ANALYSIS OF BANKRUPTCY PREDICTION WITH ALTMAN Z-SCORE AND ZMIJEWSKI X-SCORE MODEL IN COAL MINING INDUSTRY LISTED IN INDONESIA STOCK EXCHANGE 2015-2017 PERIOD

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ABSTRACT

This study aims to analyze the level of bankruptcy of PT Atlas Resources, Tbk companies listed on the Indonesia Stock Exchange in the period 2015-2017. The data used in this study are audited financial statements that are on the Indonesia Stock Exchange website. The analytical methods used are the Altman Z-Score and Zmijewski X-Score models. The test results show that from 2015 to 2017 the company PT Atlas Resources, Tbk experienced a decline in financial performance, where every year PT Atlas Resources, Tbk entered into the category of "distress" in the Altman Z-Score and Zmijewski X-Score models. This shows that PT Atlas Resources, Tbk has the potential to experience bankruptcy and indicates that PT Atlas Resources, Tbk is not the right choice for investors to invest their shares.

Key words: Altman Z-Score, Zmijewski X-Score, The rate of bankruptcy, Bankruptcy Prediction

INTRODUCTION

Indonesia as a country with abundant natural resources provides opportunities for various industries to be able to manage and utilize natural resources well. Some industries that manage and utilize natural resources are the mining industry. Coal has a strategic role in the national economy, namely as state revenues in the State Budget (APBN), and other strategic roles as raw materials for the industrial sector. However, the global crisis is getting acute, companies in the mining and plantation sectors are most affected.

The crisis regarding sustainable mining accompanied by declining coal prices, falling export figures has forced some coal mining companies to close. The ups and downs of coal prices are the most important thing in the coal business. When prices rise, it will be a happy moment for coal business people. And vice versa, if prices go down, the coal business becomes sluggish and lackluster (Jalil, 2015).

Figure 1. Indonesian Coal Price Reference in 2014-2017
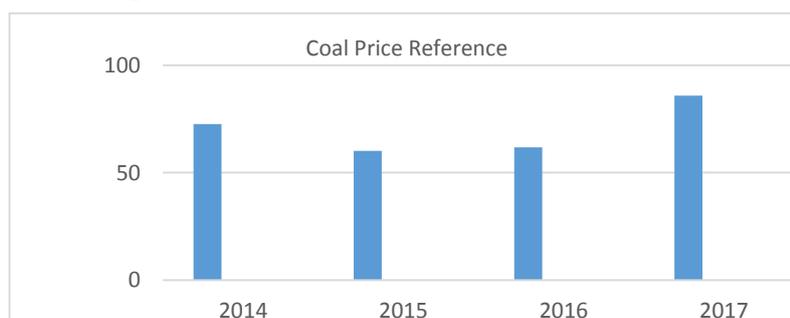
Sources: Ministry of Energy and Mineral Resources (2018)

In 2009 until the beginning of 2011, global coal prices rebounded sharply. The decline in global economic activity has reduced coal demand, leading to a sharp decline in coal prices from the beginning of 2011 to the middle of 2016 (Indonesia Investments, 2018). In the 2014-2017 period, the average Coal Price Reference experienced a fluctuating trend, seen in 2014, Coal Price Reference was at an average price of $ 72.6 per ton and in the following year it decreased by $ 60.1 per ton. In 2016, there was a slight increase of $ 61.8 per ton. The average of Coal Price Reference then rises again in 2017 to reach $ 85.9 per ton.

The bankruptcy of the coal industry in Indonesia has been seen since 2011, that is, since the decline in prices of prices, selling coal commodities which have fallen sharply and accompanied by continued significant increases in production costs. Phenomenon that occurs in the world Coal Industry both exploration, exploitation, trade and others, since 2011 until now has experienced heavy pressure. Some companies have closed down, because they are unable to finance operating expenses that have increased significantly, and world coal prices since 2011 have not yet improved, even tending to decline (Salim, 2016).

The deepest correction occurred in 2015. Large issuers were also hit. In fact, not a few coal issuers are experiencing net losses. In 2017, in line with the trend of rising coal prices, the financial performance of coal issuers slowly began to pick up. However, there are also those who still suffer losses. Improvement in world coal prices is a pillar of the performance of coal companies rather than a factor in the increase in sales volume (Kasmir, 2015), (Nainggolan, 2017).

According to Toto (in Susanti, 2016) bankruptcy is a condition where the company is no longer able to pay off its obligations. This condition usually does not just appear in the company, there are initial indications of the company which usually can be recognized earlier if the financial statements are analyzed more carefully in a certain way. The financial ratio can be used as an indication of bankruptcy in the company. Bankruptcy is a very essential problem that companies must watch out for, because if the company has been bankrupt, then the company is really experiencing a business failure. One of the ways in which companies generally detect and minimize the occurrence of financial distress is by monitoring financial performance by using financial statement analysis (Soelton *et al*, 2018), (Suryawardani, 2015).

According to (Ben, 2015), the factors causing bankruptcy are divided into two factors, namely, external factors (economic conditions, political conditions, and natural disasters) and internal factors (company performance, company policy, and corporate culture). Mentioned in (Syafitri and Wijaya, 2014), basically the purpose of establishing a company is to maximize the company and the prosperity of the owner of the company. Therefore, management must be able to produce optimal profits and careful control of operational activities, especially those related to corporate finance. If the company experiences bankruptcy, it is necessary to analyze the financial statements to determine the financial situation that occurs in the company.

So far a study on prediction of bankruptcy and delisting the company has been done a lot. However, only a few studies have attempted to predict financial distress of a company with the right bankruptcy models. The prediction of financial distress should be done first before bankruptcy prediction. Basically, every model has both some advantages and disadvantages. In more specific circumstances, a certain model can be said to be right, but in other circumstances the model may not be suitable (Husein and Pambekti, 2014)

One of the companies affected by various problems from the coal mining sector is PT. Atlas Resources Tbk. PT Atlas Resources Tbk is one of the coal producers in Indonesia. PT Atlas Resources Tbk has been listed on the Indonesia Stock Exchange. Every company that has been listed on the Indonesia Stock Exchange will certainly maximize the profits of its company. PT Atlas Resources Tbk is not like a company that is generally listed on the Indonesia Stock Exchange. This is because in the past three years there have continued to experience negative losses or profits even occurred in the previous 6 years also suffered losses shown in Table. 1 of the following:

Table 1. PT Atlas Resources Tbk Profit and Loss for the 2015-2017 Period

Year	2015	2016	2017
Income	28.342	11.641	28.731
Expenses	53.705	37.367	45.448
Profit/Loss	-25.363	-25.726	-16.717

Based on the data above, it can be seen that the total income has changed from year to year. In 2015 PT Atlas Resources Tbk amounted to 28,342, then dropped in 2016 to 11,641 and in 2017 it rose again to 28,731. The total burden in 2015 was 53,705 and in 2016 the total cost decreased to 37,367 then in 2017 it rose again to 45,448 which resulted in the company experiencing losses over the past three years. In 2015 the company's losses amounted to 25,363, then in 2016 the company's losses increased to 25,736 and in 2017 it fell back to 16,717.

One of the tools used by companies to assess the condition of the company is the financial statements produced each period. In order for companies to know more clearly the current condition of the company, the company can compare the current financial statements with the financial statements of the previous period (Kadim and Sunardi, 2018). Some models of bankruptcy that are proven to provide many benefits are Altman (Z-Score) and Zmijewski (X-Score) models.

The ability of Zmijewski and Altman's analytical model in providing early warnings of company failures is a useful tool in the present and in the future. Analysis to predict corporate bankruptcy needs to be done because the results of the analysis are very useful for various parties, namely: guarantee providers, investors, governments, accountants and management. Researches related to financial distress conditions of companies generally use company financial ratios (Wijono and Endang, 2014).

Various studies have been conducted to examine the benefits that can be drawn from financial ratio analysis Edward I Altman at New York University, is one of the early researchers who examined the use of financial ratio analysis as a tool to predict corporate bankruptcy. The results of research conducted by Altman produced a formula called Z-Score (Armani and Pangesti, 2018). Research on financial distress analysis has been carried out. As research conducted by Susanti (2016) in his research, the analytical methods used include Altman Z-Score Modification and Zmijewski X-Score to predict bankruptcy in the cement industry where the results of 1 out of 3 cement companies are claimed to potentially experience bankruptcy.

Suryawardani (2015) in his study analyzed the prediction of the textile industry's bankruptcy for the period 2008-2012 with several methods, namely Altman Z-Score Modification and Zmijewski X-Score. The result of 5 companies in 2008-2012, 3 companies are predicted to experience bankruptcy either with the Z-Score or X-Score methods. Mardaconsita and Soelton (2019) analyzed the bankruptcy rate of the plantation company using Altman Z-Score model in the period of 2014 until 2017 shows that the company potentally experiencing bankruptcy so that it can be concluded that the financial condition of the plantation company is experiencing financial distress.

Based on this phenomenon, researchers are interested in using the Altman Z-Score and Zmijewski X-Score analysis to predict and measure the level of bankruptcy of PT Atlas Resources Tbk. Based on the background above, researchers propose the following problem:

1. What is the prediction of the bankruptcy of the Modified Altman Z-Score model at PT Atlas Resources, Tbk for the 2015-2017 period?
2. What is the prediction of the Zmijewski X-Score model bankruptcy rate at PT Atlas Resources, Tbk for the 2015-2017 period?

LITERATURE REVIEW

A. Financial Distress

According to Platt and Platt in Kusanti (2015) financial distress is defined as the stage of decreasing the company's financial condition that occurs before bankruptcy or liquidation occurs. And according to Emery and Finnerty in Satriana (2013) the company is said to experience financial distress, which is when the company does not have the ability to meet the repayment schedule of debt to creditors at maturity.

B. Altman Z-Score Method

Altman's bankruptcy model analysis (1968) uses the Multiple Discriminant Analysis method with five types of financial ratios, namely Working Capital To Total Assets, Retained Earning To Total Assets, Earning Before Interest And Taxes To Total Assets, Market Value Of Equity To Book Value Of Total Debts, and Sales To Total Asset.

The model developed by Altman underwent a revision. The revision made by Altman is an adjustment made so that the bankruptcy prediction model is not only for manufacturing companies that go public but also can be applied to companies in the private sector (Hariyani and Sujianto, 2017). The formula used is:

$$\text{Z-Score} = 6.56 \, (X1) + 3.26 \, (X2) + 6.72 \, (X3) + 1.05 \, (X4)$$

Where:
X1 = Working Capital to Total Asset
X2 = Retained Earnings to Total Assets
X3 = Earnings Before Interest & Taxes to Total Assets
X4 = Book Value of Equity to Book Value of Debt

The following is the description of each financial ratio contained in the Altman Z-Score method:

Working Capital to Total Assets (X1)
The ratio of working capital to total assets presents additional information about the company's liquidity, because this ratio indicates the percentage of the company's total assets used as the company's net capital. High ratio values indicate strong liquidity conditions (Baker and Powell, 2005).

Retained Earning to Total Assets (X2)
Retained earnings to total assets ratio calculates the level of profitability of the company. Retained earnings or commonly called retained earnings are accounts that inform the total income / losses from investments made by the company. This account also indicates the balance of profits obtained. The company's profits affect this ratio because the longer the company operates it allows to facilitate the accumulation of retained earnings (Bell et al., 2013).

Earnings Ratio Before Interest and Tax to Total Assets (X3)
The earning before interest and tax to total assets ratio or also called basic earnings power reflects the effectiveness and efficiency of managing all investments that have been made by the company. The higher this ratio means the more effective and efficient management of all assets owned by the company to generate profits before interest and taxes (Sudana, 2011).

Ratio of Book Value of Equity to Book Value of Debt (X4)
The ratio used to measure the extent to which a company's assets are financed by debt. This means how much the debt burden borne by the company compared to its assets. In a broad sense it is said that this ratio is used to measure a company's ability to pay all its obligations, both short and long term if the company is dissolved or liquidated (Endri, 2009).

The final results in the form of Z-Score from each company will be grouped according to the critical value standards set by Altman, namely (Cahyono, 2013):

a) If the value of Z-Score is greater than 2.60, the company goes into safe zone, which is the area where the company is said to be healthy or not bankrupt.

b) If the value of Z-Score between 1.1 - 2.60 is included in the gray zone, which means the company is in a gray area, where the company can potentially the company not go bankrupt or go bankrupt.

c) If the value of Z-Score is smaller than 1.1, it means the company goes into the distress zone, where the company is not healthy or has the potential to experience bankruptcy.

C. Zmijewski X-Score Method

The Zmijewski X-Score First model was published by Zmijewski (1984) by conducting research on companies on the American Stock Exchange. Zmijewski's model uses ratio analysis that measures a company's performance, leverage, and liquidity for its prediction model. Zmijewski uses probit analysis applied to 40 bankrupt companies and 800 companies that still survive at that time (Hariyani and Sujianto, 2017). The formula used is:

$$\text{X-Score} = -4,3 -4,5 \ (X1) + 5,7 \ (X2) -0,004 \ (X3)$$

Where:
X1 = Earning After Tax to Total Assets (ROA)
X2 = Total Debt to Total Assets (Debt Ratio)
X3 = Current Assets to Current Liabilities (Current Ratio)
The following is the description of each financial ratio contained in the Zmijewski X-Score method:

Earning After Tax to Total Assets (ROA)
ROA is used to indicate the ability of a company to generate profits using total assets owned. Return On Assets (ROA) shows the company's ability to generate profits from assets used. Return On Assets (ROA) is the most important ratio among existing profitability ratios.

Ratio of Total Debt to Total Assets (Debt Ratio)
Debt ratios are used to measure how much the company's assets are financed by debt or how much the company's debt affects the management of assets.

Current Asset to Current Liabilities (Current Ratio)
The current ratio is used to measure a company's ability to pay short-term liabilities or debts that are immediately due when billed as a whole. In other words, how many current assets are available to cover short-term liabilities that are immediately due. The current ratio can also be said as a form to measure the level of security of a company.

The cut-offs used in this model are:
a) If X > 0 companies falls into the category of distress zone
b) If X < 0 the company falls into the safe zone category

RESEARCH METHODOLOGY

A. Research Design

In this study researchers used descriptive research methods. According to Sugiyono (2014), descriptive research is research conducted for analyze data by describing or describing data that has been collected as it is without intending to make conclusions that apply to or generalize. The type of data used in this study is secondary data. Secondary data is historical data both presented and published by other parties. This type of research is quantitative, which obtains data in the form of numbers. The object used in this research is PT. Atlas Resources, Tbk.

B. Data Sources
The researcher obtained data through the website www.idx.co.id. Sources of data used by researchers are Secondary Data, namely data from the Indonesia Stock Exchange which consists of the company's history, company organizational structure, company financial statements in the form of statements of financial position and income statement for the year 2015, 2016 and 2017 and the Annual Report.

1. **RESULTS AND DISCUSSION**

Results of financial ratio calculations used by Altman Z-Score Modifications

a) Working Capital to Total Asset Ratio (X1)

The following is the Working Capital to Total Asset Ratio (X1) from the Company PT. Atlas Resources, Tbk presented in table 2. The formulas used are as follows:

$$\text{WCTA} = (\text{Current Assets - Current Liabilities}) / (\text{Total Assets})$$

Table 2. Working Capital to Total asset Ratio (X₁) PT Atlas Resources, Tbk

Year	Current Asset	Current Liabiities	Working Capital	Total Asset	X1
2015	40,086	195,545	(155,459)	351,484	-0.442
2016	36,446	205,700	(169,254)	330,115	-0.513
2017	39,409	181,402	(141,993)	327,055	-0.434

Working Capital to Total assets Ratio (X1) of PT Atlas Resources, Tbk in 2015-2017 experienced a negative ratio. The worst occurred in 2016 with an X1 value of -0,513. That is because in 2016 Current Liabilities owned by PT Atlas Resources, Tbk are greater than other years. This shows that the company began to experience difficulties in paying short-term obligations.

b) Retained Earnings to Total Asset Ratio (X2)

The following is Retained Earning to Total Asset Ratio (X2) from PT. Atlas Resources, Tbk presented in table 3. The formulas used are as follows:

$$RETA = (Retained\ Earnings) / (Total\ Assets)$$

Table 3. Retained Earnings to Total Asset Ratio (X₂) PT Atlas Resources, Tbk

Year	Retained earning	Total Asset	X2
2015	64,169	351,484	0.183
2016	88,732	330,115	0.269
2017	104,183	327,055	0.319

Retained earnings to Total assets Ratio (X2) of PT Atlas Resources, Tbk in 2015-2017 experienced a positive upward trend. This can be seen in the increase in the amount of retained earnings from 2015 to 2017. The best occurred in 2017 with an X2 value of 0.319. Because this ratio measures cumulative profitability means that the company is able to achieve profit in operations which increases every year.

c) Earnings Before Interest and Tax to Total assets Ratio (X3)

The following is Earning Before Interest and Tax to Total Assets Ratio (X3) from the Company PT. Atlas Resources, Tbk presented in table 4. The formulas used are as follows:

$$EBITTA = (Profit\ Before\ Interest\ and\ Tax) / (Total\ Assets)$$

Table 4. Earning Before Interest and Tax to Total assets Ratio (X₃)PT Atlas Resources, Tbk

Year	EBIT	Total Asset	X3
2015	(26,503)	351,484	-0.075
2016	(19,738)	330,115	-0.060
2017	(7,136)	327,055	-0.022

EBIT to Total assets Ratio (X3) assesses the effectiveness and efficiency of managing all investments that the company has made. From 2015 to 2017 PT Atlas Resources, Tbk has a negative value ratio (X3) with an upward trend with a ratio of -0.075, -0.060, and -0.022. This indicates that the smaller the value of this ratio is likely the higher the company will experience bankruptcy. This reflects that the management is less able to manage its assets to produce profits before interest and taxes effectively.

d) Book Value of Equity to Book Value of Debt Ratio (X4)

The following is the Book Value of Equity to Book Value of Debt Ratio (X4) from the Company PT. Atlas Resources, Tbk presented in table 5. The formulas used are as follows:

$$BVEBVD = (Book\ Value\ of\ Equity) / (Book\ Value\ of\ Debt)$$

Table 5. Book Value of Equity to Book Value of Debt Ratio (X$_4$) PT Atlas Resources, Tbk

Year	Book Value of equity	Book Value of Debt	X4
2015	81,993	269,491	0.304
2016	56,267	273,848	0.205
2017	39,765	287,290	0.138

PT Atlas Resources, Tbk Value of Debt Ratio (X4) book Value of Debt Ratio (X4) from 2015 to 2017 has a downward trend. The lowest point occurs in 2017 with a score of 0.138. It means that the ability of the company's capital to fulfill all of its obligations is getting smaller. The smaller the value of this ratio, the higher the risk of bankruptcy that will be experienced by the company.

Results of financial ratio calculations used by Zmijewski X-Score

a)   Earning After Tax to Total assets (ROA) (X1)

The following is Earning After Tax to Total assets (ROA) (X1) PT. Atlas Resources, Tbk presented in table 6. The formulas used are as follows:

$$ROA = EAT / (Total\ Assets)$$

Table 6. Earning After Tax to Total assets (ROA) (X$_1$) PT Atlas Resources, Tbk

Year	EAT	Total Asset	ROA (X$_1$)
2015	(25,922)	351,484	-0.073
2016	(25,482)	330,115	-0.077
2017	(16,717)	327,055	-0.051

ROA ratio (Earning After Tax to Total Assets ratio) at PT Atlas Resources, Tbk in all years studied showed a negative ratio and the highest occurred in 2015 with a value of -0.077. This means that the company experiences operational losses every year or negative net income. The smaller the value of this ratio shows the company has a problem with net income.

b)   Total Debt to Total assets (Debt Ratio) (X2)

The following is Total Debt to Total assets (Debt Ratio) (X2) Company PT. Atlas Resources, Tbk presented in table 7. The formulas used are as follows:

$$Debt\ Ratio = (Total\ Liabilities) / (Total\ Assets)$$

Table 7. Total Debt to Total assets (Debt Ratio) (X$_2$) PT Atlas Resources, Tbk

Year	Total Debt	Total Asset	Debt Ratio (X$_2$)
2015	269,491	351,484	0.766
2016	273,848	330,115	0.829
2017	287,290	327,055	0.878

Debt Ratio (Total Debt to Total assets) at PT Atlas Resources, Tbk in all years studied has a high number with an upward trend. The highest is in 2017 with a debt ratio of 0.879. This means that the company's capital structure is dominated by debt in funding its operational activities. The higher the value of this ratio, the higher the debt dominance in the company.

c)   Current Asset to Current Liabilities (Current Ratio) (X3)

The following is Current Asset to Current Liabilities (Current Ratio) (X3) PT. Atlas Resources, Tbk presented in table 8. The formulas used are as follows:

$$Current\ Assets = (Current\ Assets) / (Current\ Liabilities)$$

Table 8 Current Asset to Current Liabilities (Current Ratio) (X_3) PT Atlas Resources, Tbk

Year	Current Asset	Current Liabilities	Current Ratio (X_3)
2015	40,086	195,545	0.20
2016	36,446	205,700	0.18
2017	39,409	181,402	0.22

Current Ratio (Current Asset to Current Liabilities) at PT Atlas Resources, Tbk shows a fluctuating number but not too significant. The lowest occurred in 2016 with a value of 0.18. This means that the company's ability to pay short-term debt that is soon due is low. In addition, the growth of current assets is not too significant. That affects the level of financial security of the company.

Results of Altman Z-Score Modified Model Analysis

The following are the results of analysis of the Altman Z-Score Modified model presented in table 9.

Table 9. Altman Z-Score Modified Analysis Results

Year	K. X_1	X_1	K. X_2	X_2	K. X_3	X_3	K. X_4	X_4	Z-Score	Result
2015	6.56	-0.442	3.26	0.183	6.72	-0.075	1.05	0.304	-2.494	Distress
2016	6.56	-0.513	3.26	0.269	6.72	-0.060	1.05	0.205	-2.673	Distress
2017	6.56	-0.434	3.26	0.319	6.72	-0.022	1.05	0.138	-1.811	Distress

Based on the results of table 9 calculation using the Altman Z-Score Modification formula, PT Atlas Resources, Tbk is predicted to experience bankruptcy in all the years studied. This is indicated by the value of Z-Score < 1.1 for all years studied.

A. Results of Zmijewski X-Score Model Analysis

The following are the result of analysis of the Zmijewski X-Score model presented in table 10.

Table 10.Zmijewski X-Score Analysis Result

Year	K. X_1	X_1	K. X_2	X_2	K. X_3	X_3	X-Score	Result
2015	-4.3 -4.5	-0.073	5.7	0.766	0.004	0.20	0.394	Distress
2016	-4.3 -4.5	-0.077	5.7	0.829	0.004	0.18	0.771	Distress
2017	-4.3 -4.5	-0.051	5.7	0.878	0.004	0.22	0.933	Distress

Based on the results of calculating table 10 using the Zmijewski X-Score formula, PT Atlas Resources, Tbk is predicted to experience bankruptcy in all the years studied. This is indicated by the value of X-Score > 0 for all the years studied.

CONCLUSIONS AND SUGGESTIONS

A. Conclusion

Based on research on the company PT. Atlas Resources Tbk in the period of 2015 to 2017 and from the results of analysis and discussion using two methods of bankruptcy namely Altman Z-Score Modification and Zmijewski X-Score, the conclusions that can be taken are as follows:

a) According to the results obtained using the Modified Altman Z-Score model in the period 2015-2017 PT. Atlas Resources, Tbk has the potential to experience bankruptcy, this is indicated by the value of Z-Score <1.10 each year so that it can be concluded that the financial condition of PT. Atlas Resources, Tbk is experiencing financial distress in the 2015-2017 period.

b) No different from the results obtained using the Zmijewski X-Score model, PT. Atlas Resources, Tbk in the period 2015-2017 has an X-Score> 0 in each year. This means that the financial condition of PT. Atlas Resources, Tbk is experiencing financial distress in the period 2015 - 2017 according to Zmijewski Z-Score.

B. Suggestions
a) For the company
The following are suggestions that the researcher can give to the company in connection with the analysis of the bankruptcy rate at PT Atlas Resources Tbk, that is, the company should be able to increase the company's working

capital by managing it effectively and efficiently. Companies should use assets productively so that they can generate retained earnings and profit before interest and high value taxes.

Borrowing money made by companies should be sought not to be too large in value and adjusted to the equity held by the company so that the company is able to fulfill its obligations with total equity held. The development carried out in the Muba Hub should be as efficient as possible, and if the transportation costs through the waterway cause a high cost of revenue, the transportation of mining products should be carried out by land or other alternative transportation that can minimize the cost of production.

b) For investors

Investors who will invest in PT. Atlas Resources, Tbk on the Indonesia Stock Exchange should temporarily choose other companies that are performing financially healthy to increase profits while minimizing the risks that will occur.

c) Share further research

For further research, it is attempted to use other methods of bankruptcy analysis as a comparison in predicting bankruptcy and using different companies to expand knowledge.

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