COMPARATIVE ANALYSIS OF Z-SCORE AND SPRINGATE ALTMAN MODELS ON REGISTERED COAL COMPANIES BEI IN 2011-2015

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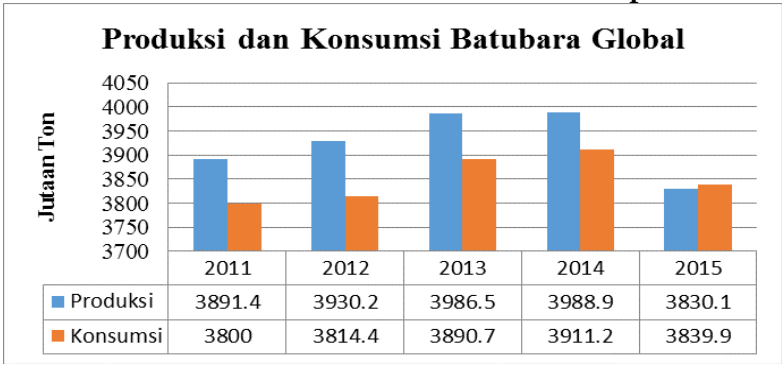
ABSTRACT

Subsector coal mining sector experienced a decrease from the years 2011-2015, if the company fails to carry out operations to generate a profit, then this may lead to bankruptcy. The purpose of this study was to determine whether there are differences in the potential bankruptcy of the Altman Z-score models and models Springate, as well as to determine the model of bankruptcy is most appropriate for the coal company listed on the Indonesia Stock Exchange in 2011 to 2015. This research method is quantitative secondary data is the data from this study. The results of this study, based on the results of hypothesis testing with different test paired samples t-test mennjukkan that there are differences in the potential bankruptcy of the Altman Z-score models and models Springate. Then, based on the calculation and oengamatan writer, a model that can assess more fair and appropriate for the coal company listed on the Indonesia Stock Exchange period 2011 - 2015 is the model of the Altman Z-score.

INTRODUCTION

Indonesia is one of the largest coal producers and exporters in the world. In 2015, the mining sector especially coal was in the spotlight in the business world. In August 2015, approximately 125 coal mining companies in East Kalimantan were not operating. As a result, 5,000 people were terminated. The Chairperson of the Indonesian Employers Association (Apindo) of East Kalimantan, M Slamet Brotosiwoyo, said. (Djumena, Kompas.com accessed August 17, 2016). This is supported by the decline in coal production and consumption figures, where global coal production fell to 3830.1 million tons in 2015, and global coal consumption also decreased at 3839.9 million tons.

Table 1.1 Global Coal Production and Consumption 2013-2015



	2011	2012	2013	2014	2015
Produksi	3891.4	3930.2	3986.5	3988.9	3830.1
Konsumsi	3800	3814.4	3890.7	3911.2	3839.9

Sources: BP Statistical Review of World Energy

The decline was followed by coal prices, reduced imports by coal consuming countries caused oversupply or excess coal supply, coal consuming countries continued to reduce the use of mainly China as the largest consumer. In early 2014, the Indonesian Mining Institute (IMI) noted that 250 million tons of coal oversupply had occurred. In addition, the emergence of new energy sources such as shale gas also caused a decline in coal prices. Coal prices fell at $ 53.59 in 2015.

The weakening that occurs in the coal subsector mining sector if it lasts too long can be a concern of investors in investing. The company's obligations in funding operations and dividend distribution to investors may be delayed or not smooth. If it is not resolved, it will affect the company's performance which will gradually suffer both financial and non-financial setbacks. The company failed to run the company's operations to generate profits that would lead to bankruptcy.

In this study the company studied was a coal company in the last few years that experienced a decline, coal prices declined, production declined, consumption also declined. Tools are needed as an early warning for companies to be able to realize the condition of the company early and as a tool for investors in choosing companies to invest. Putro (2014: 2) Bankruptcy is a condition in which a company is no longer able to pay off obligations. The method used to predict bankruptcy is one of them Z-score and Springate. Z-score was introduced by Edward L Altman, in predicting bankruptcy Z-score does not pay attention to company size. This method of predicting bankruptcy is needed as an early warning tool for companies to be able to realize the condition of the company early and as a tool for investors in choosing companies to invest.

Based on the background above, the formulation of the problem in this study is whether there are differences in the potential for bankruptcy with the Altman Z-score model and the Springate model for coal companies listed on the Indonesia Stock Exchange in 2011-2015? And is the Altman Z-score model or the Springate model the most appropriate in measuring the potential bankruptcy of coal companies listed on the Indonesia Stock Exchange in 2011-2015?

LITERATURE REVIEW AND HYPOTHESES

Bankruptcy

Nurcahyanti (2015: 7) The term "bankrupt" is found in the treasury of Dutch, French, Latin and English. In French, the term "failite" means strike or traffic jam in making a payment.

People who strike or freeze or stop paying their debts are called Le falli. In the Dutch language the term faillit is used which has a double meaning namely as a noun and

an adjective. Whereas in English the term to fail is used, and in Latin the term failire is used. In English-speaking countries, the terms "bankrupt" and "bankruptcy" are used. Nafisatin, Suhadak, Hidayat (2014) Bankruptcy as a failure that occurs in a company is defined in several senses.

a. Economic Failure (Economic Distressed)

Failure in the economy means that the company loses money or income, the company cannot cover its own costs, this means the profit rate is less than the cost of capital or the present value of the company's cash flow is less than the liability. Failure occurs when the actual cash flow of the company is far below the expected cash flow. Even failure can also mean that the level of income on the historical costs of the investment is smaller than the cost of capital companies incurred for an investment.

b. Financial Failure (Financial Distressed)

Understanding financial distressed has the meaning of funding difficulties both in terms of funds in the sense of cash or in the sense of working capital. Some asset liability management has a very important role in the regulation to prevent financial distress. Bankruptcy will quickly occur in companies located in countries that are experiencing economic hardship, because economic hardship will trigger faster bankruptcy of companies that may be sick from the start then get sicker and bankrupt.

Altman Z-score model

Li (2014: 7) Altman (1968) first tried to combine several variables into one predictive function by using the multiple discriminant analysis method to study credit risk measurement and develop 5 well-known Z-score Model variables. This model resulted from the analysis of 22 financial ratios through a statistical filter based on a sample consisting of 33 distress manufacturing companies and 33 non-stress manufacturing companies.

The selected company has total assets ranging from 7 million to 25. Of the 22 variables originally selected, Altman found five ratios to be included in the discriminant function. Altman validates the function using a sample of 66 companies and has an accuracy percentage of 79% one year before failure. None of the 66 companies used by Altman are construction companies. From the five variables, the results of the study developed by Altman, namely:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$$

X_1 = Working capital to total assets
X_2 = Retained earnings to total assets
X_3 = Earnings before interest and taxes to total assets
X_4 = Market value of equity to total liabilities
X_5 = Sales to total assets

Meita (2015: 9) The cut-off value used in the Altman Z-score model is Z > 2.99 companies categorized as healthy, while Z < 1.81 companies are categorized as companies in the distress zone, where the company has the potential to go bankrupt. Z-score values that are between 1.81 - 2.99, including the gray area means the company is in a gray area where the company can potentially go bankrupt or not bankrupt.

Working Capital to Total Assets

Putro (2013: 6) A company that has the potential to go bankrupt begins to experience a reduction in investment in current assets. The ratio of working capital to total assets is calculated by dividing net working capital by total assets. Net working capital is obtained by means of current assets less current liabilities. Negative net working capital is likely to face problems in covering short-term liabilities because there are not enough current assets to cover these

obligations. Conversely, companies with positive positive net working capital rarely face difficulties in paying off obligations.

Retained Earnings to Total Assets

Putro (2013: 6) Retained earnings to total assets is an indicator of cumulative profitability relative to the length of time, the younger a company is, the more likely it is to go bankrupt. This ratio measures the cumulative profit against the age of the company which shows the strength of revenue. This ratio shows the company's ability to generate retained earnings from total company assets. Retained earnings are profits which are not distributed to shareholders. In other words, retained earnings shows how much company income is not paid in the form of dividends to shareholders.

Li (2014: 10) Retained earnings are accounts that report the total amount of reinvested income and / or losses from the company during the company's lifetime. A relatively young company tends to have a lower ratio of retained earnings to total assets because it does not have enough time to build cumulative profits, therefore this ratio is discriminated against for young companies and the possibility of being classified as potentially bankrupt is higher than older companies. Companies with high retained earnings to high assets can finance their assets through profits rather than a lot of debt, and the situation is a sign of healthy growth for the company.

Earning Before Interest and Taxes to Total Assets

Putro (2013: 6) the ratio of earnings before interest and taxes to total assets reflects the company's strength in bringing in revenue, showing the company's ability to generate profits from company assets, before paying interest and taxes. This ratio is a measure of the productivity of a company's assets, regardless of taxes and interest, where the company's existence is based on income from assets.

Market Value of Equity to Total Liabilities

Putro (2013: 6) Market value of equity to total liabilities, this ratio shows the company's ability to fulfill obligations from the capital market value itself. Li (2014: 11) equity is calculated by a combination of ordinary shares and preferred shares, and liabilities come from total long-term liabilities and short-term liabilities.

Sales to Total Assets

Putro (2013: 6) The ratio of sales to total assets is the ratio of asset turnover which shows the size of management's ability to sell company assets. This ratio shows whether the company produces enough business volume compared to investment in total assets. This ratio reflects the efficiency of management in using the overall assets of the company to generate sales and make a profit. This is one measure of management capacity in handling competition conditions.

Springate Model

Prihartini (2013: 422) Research conducted by Gordon L. V Springate (1978) produced a bankruptcy prediction model created by following the Altman model procedure. The bankruptcy prediction model known as the Springate model uses four financial ratios selected based on 19 financial ratios in various literature. Purnajaya and Merkusiwati (2015: 5) The cut-off value that applies to this model is 0.862. S value smaller than 0.862 indicates that the company is predicted to go bankrupt. This model has an accuracy of 92.5% in tests conducted by Springate. In the Springate model there is a different ratio between the same 3 ratios as the Altman Z-score model, namely Earning Before Taxes to Current Liabilities.

H0: There is no difference in bankruptcy

potential with the Altman Z-score and springate models for coal companies listed on the Indonesia Stock Exchange in 2011-2015

Mining Sector

Tri Hayati (2015: 2) Minerals and Coal contained in the Indonesian mining jurisdiction as a gift from God Almighty, have an important role in meeting the needs of many people. Mineral and coal mining business activities have an important role in national economic growth and sustainable regional development. For this reason, mining management must be done wisely and wisely so that there is continuity and sustainability.

The rules and provisions of the mineral and coal mining sector are regulated in Law of the Republic of Indonesia Number 4 of 2009. Listed in Article 1 Paragraph 1, mining is part or all of the stages of activities in the framework of research, management and exploitation of minerals or coal which includes general investigations, exploration, feasibility studies, construction, mining, processing, refining, transportation and sales, as well as post-mining activities.

Paragraph 6 of the Law of the Republic of Indonesia concerning Minerals and Coal, writing down mining business is an activity in the context of exploiting minerals or coal which includes stages of activities of general investigation, exploration, feasibility study, construction, mining, processing, and refining, transportation, and sales, as well as post mining. Followed by Paragraph 7 which contains the Mining Business Permit called the IUP which is a permit to conduct mining business. IUP is divided into several types according to the needs of the mining business, which include; Exploration IUP, Production Operation IUP, People's Mining Permit, i.e. permit to carry out mining business in people's mining areas with limited area and investment, and Special Mining Business Permit (IUPK) is a permit to carry out mining business in a special mining business permit area. Setianto (2016: 4) The mining sector consists of coal mining, land or stone mining, metal and mineral mining, crude petroleum and natural gas production.

METHODOLOGY

Population and Sample

Sugiyono (2015: 148) Population is a generalization area that consists of objects or subjects that have a certain quantity and characteristics determined by researchers to be studied and then drawn conclusions. The population in this study is Issuers included in the mining industry. Sugiyono (2015: 149) The sample is part of the number of characteristics possessed by the population. If the population is large, and researchers may not study everything in the population, for example due to limited funds, manpower, and time, then researchers can use samples taken from the population. The sample in this study are companies included in the mining subsector, namely coal

The sampling technique used was purposive sampling which is the technique of determining the sample with certain considerations (Sugiyono 2015: 156). Considerations in selecting a sample of the coal subsector mining industry are the large amount of coal supply, declining coal prices and choosing companies included in the coal subsector mining sector which were listed on the Indonesia Stock Exchange in the period 2011-2015. The sample of this study amounted to 15 coal companies.

Operational Definitions of Research Variables

In this study the operational definition refers to how to measure a variable. The scale used in this study is the interval scale. Sugiyono (2015: 29) Interval scale is a scale of giving numbers to the classification or

categories of objects that have ordinal data. The data of this study are in the form of determinants of company condition obtained from the calculation results, therefore this study uses an interval scale because after calculating the financial condition classification the company is in a potentially bankrupt condition, gray area and not potentially bankrupt based on the Altman Z-score cut-off model and the Springate model.

Table 3.1 Variables and Indicators of the Altman Z-score Model

Variabel	Indicator	Formula	Source	Scale
Edward Altman	Working Capital to Total Assets	$\frac{\text{Current Assets} - \text{Current Liabilities}}{\text{Total Assets}}$	Putro (2013:6)	Interval
	Retained Earning to Total Assets	$\frac{\text{Retained Earning}}{\text{Total Assets}}$		
	Earnings Before Interest and Taxes to Total Assets	$\frac{\text{EBIT}}{\text{Total Assets}}$		
	Market Value of Equity to Book Value to Total Liabilities	$\frac{\text{Outstanding Shares x Current Share Price}}{\text{Total Liabilities}}$		
	Sales to Total Assets	$\frac{\text{Sales}}{\text{Total Assets}}$		

Source: Data processed by researchers, 2016

Table 3.2 Rating Criteria Altman Model Z-score (Z)

Z	Condition	Source
Z > 2.99	Not Potential to Go Bankrupt	Meita (2015:9)
1.81 – 2.99	Grey Area	
Z < 1.81	Bankrupt Potential	

Source: Data processed by researchers, 2016

Tabel 3.3 Variables and Indicators of the Altman Z-score Model

Variabel	Indikator	Formula	Source	Scale
Gordon L.V Springate	Working Capital to Total Assets	$\frac{\text{Current Assets} - \text{Current Liabilities}}{\text{Total Assets}}$	Putro (2013:6)	Interval
	Earning Before Interest and Tax to Total Assets	$\frac{\text{Earning Before Interest and Tax}}{\text{Total Assets}}$		
	Earnings Before Taxes to Current Liabilities	$\frac{\text{EBT}}{\text{Current Liabilities}}$		
	Sales to Total Assets	$\frac{\text{Sales}}{\text{Total Assets}}$		

Source: Data processed by researchers, 2016

Tabel 3.4 Springate Model Assessment Criteria (S)

S	Condition	Source
S > 0.862	Not Potential to Go Bankrupt	Purnajaya dan Merkusiwati (2015:5)
S < 0.862	Bankrupt Potential	

Source: Data processed by researchers, 2016

Data Analysis

The data analysis method in the financial statements is used to measure, find out and describe the condition of the possibility of transportation or not going bankrupt in the company under study, namely the mining sector listed on the Indonesia Stock Exchange 2011-2015. All financial data obtained through the BEI official website and the company's website processed using the Altman Z-score and Springate potential bankruptcy calculation method to find the difference between the two bankruptcy methods. Different test was done using Paired Samples T-Test to find out whether there are differences in potential bankruptcy between the two bankruptcy models in this study.

Sugiyono (2015: 245) Paired samples t-test
is a method used to test the comparative hypothesis of two paired samples with interval or ratio scale data. In this study, researchers compare how company conditions are based on calculations with the Altman Z-score model and the Springate model. Data paired up because researchers compared using 15 coal companies, each company needed 5 years of annual reports to be examined, each company examined its calculation results, with the Altman Z-score model and the Springate model. The scale used is the interval, where researchers determine the condition of the company based on cut-offs based on the results of calculations with the Altman Z-score model and the Springate model.

The researcher chose a significance level of 0.05. Doughlas, et al (2014: 263) Probability of 0.05 is that the true null hypothesis is rejected. The null hypothesis is rejected if the value of paired samples t-test is less than or equal to the level of significance used. Paired samples t-test testing was performed using the IBM SPSS 20 program to obtain degrees of freedom and the significance value of paired samples t-test as a measure in determining answers to hypotheses.

RESULT AND DISCUSSSION

Hypothesis Testing

Based on a predetermined hypothesis, the authors conducted a hypothesis test using a different test. The results of calculations on the two models were tested with different test paired samples t-test with the IBM SPSS 20 program showed that there were differences in the calculation of potential bankruptcy with the Altman Z-score model and the Springate model.

Table 4.1 Results of Paired Sample T-Test

Paired Samples T-Test	Sig. (2-tailed)
Altman-Springate	.000

Source: Data processed by researchers, 2016

Where the different test results have a significance value of 0,000, the number is lower than 0.05, meaning H_0 is rejected and H_1 is accepted, meaning there is a

difference in potential bankruptcy with the Altman Z-score model and Springate model on coal companies listed on the Indonesia Stock Exchange in 2011-2015 .

The difference is caused by the existence of several different ratios in the two models, among others, retained earnings to total assets and market value of equity to total liabilities in the Altman model, as well as the ratio of EBT to current liabilities in the Springate model. In the companies studied in this study, the length of the business standing affects the score that appears mainly in the Altman model, where the company with a longer standing age has a greater nominal retained earnings, the retained earnings also shows cumulative profit or loss that the company has so far. While the company's market value of equity does not depend on the age of the company, where companies with high share prices and the number of circulating stock volumes cause the nominal market value of equity to total liabilities to increase, this indicates that the company is able to fund total liabilities from its own capital obtained through sales stock.

The EBT to current liabilities ratio is a ratio in the Springate model that is not found in the Altman model, according to Ben (2015: 3) this ratio is useful for companies to find out how much profit has been deducted by interest expense to be able to pay off existing debt. Companies need to know the earning conditions before the tax deduction whether it is sufficient to finance the current liabilities owned by the company, according to a bppk.kemenkeu.go.id source, the coal mining business contains tax obligations from the initial stage to being traded, namely at the stage of general investigation, exploration, study the feasibility, construction, exploitation and reclamation of the stages of the company has a tax obligation, but if these stages are carried out by other parties, then it has no effect on the company. Besides the taxes borne by the company also are the Land and Building Tax (PBB) in the mineral and coal mining sector, the Land and Building Tax Object which is divided into two namely the surface of the earth which includes land, waters, inland and or offshore linkages, and the body of the earth which is below the surface of the earth, then there are additional tax obligations for central and regional governments, and IUP and IUPK, where the permit holder is obliged to pay state revenues and regional revenues. Therefore companies need to know how much revenue can be generated from the current liabilities they have.

Based on the author's calculations and observations, the coal company cannot be seen only by the nominal arising from the ratio calculation results. That is because in this study companies with high sales, classified as unhealthy companies. This is because companies with high sales in this study, have lower share prices, interest costs due to debt borne by the company is greater, and company investment to expand is also greater, so the EBIT and EBT value of the company when compared to companies with Altman Z-score other scores, companies with the highest sales classified as having a small score even including the category of unhealthy or bankrupt.

The Most Suitable Bankruptcy Model

The data in this study are secondary data, namely annual reports from coal companies listed on the Indonesia Stock Exchange in 2011-2015. This section will review the results of the Altman Z-score and Springate models. Scores that appear from the calculation results are then categorized based on the cut-off of each model. After calculating 75 times based on the number of companies that is 15 and counted five times in accordance with the observation period, the authors found that the results of calculations with the Altman

Z-score and Springate models are as follows:

Table 4.2 Calculation Results Based on Cut-offs

	Bankrupt	Not Bankrupt	Grey Area
Altman Z-*score*	36 Companies	29 Companies	10 Companies
Springate	33 Companies	42 Companies	

Source: Data processed by researchers, 2016

Based on calculations and analysis by the author, the decline in coal companies occurs because this business line requires large capital so that large debts are needed in the hope of large returns, because debt is operational funding of this business, so that debt that exceeds the total assets of the company can cause the company to own the ratio of working capital to total assets in nominal terms is small and even negative. This is in line with the theory of the Altman Z-score model in Li's research (2014: 7) which states that the Altman Z-score theory is related to credit risk, Altman studies corporate credit risk and develops the theory into variables in his research model that are used as bankruptcy model calculations. Coal companies have a lot of debt for their operations. Based on this study chose Altman as a bankruptcy model that is suitable for coal companies, and in line with the research of Meita (2015: 8) and Ghodrati (2012: 65) where the Altman bankruptcy model is a bankruptcy model that is able to predict the condition of the company.

The author chose the Altman Z-score model and not the Springate model which quantitatively shows more companies going bankrupt, because the Altman Z-score model views companies from various sides that are not contained in the Springate model, namely retained earnings to total assets and market value of equity to total liabilities, the Altman Z-score model is equipped with an EBIT to total assets ratio, which can be seen that the interest expense and taxes borne by the company that have not been deducted from revenue can reflect the condition of the company with the amount of debt, because debt is related to interest.

Based on research by Prihartini (2013: 422) the Springate model itself is a bankruptcy model by following the Altman model procedure, the Springate model shows more bankrupt companies and the ratio contained in the Springate model is more to those accepted by companies namely EBIT and EBT, while judged by the condition of coal companies in terms of the volume of sales there was an increase, but financially continued to decline due to falling prices, so that coal companies could not be valued in terms of earnings. The Altman model produces results that are consistent with the facts contained in the company's annual report, this is in agreement with previous research by Savitri (2015: 2) which states the Altman model is the most effective model with a high degree of accuracy in measuring the potential for bankruptcy.

CONCLUSION

Conclusions

Based on the results of the study, conclusions can be drawn to answer the problem formulation, namely:

Based on the results of hypothesis

testing with different paired samples t-test shows that there are differences in potential bankruptcy using the Altman Z-score calculation model and the Springate model, where it is evidenced at a significance value of 0,000, the value is smaller than the significance level of 0.05. Thus causing H_0 to be rejected and H_1 to be accepted, which means that there are differences in the two Altman Z-score bankruptcy models and the Springate model.

The results of the author's calculations and observations, the most suitable bankruptcy model for coal companies listed on the Indonesia Stock Exchange in the period 2011-2015 based on this study is the Altman Z-score model. This is because the Altman Z-score model can assess the condition of coal companies more equitably, taking into account the number of outstanding shares, stock prices, and company profit balances. Unlike the Springate model which sees from the earning side, while the companies in this study have fluctuating prices, so that even though coal sales volume is high, bankruptcy scores are not high. This cannot be used as a benchmark in assessing the condition of coal companies.

Suggestions

Based on the research conducted and the conclusions of this study, the authors provide the following suggestions:

For further researchers to calculate the potential for bankruptcy with other models and take samples from other industries so that this research is more varied and growing.

For related companies to consider what debt they have is in accordance with the weight of income and current assets owned, because current assets are assets that are fast liquid so that when things happen that are not expected, the company has liquid funds that come from current assets to fund the needs that must be covered up.

For investors to pay attention to company conditions or practice bankruptcy model calculations before investing.

For the community to be able to add insight before buying shares of a coal company and / or to know the company's going concern.

Research Limitations

The researcher realizes that in this study has limitations, namely in determining the potential bankruptcy model decisions that are most suitable for coal companies listed on the Indonesia Stock Exchange in 2011-2015. Where the Springate model displays more company results with bankrupt conditions, on the other hand the authors see real conditions of the company in order to determine the most appropriate and or close to factual model and fair to the company, so the authors make decisions based on facts and information obtained from the annual report, the Altman Z-score model is a suitable bankruptcy model for listed coal companies on the Indonesia Stock Exchange in 2011 - 2015.

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