Bankruptcy Prediction Using The Atlman Z-Score Modification Method In Mining Sector Companies For The 2018-2022 Period

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Abstract. In this study, the aim was to explore the tendency for company bankruptcy in the mining sector in Indonesia in the 2018-2022 period on the Indonesia Stock Exchange using the Altman Z-Score model. The research sample was taken from financial reports that were routinely published during that period. The results show that the Altman Z-Score model can identify the tendency of bankruptcy in the mining company sector on the Indonesia Stock Exchange. The results of the research analysis show that the three mining sector companies that were tested and registered on the IDX in the 2018-2022 period had an average value of Z≥ 2.9, which is 1,205, which indicates a bankrupt financial state. However, these companies still need to continue to improve their performance in order to gain profits in order to avoid the risk of bankruptcy.

Keywords: altman; bankruptcy; industry; mining; healthy; Z score analysis

A. INTRODUCTION

At this time there are many technological advances and are marked by the many companies that stand in various industries. This raises a lot of competition in other industrial companies. In a very dynamic business environment, the sustainability of the company is very important. One of the risks that can threaten the sustainability of the company is the risk of bankruptcy. Corporate bankruptcy can have serious financial and economic impacts, both for company owners, stakeholders and the economy as a whole.

In an effort to prevent bankruptcy risk, many studies have been conducted to develop predictive models and methods that can assist in identifying companies that are at risk of bankruptcy in the future. One of the popular and widely used methods in this research is the Altman Z-Score method. Modification. This method was developed by Professor Edward Altman in the 1980s and has undergone modifications so that it can be applied to certain industrial sectors more accurately and effectively.

This research focuses on the basic material sector, which is an important sector in the economy. The basic material sector includes raw material processing industries such

as metals, chemicals and mining. Due to the unique characteristics of this sector, the prediction of corporate bankruptcy in the basic material sector requires a more in-depth and specific approach.

The purpose of this study is to test and apply the Modified Altman Z-Score method in predicting the bankruptcy of basic material sector companies from 2015 to 2022. In this study, we will collect company financial data that includes financial ratios such as liquidity, solvency, profitability, and company stability.

Through this research, it is hoped that a bankruptcy prediction model will be found that can provide an accurate and more timely assessment of the risk of bankruptcy for companies in the basic material sector. This discovery can provide benefits for both company owners, investors and the government in making better decisions in the regulation, management and supervision of basic material sector companies. In addition, this research can also provide new insights and contributions in research in the field of company bankruptcy prediction

B. LITERATURE REVIEW

1. Bankruptcy

Bankruptcy is a condition in which a company is unable to meet its financial obligations and is unable to pay its debts to creditors. Bankruptcy can be caused by various factors, such as poor management, low income and sales, inability to adapt to market changes, high debt burden, and a bad economic situation.

According to (Abdul Kadim and Nardi Sunardi, 2018), corporate bankruptcy is a phenomenon that often occurs in the business world, both influenced by internal and external parties of the company.

Financial experts Bris, Gürtler, and Schumann (2012) in their research concluded that accounting aspects, such as liquidity, profitability and solvency, play an important role in identifying bankruptcy risk. They show that companies with poor financial ratios have a higher chance of bankruptcy. Bankruptcy is a condition in which a company is unable to meet its financial obligations and is unable to pay its debts to creditors.

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2. Z-Score Ratio

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Altman (1968), developer of the modified Altman Z-Score method, shows that financial ratios can be used as early indicators that are useful for predicting bankruptcy.

The Altman Z-Score method has become one of the most popular and widely used methods in financial analysis to predict corporate bankruptcy.

In addition, other studies by Shumway (2001) and Ohlson (1980) also emphasize the importance of financial ratios in predicting bankruptcy. Shumway argues that financial ratios that describe a company's liquidity, profitability, and stability can provide a strong initial signal of bankruptcy risk. Ohlson also shows the importance of financial ratios in bankruptcy prediction analysis and proposes an O-Score model that uses the profit ratio as the main indicator.

In line with that, many other studies have been conducted to support the importance of financial ratio analysis in predicting bankruptcy, both in the context of the basic material sector and other sectors. In the context of this study, the purpose of applying the Modified Altman Z-Score method is to improve accuracy and effectiveness in predicting bankruptcy of basic material sector companies from 2015 to 2022. It is hoped that by using this method, company management and other stakeholders can take timely preventive or restructuring actions to avoid bankruptcy and maintain corporate sustainability. [17.04, 4/7/2023] Nana: The Altman Z-Score method proposed by Edward Altman to predict corporate bankruptcy.

The method was carried out using multiple discriminant analysis or a combination of the Altman Z-Score which has undergone 3 changes, namely the First Altman Z-Score model (1968) can be carried out only in open manufacturing companies, then the Revised Altman Z-Score (1983) is a development of the previous formula so that can be used in manufacturing companies both in the form of going public and

private sector, and the last change, namely the Altman Z-Score Modification (1995) is used by various types of industries that are both public and private.

The formula of the Modified Altman Z-Score is :

$$Z = 0.717X1 + 0.847X2 + 3.107X3 + 0.42X4 + 0.988X5$$

Description=
Z = Bankruptcy Index
X1 = Working Capital / Total Asset
X2 = Retained Earning / Total Asset
X3 = Earning Before Interest and Tax / Total Asset
X4 = Market Value of Equity / Total Debt
X5 = Sales / Total Assets.

a. Working Capital to Total Assets The ratio is used to determine the ability of all assets to obtain working capital, namely the difference between current assets and current liabilities.
b. Retained Earnings on Total Assets This ratio is used to determine the ability of all company assets to generate profits that are not distributed to owners.
c. Earnings Before Interest and Tax on Total Assets This ratio is used to determine the ability of all company assets to generate profit before deducting interest expenses and taxes.
d. Book Value of Equity to Book Value of Debt This ratio is useful for knowing the company's equity can meet the obligations that must be repaid by the company.

Analyse each research sample according to Altman's bankruptcy criteria as follows :

Num	Z-Score Altman	Predicate
1	Zi > 2,99	Healthy
2	Zi diantara 1,81 – 2,99	Bankruptcy-prone (Grey Area/Zone of Ignorance)
3	Zi < 1,81	Bankrupt

C. RESEARCH METHODOLOGY

1. Research Method

The research method was carried out using a descriptive method with a quantitative approach. Descriptive research according to Indriantoro and Supomo (2010) is research that uses certain phenomena obtained from subjects with the aim of explaining aspects relevant to the phenomenon being observed, while the quantitative method according to Sugiyono (2018) is a method for research with a positivism philosophy, and functions to research objects which has been determined by data analysis that is quantitative or statistical in nature. So that quantitative descriptive data is a method used to explain the phenomenon being observed using quantitative analysis. Research data is in the form of secondary data, namely the data obtained is not given directly to researchers (Sugiyono, 2018). The research subject is the Basic Material Sector. The object of research is the annual financial report of the Basic Material Sector for 2018 – 2022. The source of research data is the financial reports of the Basic Material Sector) which have been published and taken from the company's official website. The data analysis tool used is the Microsoft Excel application. Exchange in the period 2018-2022. The research sample consists of:
a. PT Aneka Tambang Tbk (ANTM)
b. PT Archi Indonesia Tbk (ARCI)

Variable identification is as follows:
a. X1 = Ratio of working capital to total assets
b. (current assets - current liabilities) ÷ total assets
c. X2 = Retained earnings to total assets rationretained earnings ÷ total assets
d. X3 = Ratio of earnings before interest and tax to total assets EBIT ÷ total assetse.
e. X4 = Ratio of market value of capital to total debt (number of shares * share price) ÷ total debt
f. X5 = Ratio of sales to total assets sales ÷ total assets

2. Research Method

The In this study, a quantitative data analysis method was used, which involves the use of numerical calculations from financial statements such as balance sheets, profit and loss, and sales. The purpose of this analysis is to provide a basis that can be used in decision making. The following are the analysis techniques used in this study:
 a. Calculate several financial ratios of companies contained in the research sample.
 b. The results of the calculation of financial ratios are then analysed using the formula developed by Altman :

$$Z = 0.717X1 + 0.847X2 + 3.107X3 + 0.42X4 + 0.988X5$$

Description=
Z = Bankruptcy Index
X1 = Working Capital / Total Asset
X2 = Retained Earning / Total Asset
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c. Analyse each research sample according to Altman's bankruptcy criteria as follows:

Num	Z-Score Altman	Predicate
1	$Z_i > 2{,}99$	Healthy
2	Z_i diantara $1{,}81 - 2{,}99$	Bankruptcy-prone (Grey Area/Zone of Ignorance)
3	$Z_i < 1{,}81$	Bankrupt

D. RESULTS AND DISCUSSION

1. **Calculation of Altman Z – Score analysis**
a. **PT. ANEKA TAMBANG TBK**

in In table 1.1 this is the result of calculating the Z-Score value of the company PT. Aneka Tambang Periode 2018 to 2022 :
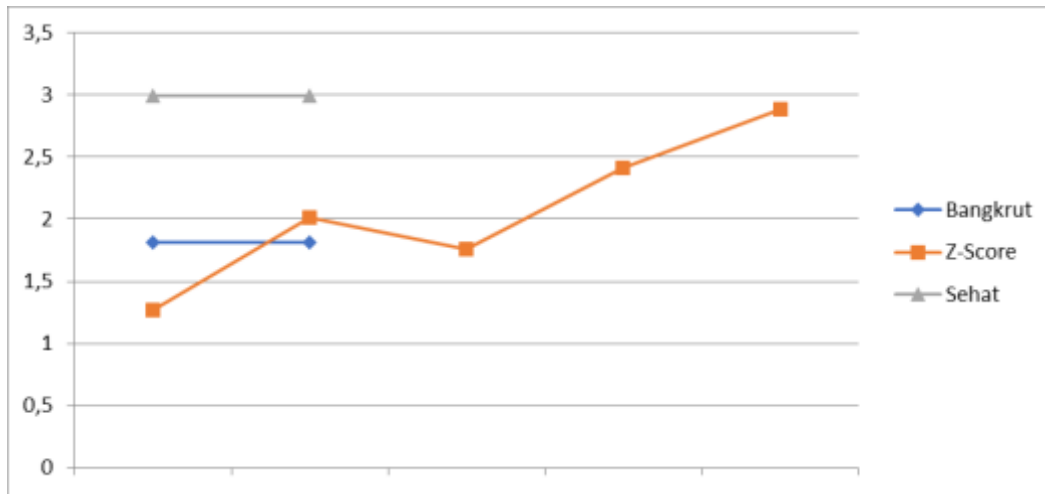
Table 1.1

Nilai Z Score PT. Aneka Tambang Tbk.

Periode 2018 to 2022

PT ANEKA TAMBANG TBK							
Priode	Nilai Z Score					Zi	Predikat
	X1	X2	X3	X4	X5		
2.018	0,090	0,044	0,104	0,0014	0,758	1,273	Bangkrut
2.019	0,079	0,246	0,147	0,0017	1,084	2,009	Rawan Bangkrut
2.020	0,050	0,262	0,141	0,0037	0,863	1,757	Bangkrut
2.021	0,157	0,297	0,193	0,0045	1,168	2,413	Rawan Bangkrut
2.022	0,155	0,376	0,244	0,0048	1,365	2,887	Rawan Bangkrut
RATA-RATA	0,106	0,245	0,166	0,003	1,048	2,068	Rawan Bangkrut

Source: Data processed by the author (2023)
:

From Table 1.1, the results obtained for 5 years at the company PT. Aneka Tambang Tbk. Shows that the condition of the company is prone to bankruptcy. Table 1.1 shows that the average Zi value is 2.068 which is > 2.90. The following figure 1.1 shows the PT chart. Aneka Tambang Tb for the period 2018 – 2022, which was obtained from the calculation results in Table 1.1 above.

Picture 1.1
Z-Score Valute PT. Aneka Tambang Tbk

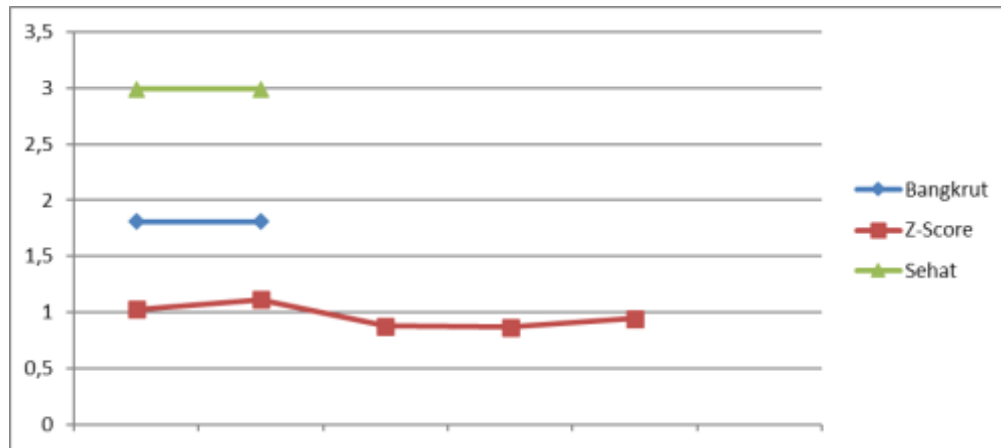## b. PT. SEMEN BATURAJA TBK

In table 1.1 this is the result of calculating the Z-Score value of the company PT. Semen Batubara Periode 2018 to 2022:

Tabel 1.2
Nilai Z Score PT. Semen Baturaja tbk.
Periode 2018 -2022

PT. SEMEN BATURAJA TBK							
Periode	Nilai Z Score					Zi	Predikat
	X1	X2	X3	X4	X5		
2.018	0,130	0,060	0,128	0,008	0,360	1,026	Bangkrut
2.019	0,108	0,076	0,157	0,002	0,359	1,115	Bangkrut
2.020	0,049	0,074	0,126	0,005	0,300	0,879	Bangkrut
2.021	0,094	- 0,044	0,147	0,003	0,332	0,870	Bangkrut
2.022	0,081	- 0,036	0,162	0,002	0,361	0,943	Bangkrut
RATA-RATA	0,092	0,026	0,144	0,004	0,343	0,967	Bangkrut

Source: Data processed by the author (2023)

From Table 1.1, the results obtained for 5 years at the company PT. Semen Baturaja Tbk. Indicates that the condition of the company is bankrupt. Table 1.1 shows that the average Zi value is 0.697 which is > 2.90. The following figure 1.1 shows the PT chart. Semen Baturaja Tb for the period 2018 – 2022, which was obtained from the calculation results in Table 1.1 above.

Picture 1.1
Z-Score Value PT. Semen Tambang Tbk

2. Analysis of Altman's Z Score for Predicting Bankruptcy in the Mining Industry at PT BEI in 2018 to 2022

In table 1.1 this is the result of calculating the Z-Score value of the company PT. Aneka Tambang Tbk. period 2018 to 2022.

Tabel 2.1
Bankruptcy in Material Companies in Indonesia.
Periode 2018 to 2022

Nama Industri Healthcare	Analisa Altman Z-Score					Zi	Predikat
	2018	2019	2020	2021	2022		
PT ANEKA TAMBANG TBK	0,106	0,245	0,166	0,003	0,422	1,442	Rawan Bangkrut
PT. SEMEN BATURAJA TBK	0,092	0,026	0,144	0,004	0,343	0,967	Bangkrut
Tingkat Kebangkrutan Bank Pemerintah (BUMN)						1,205	Rawan Bangkrut

Source: Data processed by the author (2023)

Table 2 shows the results for 5 years for the company. The calculation of the average above with a Z-Score of 5,834 shows that the mining company sector in Indonesia is in Bankruptcy. With the Altman Z-Score method, the higher the Z score, the better the company's financial condition.

Keep in mind that in previous research, it has been determined that companies with a Z-Score ≥ 2.90 can be considered in good health. However, these limits may vary depending on the particular context and industry. Therefore, it is important to refer to the relevant boundaries for companies in the mining sector.

E. CONCLUSIONS AND SUGGESTIONS

1. CONCLUSION

The use of the Altman Z-Score method with this analysis shows that the Mining company sector listed on the Indonesia Stock Exchange (IDX) in 2018-2022 is predicted to have the potential for bankruptcy. The average value of the Z-Score is less than 2.90, namely 1.205, indicating that the company is in a financial condition that will experience bankruptcy. A higher Z-Score value indicates that you are in a good financial position and can obtain optimal profits. So that from the description above, it can be concluded that healthcare companies on the IDX in that period had adequate capabilities to meet their financial obligations and were not at risk of bankruptcy.

However, this conclusion is based on assumptions and the use of research data. The use of the method in the Z-Score analysis only provides potential predictions about the company's financial condition and does not guarantee certainty. Therefore, it is important to view the results of this analysis as one of several considerations for a wider investment or finance

2. SUGGESTIONS

Companies that are categorized as healthy must still be careful and alert to the risk of bankruptcy in the next period. Even if the company is in good shape today, economic and industry conditions can change, and company internal and external factors can also have an impact. Therefore, healthy companies need to continuously monitor and analyze the factors that affect their performance on a regular basis, as well as minimize future bankruptcy.

In addition to increasing sales, companies must also pay attention to other aspects such as effective financial management, good debt management, operational efficiency, appropriate marketing strategies, and product or market diversification. Developing sustainable strategies and taking proactive actions in dealing with changing business environments can help companies reduce bankruptcy risk and maintain their financial health.

In addition, it is important for the company to have a good monitoring and reporting system, and engage a financial expert or professional consultant to provide proper guidance and advice. By combining internal and external factor analysis, companies can reduce bankruptcy risks and ensure successful business continuity

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