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THE 4th INDONESIAN FINANCE ASSOCIATION INTERNATIONAL CONFERENCE 2018

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PREFACE

We are very grateful to God for his grace that the 4th Indonesian Finance Association International Conference 2018 was held successfully on September 5-6, 2018 at Faculty of Economics and Business, Universitas Lampung. Tokens of appreciation should also be rendered to our co-hosts, sponsors, and you all that the event could be organized and carried out with utmost quality, comfort, and precision. These proceedings are compiled as a collection of all presenters' research papers, reflecting state-of- the-art ideas and findings on the field.

The theme of this conference is "Finance in the Age of Digital Technology: Pushing New Frontier," and this theme is manifested in the presented papers compiled in these proceedings, comprised of scholarly works from all over Indonesia as well as honorary speakers. Hence, we would like to express our gratitude and credits to:

Universitas Lampung, Universitas Gadjah Mada, Universitas Indonesia, Universitas Negeri Sebelas Maret, Universitas Bandar Lampung, IBI Darmajaya, Universitas Teknokrat Indonesia, Universitas Malahayati, STIE Umitra Lampung, STIE Gentiaras, STIE Prasetya Mandiri Lampung for hosting the conference and putting together materials for these proceedings.

Professor Alistair Milne (Looghborough University, UK), Professor Ghon Rhee (University of Hawai, USA and Pacific Basin Finance Journal), Professor Robin K. Chou (National Chengchi University Taiwan) for taking the time to contribute their expertise and experiences to the conference that have enriched our knowledge.

All scientists and researchers that have contributed their research ideas and results, and encouraged one another by sharing, learning, and discussion. There were 63 papers presented in the conference. Some of them have agreed to include their full papers in the proceedings.

The proceedings cover various topics, ranging from asset pricing to behavioral asset pricing, banking and financial intermediation, corporate governance, financial literacy, financial market behavior, market microstructure, and Islamic finance.

We sincerely hope that these proceedings, and the conference in particular, will benefit all the participants and readers, especially as a reference for further financial development in Indonesia and beyond.

We welcome any suggestions and constructive feedbacks to improve the organizing of the next IFA conferences and proceedings, and we look forward to seeing you again.

Bandar Lampung, September 2018

COMPARATIVE ANALYSIS ON THE ACCURACY LEVEL OF FINANCIAL DISTRESS PREDICTION MODEL

A STUDY OF THE MINING SECTORS LISTED ON INDONESIA STOCK EXCHANGE IN PERIOD OF 2012 – 2016)

Pudji Astuty[24], Moch.Jasin[25], Agus zainul Arifin[26], Armalia Reny WA[27], Srinita[28]

ABSTRACT

This study aims to determine the difference between the Modified Altman model, the Zmijewski model, the Grover model, and the Springate model, to predict financial distress, and to find out which Financial Distress prediction model is the best for mining companies in Indonesia. Complementary models are created by analyzing each model, using the real state of the company's net profit.

The population is the mining companies listed on the Indonesia Stock Exchange in a period of 2012-2016. This research employs a purposive sampling method and uses 60 samples that consist of 30 samples of financial distress companies and the rest is non-financial distress. In this research, it uses a logistic regression test, regression feasibility model test, fit model fittest, and regression coefficient test. The results indicate that all the prediction models of this research can be used to predict the financial distress, by which the Grover model has the best accuracy with 85%, the second Springate model has 81,67%, the third Modified Altman model has 75%, and the last Zmijewski model with 56,67%.

Keywords: financial distress, Modified Altman Model, Zmijewski Model, Grover Model, Springate Model, Logistic Regression

[24]Pudji_astuty@Borobudur.ac.id, [25]moch.jasin1@gmail.com, [26]agusz@fe.untar.ac.id,
[27]STIE@umitra.ac.id, [28]Srinita@unsyiah.ac.id

I. INTRODUCTION

The economic growth in Indonesia has decreased starting from the end of 2011 which kept on going until it reached its lowest point in 2015. This decrease continues due to the weakening economic in China as the second economic power in the world, the economic downturn, and the embargo of Russia as well as the price decrease of world's commodity in the international market which becomes the beginning of economic slowdown in period of 2014 – 2015 (www.dpr.go.id). The weakened economic growth makes the growth of Gross Domestic Product (GDP) in some sectors decreased as well. Basically, the GDP is one of the indicators to find out the condition of economic in a country. The decreases of GDP are followed by the growth decrease in some business sectors. In 2015, the primary sector of mining and excavation experienced a decrease in negative growth. The factors of the primary sector decreased because the price dropped dramatically and the market demand was quite difficult. According to kompas.com, the research result by Pricewaterhouse Cooper (PwC) in 2016, there were 40 global mining companies suffered the biggest lost throughout 2015. PwC also stated that the market capitalization of national mining companies recorded on the Indonesia Stock Exchange has decreased. The companies which have negative growth mean to have low profit.

The companies which are steadily suffering the growth decrease towards negative direction will disrupt the course of operational activities in the company. The disrupted operational activities will make the companies not maximized in generating the output. Thus, the resulted input will also decrease. If it steadily continues, the company will suffer the financial distress condition which will bankrupt in the future.

According to Gunawan et al (2017), financial distress is a stage of financial condition decrease occurred before the bankruptcy or liquidation. One of indicators used to determine the company which is experiencing the financial difficulties is the loss generated by the company because it cannot make profits so that the company profits are negative.

A. Research Question

Based on the introduction above, the questions formulated in this research are:

1. Is the financial distress measurement model feasible to be used in observing the condition of financial distress in the mining companies listed in Indonesia Stock Exchange in the period of 2012 – 2016?

2. Which prediction model has the highest and the lowest accuracy level and error rate in measuring the financial distress in Indonesia Stock Exchange in the period of 2012 – 2016?

II. Literature Review

1. Modified Altman Model

The adjustment on various types of companies, Altman then modified the model in order to be able to be used by all companies, such as manufactures and non – manufactures. This is the equation for modified Altman model:

Explanation:

Z'' = Altman Score

X1 = Working capital/total assets

X2 = Retained earnings/total assets

X3 = Earnings before interest and taxes/total assets

X4 = Book value of equity/book value of total debt

The classification of financial distress and non-financial distress companies on the value of Z-score of Modified Altman Model (1995), are:

a) If the value of $Z \leq 2.6$ it is categorized as distresscompany*;*

b) If the value of $Z > 2.6$ it is categorized as non-distresscompany

2. Zmijewski Model

Based on Prihanthini (2013), the prediction model generated by Zmijewski in 1983 is a research result during less than 20 years that has been repeated. This model resulted a formula as following:

$$X = -4.3 – 4.5\ X1 + 5.7\ X2 – 0.004\ X3$$

Explanation:

X = Zmijewski Score

X1 = ROA (return on assets)

X2 = Total Debt/total assets

X3 = Current assets/current liabilities

The classification of distress and non-distress companies on the value of X-score of Zmijewski model (1983), are:

a) If the value of $X > 0$ it is categorized as distresscompany*;*

b) If the value of $X < 0$ it is categorized as non-distresscompany

3. Grover Model

Grover Model is a model created with reassessing the Z-score Altman model. Jeffrey S. Grover uses the sample in accordance with Z-score Altman model in 1968, by adding 13 new finance ratios (Ni Made, 2013). Jeffrey S. Grover (2001) generated a formula as following:

$$G = 1.650\ X1 + 3.404\ X2 - 0.016\ X3 + 0.057$$

Explanation:

G = Grover Score

X1 = Working capital/total assets

X2 = Earnings before interest and taxes/total assets

X3 = ROA (return on assets)

The classification of distress and non-distress companies on the value of X-score of Grover model (1983), are:

a) If the value of X> 0.02 it is categorized as distresscompany*;*

b) If the value of X ≤ 0.02 it is categorized as non-distresscompany.

4. Springate Model

Based on Wulandari (2014), Springate Model was developed in 1978 by Gorgon L. V. Springate. The Springate Model is a ratio model using the Multiple Discrimination Analysis or MDA to choose 4 of 19 financial ratios which are popular in the literature, which is capable to differentiate the distress and non-distress company at its best. The formula of Springate model is:

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

Explanation:

S = Springate score

X1 = Working capital/total assets

X2 = Earnings before interest and taxes/total assets

X3 = Earnings before taxes/current liabilities

X4 = Total sales/total assets

The classification of distress and non-distress companies on the value of *S*-scoreof Springate model (1978), are:

c) If the value of S < 0.862 it is categorized as distresscompany*;*

a) If the value of S > 0.862 it is categorized as non-distresscompany

III. Hypothesis

Based on the theoretical foundation and the framework above, the proposed hypothesis is as following:

1. H_{01}: Altman, Zmijewski, Grover and Springate model are not feasible to be used in the prediction of financial distress condition on the mining sectors listed on the Indonesia Stock Exchange.
2. H_{a1}: Altman, Zmijewski, Grover and Springate model are feasible to be used in the prediction of financial distress condition on the mining sectors listed on the Indonesia Stock Exchange.
3. H_{02}: There is no difference of accuracy and error rate from Modified Altman, Zmijewski, Grover and Springate Model in predicting the financial distress condition in the mining sectors listed on the Indonesia Stock Exchange.
4. H_{a2}: There is a difference between accuracy and error rate from Modified Altman, Zmijewski, Grover and Springate in predicting the financial distress in the mining sectors listed on the Indonesia Stock Exchange.

IV. RESEARCH METHODOLOGY

The population used in this research is all companies of mining sector listed on the Indonesia Stock Exchange (IDX). There are 43 mining sectors of population listed on the IDX in 2012-2016 (seen on www.idx.com). The sampling technique used in this research is purposive sampling method, a sampling based on certain criteria in accordance with the desired by the researchers.

V. DATA ANALYSIS TECHNIQUE

Difference test technique of matched pair is conducted to find out whether there is a total difference of asset between two sample categories or not as a requirement to perform the logistic regression test. After the data have met the requirements, the next stage is to conduct the logistic regression test. The logistic regression is a technique to create a prediction towards the dependent variables with nominal scale (dummy variable) by using the independent variables with interval scale. To answer the last hypothesis, it uses the calculation of accuracy and error rate from each prediction model which are Modified Altman, Zmijewski, Grover, and Springate by seeing the value from the cut-off point of each model.

VI. RESEARCH RESULT AND DISCUSSION

1.Difference Testing of Matched Pair

Table 1.3

Difference Testing of Matched Pair Criteria

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1 TA_0 - TA_1	-9.556E9	3.323E10	6.067E9	-2.196E10	2.851E9	-1.575	29	.126

Source: Data Processed with SPSS 16

The data can be seen from the above output table, the obtained value of Sig (2-tailed) is 0.126 and this value is bigger than α (0.126>0.05), it can be concluded that there is no difference of average on the total of an asset among two sample categories. This sample means to meet the matched pair criteria and it can be used for further research later.

2. Logistic Regression Test

Table 1.4 Summary ofLogistic Regression Test

Model	Logistic Regression					
	Hosmer and Lemeshow	*Block 0*	*Block 1*	*Cox & Snell R Square*	*Nagelkerke R Square*	Remarks
Altman	0.438 > 0.05	83.111	47.050	0.452	0.603	Feasible
Zmijewski	0.076 > 0.05	83.111	54.122	0.383	0.511	Feasible
Grover	0.998 > 0.05	83.111	24.224	0.625	0.834	Feasible
Springate	0.778 > 0.05	83.111	43.403	0.484	0.646	Feasible
Significance of Ratio Variable						
	Model					
Ratio	Altman		Zmijewski	Grover	Springate	
WCTA	Significant			Significant	Not Significant	
RETA	Not Significant					
EBITTA	Not Significant			Significant	Not Significant	
BVEBVD	Significant					
ROA			Significant	Significant		
TDTA			Not Significant			
CACL			Significant			
EBTCL					Not Significant	

Model	Logistic Regression					
	Hosmer and Lemeshow	*Block 0*	*Block 1*	*Cox & Snell R Square*	*Nagelkerke R Square*	Remarks
TSTA					Significant	

Source: data processes with Microsoft Excel

a) Modified Altman Model

The Altman model has the value of Hosmerand Lemeshow with the value of Sig which is bigger than α (0.435 ≥ 0.05), meaning that the Altman model can be accepted since the model can predict its observed value.

By assessing and using-2Loglikelihood, if block 0 decreases to block 1, it can be assumed that the second regression model is becoming better. On the block 0, the value of -2Loglikelihood is 47.092. From that result, it can be assumed that the second regression model is becoming better to predict the financial distress condition of companies listed on the Indonesia Stock Exchange. The result from the output shows the value of the Nagelkerke R Square by 0.602, bigger than the value of Cox & Snell R Square only by 0.451. It shows that the capability of the four independent variables in explaining the variance of financial distress is 60.2% and there is 39.8% of other factors explaining that the financial distress variants besides the Altman model.

The test result from the model significance can be perceived that the RETA variable does not influence the financial distress condition, since the value of Sig is bigger than the value of α (0.065 > 0.05), meaning that the RETA variable is not significant. EBITTA variables also do not influence the financial distress condition since it has the value of Sig which is bigger than α (0.699 > 0.05), meaning that the EBBITA variable is not significant. Meanwhile, WCTA variable influences the financial distress condition of the company since it has the value of Sig which is smaller than the value of α (0.001 < 0.05), meaning that the WCTA variable is significant. Another variable, BVEBVD, also influences the financial distress condition since it has the value of Sig which is smaller than the value of α (0.021 < 0.05), meaning that the BVEBVD variable is significant.

b) Model Zmijewski

It can be seen from above that Zmijewski model has the value of Hosmer and Lemeshow with the value of the Sig 0.076 bigger than the value of predetermined α which means that Zmijewski model can be accepted since it can predict its observed value. Zmijewski model above assesses by using -2Loglikelihood. On

block 0, -2Loglikelihood is 83.111 and on the block 1, the value of -2Loglikelihood is 54.122. It decreases from block 0 to block 1, it can be assumed that the second regression model is becoming better to predict the financial distress condition of companies listed on the Indonesia Stock Exchange. The result from the output above show that the value of Nagelkerke R Square by 0.511 bigger than the value of Cox & Snell R Square only by 0.383. It shows that the capability of the three independent variables in explaining the variance of financial distress is 51.1% and there is 48.9% of other factors which explain the variants of financial distress beside Zmijewski model.

The testing result of this model significance can be seen that only TDTA variable which does not influence the financial distress condition since it has the value of Sig which is bigger than the value of α (0.604 > 0.05), meaning that TDTA variable is not significant. Meanwhile, ROA variable influences the financial distress condition since it has the value of Sig which is smaller than the value of α (0.604 > 0.05), meaning that ROA variable is significant. CACL variable also has an influence on the financial distress condition since it has the value of Sig which is smaller than the value of α (0.004 < 0.05), meaning that CACL is significant as well.

c) Grover Model

Grover model has the value of Hosmer and Lemeshow with the value of Sig which is bigger than α (0.998 > 0.05) which means that Grover model can be accepted since it can predict its observed value.

With assessing by using -2Loglikelihood, if block 1 decreases with the value of 24.224 from block 0 with the value of 83.111, it can be assumed that the second regression model is becoming better to predict the financial distress condition of companies listed on the Indonesia Stock Exchange. The result from the output above shows that the value of Nagelkerke R Square of 0.834 is bigger than the value of Cox & the Snell R Square by 0.625. It shows that the capability of the three independent variables in explaining the variance of financial distress is 83.4% and there is 16.6% of other factors which explain the variants of financial distress beside Grover model. The testing result of Grover model significance can be seen that WCTA variable has an influence on the financial distress condition since it has the value of Sig which is smaller than the value of α (0.004 < 0.05), meaning that WCTA variable is significant. EBITTA variable also influences the financial distress condition since it has the value of Sig which is smaller than α (0.013 < 0.05), meaning that EBITTA variable is significant. The last variable, ROA, is also similar to the previous variables. It influences the financial distress

condition since it has the value of Sig which is smaller than the value of α (0.009 < 0.05), meaning that ROA variable is significant.

d) Model Springate

Springate model has the value of Hosmer and Lemeshow with the value of Sig which is bigger than the value of α (0.778 > 0.05) which means that Springate model can be accepted since it can predict the observation value.

By seeing the value of the column -2Loglikelihood, if block 1 decreases from block 0, it can be assumed that the second regression model is becoming better. On the block 0, the value of -2Loglikelihood is 83.111 and on the block 1, the value of -2Loglikelihood is 43.403. From this result, it can be assumed that the second regression model is becoming better to predict the financial distress condition of companies listed on the Indonesia Stock Exchange. The output result above shows that the value of Nagelkerke R Square by 0.646 is bigger than the value of Cox & Snell R Square by 0.484. It shows that the capability of the four independent variables in explaining the variance of financial distress is 64.6% and there is 35.4% of other factors which explain the variants of financial distress beside Springate model.

The testing result of this model significance can be seen that only TSTA variable which influences the financial distress condition since it has the value of Sig which is smaller than the value of α (0.000 < 0.05), it means that TSTS variable is significant. Meanwhile, WCTA variable does not have an influence on the financial distress condition since it has the value of Sig which is bigger than the value of α (0.477 > 0.05) meaning that WCTA variable is not significant. Furthermore, EBITTA variable does not influence the financial distress condition since it has the value of Sig which is bigger than the value of α (0.216 > 0.05) meaning that EBITTA variable is not significant. And, the last variable which does not have an influence on the financial distress condition is EBTCL variable since it has the value of Sig which is bigger than the value of α (0.097 > 0.05) meaning that EBTCL variable is no significant as well.

1. Accuracy and Error Rate

Table 4.33

Summary of Accuracy and Error Rate Result

Result	Model			
	Altman	Zmijewski	Grover	Springate

Accuracy Rate	75%	56,67%	85%	81,67%
Type I Error	8.33%	35%	15%	0%
Type II Error	16.67%	8.33%	0%	18.30%

Source: Data processed by Microsoft Excel

Grover model has the highest accuracy rate to 85% and the lowest error rate by 15%. The second model, which is Springate model, is 81.67% with the biggest error rate with 18.30%. The third model, Modified Altman Model, has the accuracy rate of 75% and the error rate of 25%. The last model, Zmijewski, has the accuracy rate of 56.67% and the error rate of 43.33%.

VII. CONCLUSION AND SUGGESTION

Conclusion

Based on the analysis and the research result discussion by using the logistic binary regression test regarding the ratio of accuracy rate of financial distress model from the mining companies, the conclusions are:

a). The research result states that Altman, Zmijewski, Grover and Springate model are feasible to be used to predict the financial distress condition of the companies listed in IDX. By seeing the value of the Nagelkerke R Square, from the highest to the lowest, they are Grover, Springate, Altman and Zmijewski model.

b). The research result states that from four tested prediction model, the best prediction model which has the highest accuracy rate with the lowest error rate is the Grover model on the first rank. The second rank is Springate model. Altman model is on the third rank while the last rank is Zmijewski model.

Suggestions

Based on the research result, the writer offers suggestions as considerations for further research, which are:

a). This research only uses the prediction model of Modified Altman, Zmijewski, Grover and Springate mode. It is expected that the next researcher can add or test other prediction model such as Ohlson or Foster or other predictions to get the best result.

b). There are some variables from each prediction model which do not have an influence on the financial distress condition. Thus, the future research should need a deeper reference and understanding in implementing the prediction model.

c). The best prediction model can only be implemented on the mining sector companies. It is expected that the further research is capable to find out the best prediction model in various sectors listed in Indonesia Stock Exchange.

d). The future researcher is expected to expand the time period of the sample in order to be able to see more complete financial distress condition from mining companies.

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