,915	6	0,473

Grover	Indosat	0,936	6	0,629
	Telkom	0,870	6	0,227
	XL Axiata	0,890	6	0,320
	Smartfren	0,941	6	0,665

In the normality test, it is stated that good data is data that is normally distributed, where data that is normally distributed usually has a significance (Sig)> 0.05. In table-7 above, we can observe that there is only 1 data that is below 0.05, namely the Sig value of PT. Smartfren for Altman analysis. However, because the resulting value is the actual calculation result, the research is continued.

We also examines more about the significance value of PT. Smartfren below 0.05, when we tries to ignore the value calculated by PT. Telkom, then the significance value of PT. Smartfren becomes above 0.05. From this result, we conlcude that the statistical data assumes anomalies occur in the PT. Smartfren for Altman analysis due to the variations that are too far when compared with the calculation results of PT. Telkom.

B. Multicollinearity Test

The multicollinearity test is intended to determine whether there is multiple collinearities in the research results. The parameter used is if the tolerance is above 0.10 and the VIF is below 10, then the data is declared good and can be used in statistical regression research.

The results of statistical calculations for the multicollinearity test in this study are presented as follows:

Table 8: Multicollinearity Test

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistiks	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	3,062	0,425		7,203	0,000		
	Indosat	0,097	0,618	0,043	0,156	0,877	0,422	2,367
	Telkom	-0,267	0,149	-0,488	-1,796	0,088	0,427	2,340
	XL	0,611	0,781	0,174	0,782	0,444	0,640	1,562
	Smartfren	0,315	0,640	0,125	0,492	0,629	0,489	2,044

a. Dependent Variable: BPS

From table-8, we can see that the tolerance value from the BPS calculation results for Indosat, Telkom, XL Axiata and Smartfren are all below 0.10 and the VIF value from the BPS calculation results is not greater than 10 so that the regression analysis can be used and can be proceed further.

C. Heteroscedasticity Test

In heteroscedastic testing, we used the Glejser method, which obtained the following results:

Table 9: Heteroscedasticity Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,099	0,206		5,346	0,000
	Indosat	-0,106	0,299	-0,113	-0,356	0,726
	Telkom	0,076	0,072	0,332	1,053	0,305
	XL	0,472	0,378	0,321	1,249	0,227
	Smartfren	0,538	0,310	0,511	1,737	0,099

a. Dependent Variable: RES2

From table-9 above we can observe that the significance value for the variable calculation analysis of the Altman, Springate, Zmijewski and Grover models for Indosat, Telkom, XL Axiata and Smartfren has a significance value above 0.05 so that the independent variable is heteroscedasticity and can be continued for regression calculations furthermore.

D. Independent Variable Test (t-test)

In performing the T test, the T Table value for this study was found to be 2.09302 which will then be compared with the results of the SPSS calculation as follows:

Table 10: t-test result

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,008	0,079		12,756	0,000
	Altman	0,365	0,145	1,470	2,528	0,020
	Springate	0,616	0,270	1,113	2,283	0,034
	Zmijewski	0,020	0,107	0,050	0,187	0,854
	Grover	-1,342	0,686	-1,552	-1,956	0,065

a. Dependent Variable: Kinerja

i. Altman Hypothesis Statistical Testing

In the T test value of the Altman variable, it was found that the significance of 0.020 was less than 0.05 and the t value of 2.528 was greater than the t table value so that the H1 hypothesis was accepted, namely "Revised Altman Model can be used to predict the financial distress conditions of telecommunications companies listed on the Indonesia Stock Exchange for the period 2014-2019".

ii. Springate Hypothesis Statistical Testing

In the T test value of the Springate variable it was found that the significance was 0.034 which was smaller than the significance limit of 0.05 and the t value of 2.283 was greater than the t table value so that the H2 hypothesis was accepted, namely "The Springate Model can be used to predict the financial condition of the company's distress. telecommunications listed on the Indonesia Stock Exchange for the period 2014-2019".

iii. Zmijewski Hypothesis Statistical Testing

In the T test value of the Zmijewski variable, it was found that the significance of 0.854 was greater than the significance limit of 0.05 and the t value of 0.187 was smaller than the t table value so that the hypothesis H3 was rejected so that it became "Zmijweski's model cannot be used to predict financial distress. telecommunications companies listed on the Indonesia Stock Exchange for the period 2014-2019".

iv. Grover Hypothesis Statistical Testing

In the T-test value of the Grover variable, it was found that the significance of 0.065 which is greater than the significance limit of 0.05 and the t value of -1.956 which is smaller than the t table value causes the H4 hypothesis to be rejected so that it becomes "Grover's model cannot be used to predict financial conditions. distress of telecommunication companies listed on the Indonesia Stock Exchange for the period 2014-2019".

v. The Best Hypothesis Statistical Testing is based on the Comparison of the T test

In table-10, we can see that the results of the Altman model analysis have a t value of 2.528 which is higher than the other models so that H5 is accepted, namely "There will be one model that is the most accurate among the Altman model, the Springate model, the Zmijewski model and the Grover model. predict the bankruptcy of telecommunication companies listed on the Indonesia Stock Exchange for the period 2014-2019".

E. Overall Significance test (f-test)

In the F test analysis, the F table value of 2.87 is obtained which will then be compared with the results of the SPSS to determine whether these independent variables have a simultaneous effect on company performance.

The F test analysis table through SPSS can be seen as follows:

Table 11: f-test result

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4,240	4	1,060	77,410	.000[b]
	Residual	0,260	19	0,014		
	Total	4,500	23			

a. Dependent Variable: Kinerja

b. Predictors: (Constant), Grover, Zmijewski, Springate, Altman

From table-11 above, it is found that the calculated F value of 77.410 is higher when compared with the F table so it can be concluded statistically that the analysis of Altman, Springate, Zmijewski and Grover models has a positive effect simultaneously on the company's performance appraisal so that it can used in research conditions of a financial distress against telecommunications companies in Indonesia.

Comparative Analytic between Descriptive and Statistical result

In the analysis of the hypothesis statistical testing, we found that:

a) The Altman model can be used to predict the company's financial difficulties at telecommunications companies in Indonesia.

b) The Springate model can be used to predict the financial difficulties of companies in telecommunications companies in Indonesia.

c) The Zmijewski model cannot be used to predict the financial distress of companies in telecommunications companies in Indonesia.

d) The Grover Model cannot be used to predict the financial difficulties of companies in telecommunications companies in Indonesia.

e) Altman is the best model to use in predicting the financial difficulties of telecommunications companies in Indonesia.

Accuracy of Measurements

In measuring the accuracy or accuracy of the company's bankruptcy prediction model compared to the binary condition, namely if DAR > 50% is in a bad financial condition and if DAR < 50% then the company is in good financial condition, we get results that can be seen in the table as follows:

Table 12: Accuracy of Measurements

Prediction Model	Sample	Accurate	Not Accurate	Accuracy Ratio
Altman	24	24	0	100%
Springate	24	24	0	100%
Zmijewski	24	14	10	58%
Grover	24	24	0	100%

In table-12 we can see that only the Zmijewski model has a low accuracy of 58% and this is in accordance with the descriptive and statistical research results in the discussion of the previous sub-chapter which states that the Zmijewski model may not be suitable if used in predicting the company's financial difficulties.

Best Bankruptcy Prediction Model

From the four bankruptcy prediction models, based on the analysis results in previous chapter, it is concluded that Altman is the best bankruptcy prediction model in predicting the company's financial distress with the highest t-test value.

Descriptive analysis also shows that Altman is the best prediction model because in addition to being consistent and accurate, Altman's prediction model is the only prediction model that gives Telkom a gray zone rating, which is indicated by a negative working capital value. and a fairly high decline in the value of working capital in 2019.

Table 13: Best Bankruptcy Prediction Model Comparison

Altman Z Score	2014	2015	2016	2017	2018	2019
Indosat	-1,419	-1,098	-0,793	-0,194	-1,664	-0,563
Telkom	3,417	3,410	3,493	3,132	2,719	2,068
XL Axiata	-0,024	-0,365	-0,233	-0,256	-0,979	-0,923
Smartfren	-1,891	-0,751	-1,172	-1,166	-0,925	-0,703

Springate S-Score	2014	2015	2016	2017	2018	2019
Indosat	-0,236	-0,153	0,177	0,296	-0,318	0,132
Telkom	1,471	1,487	1,591	1,550	1,300	1,122
XL Axiata	-0,065	-0,040	0,013	0,015	-0,279	0,054
Smartfren	-0,581	-0,655	-0,715	-0,726	-0,836	-0,573

Zmijewski X-Score	2014	2015	2016	2017	2018	2019
Indosat	0,043	0,145	-0,287	-0,364	0,302	0,046
Telkom	-2,751	-2,448	-2,676	-2,557	-2,536	-2,135
XL Axiata	0,204	0,037	-0,833	-0,819	-0,234	-0,317
Smartfren	0,464	-0,144	0,325	-0,219	-0,782	-0,867

Grover G-Score	2014	2015	2016	2017	2018	2019
Indosat	-0,457	-0,354	-0,181	-0,032	-0,521	-0,112
Telkom	0,764	0,821	0,851	0,804	0,632	0,514
XL Axiata	-0,051	-0,136	-0,162	-0,165	-0,450	-0,253
Smartfren	-0,631	-0,427	-0,514	-0,596	-0,654	-0,489

NPM	2014	2015	2016	2017	2018	2019
Indosat	-7,80%	-4,35%	4,37%	4,35%	-9,01%	6,26%
Telkom	23,91%	22,75%	25,08%	25,50%	20,63%	20,35%
Xl Axiata	-3,80%	-0,11%	1,76%	1,64%	-14,37%	2,84%
Smartfren	-46,77%	-51,74%	-54,28%	-64,75%	-64,71%	-31,31%

Working Capital (Billion IDR)	2014	2015	2016	2017	2018	2019
Indosat	(12.557)	(10.134)	(11.013)	(6.721)	(13.134)	(9.685)
Telkom	1.976	12.499	7.939	2.185	(2.993)	(16.647)
XL Axiata	(2.088)	(5.596)	(7.670)	(8.046)	(8.675)	(14.147)
Smartfren	(4.499)	(1.951)	(2.806)	(3.841)	(4.126)	(4.345)

In Table-13 working capital section, it can be seen that PT. Telkom has experienced a decrease in working capital where in 2014-2017 it has positive working capital, with the highest in 2015 (working capital 12 Trillion IDR) being negative in 2018 (- 2.9 T) and 2019 (-16.6 T).

The decrease in working capital to the lowest level is certainly a warning to the top management of PT. Telkom so as not to follow the trend of other telecommunication companies (PT. Indosat, PT. XL Axiata and Smartfren) which had negative working capital during the observation period.

Management Implications

Net Profit Margin, which is the profitability ratio, shows how much profit you get from sales. Setiawati and Lim (2016) state that profitability affects firm value. The higher the level of profitability, the higher the company's ability to increase sustainable growth and increase share prices that will attract investors. High Net Profit Margin also allows companies to improve the welfare of their employees through bonus distribution or salary increases.

Morshed (2020) argues that working capital greatly influences the company's profitability. Negative working capital means that the company in carrying out its operational activities relies on short-term debt. And the profit obtained from these operational results will certainly be reduced due to having to pay interest on short-term debt. A negative net profit margin value accompanied by negative working capital will worsen company performance because there is no profit that can be used to pay current debts.

Some of the management implications that arise including:

1. Negative and low Net Profit Margin results in the scale value of the Altman and Springate models which are in bad financial conditions, which can be used as a reference by the management of PT. Indosat, PT. XL Axiata and PT. Smarfren in doing short- and long-term planning. Companies must focus on getting a good net profit margin (~ 20% according to observations on PT Telkom) and sustainable so that they can develop positively without being burdened by ineffective operating costs and short-term and long-term obligations. Rational steps that can be taken include streamlining the organization, selling assets, emphasizing the principle of prudence in expansion, investment and increasing sales effectiveness.

2. Consistent research results through the Altman and Springate models to PT. Indosat, PT. XL Axiata and PT. Smartfren (in an unfavourable financial condition) must be immediately followed up with concrete steps so that these companies can immediately rise up and achieve positive results. Without concrete steps and taking steps to rationalize it, it is not impossible for PT. Indosat, PT. XL Axiata and PT. Smartfren will follow in the footsteps of PT. Bakrie Telekom is currently in a "suspended animation" condition.

3. Management of PT. Telkom must immediately respond to the drastic reduction in working capital in 2019 (which resulted in PT. Telkom entering the grey zone of the Altman model) with tangible, efficient and sustainable steps so as not to follow the pattern of other telecommunications companies, namely negative working capital throughout the observation year. of course, be the first step in the company's financial difficulties.

Conclusion and Recommendation

Conclusion

Based on the research results, it is concluded that of the four telecommunications companies listed on the Indonesian stock exchange for the 2014-2019 period, only PT. Telkom which is in a healthy financial condition. PT. Indosat, PT. XL Axiata and PT. Smartfren, all three are consistently in an unhealthy condition based on the results of the analysis of the Altman and Springate models.

The calculation of Zmijewski's model and Grover's model gave inconsistent results. When comparisons were made between the four bankruptcy analysis models, Altman, Sprigate and Grover recorded accurate results, but we only recommend the analysis results from Altman because it is an accurate, consistent, and tested model both descriptively and statistically.

The results of this study can certainly be of concern to the government where apart from PT. Telkom, which is a state-owned company, the 3rd telecommunications network provider including the private sector is in a bad condition.

If the private sector in telecommunications is reduced or lost, then the losers are the customers because with reduced competition there will be a monopoly on prices and services which results in the lack of choices provided by the telecommunications sector.

In addition, if the private sector is reduced, this will have an impact on the thousands or tens of thousands of employees who are part of the private sector.

PT. Bakrie Telecom as in Kokyung and Khairani's (2013) research can be a good benchmark for comparison, where Kokyung conducted research in 2013 and in 2020 PT. Bakrie Telecom is operationally gone and is waiting for delisting or liquidation.

Net Profit Margin, which is the profitability ratio, shows how much profit you get from sales. Setiawati and Lim (2016) state that profitability affects firm value. The higher the level of profitability, the higher the company's ability to increase sustainable growth and increase share prices that will attract investors. High Net Profit Margin also allows companies to improve the welfare of their employees through bonus distribution or salary increases.

Recommendation

1. Advice for Telecommunication Company Management in general.

Our research resulted in a negative and decreasing pattern of the company's working capital value. This indicates that in their operations, telecommunication companies in Indonesia depend on short-term loans. Negative working capital accompanied by a negative or small Net Profit Margin can cause a chain reaction that causes the company to be in a circle of bad financial conditions and difficulty in recovering, as in the proverb, dig a hole to close the hole.

In this case we suggest to carrying out effective and selective operational activities in terms of expansion, adding assets and in terms of planning, planning new products to be flexibly adapted to the circumstances.

2. Advice to Government

The government as a regulator is also obliged to actively encourage mutually beneficial competition between telecommunications companies and with customers, in this case the people.

According to our opinion, the government can do what is based on article 33 of the UUD45 (Indonesian Constitution) which states that the lives of many people are managed by the government, in this case the government may issue regulations on interconnection networks that can be utilized by PT. Indosat, PT. XL Axiata and PT. Smartfren effectively and encourages positive business growth.

Another thing is the adjustment of telecommunication upper and lower tariffs and the setting of internet tariffs whereas we know, 4G services encourage large data usage and it seems that this has not been felt by PT. Indosat, PT. XL Axiata and PT. Smartfren which is depicted from the results of the bankruptcy analysis that is in unfavourable condition.

3. Suggestions for Future Researchers

In 2020, research methodologies using machine learning and artificial intelligent can open up the possibility of research methods that are more modern, comprehensive and can be used across industries.

The limitation of the author at this time is that we only use the Multivariant Discriminant Analysis (MDA) model such as Altman, Springate, Zmijewski and Grover with a span of only 6 years.

In line with Qu, Quan, Minglong & Shi (2020), we suggest that further researchers conduct research on comparisons between the MDA model (Altman and Springate) with the Deep Belief Network (DBN) and Convolutional Neural Network (CNN) models with a longer period. and make predictions for the next 5 years, so that a prediction model that is relevant for now and with the right expectations can be used not only to predict the condition of the company's financial difficulties, but also to be able to find out the true "disease" in the company so that " the drugs" used are effective and can lead the company to recover and become a company that has good finances and continues to grow.

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