

ANALYSIS OF FINANCIAL DISTRESS IN COMPANIES THREATEN TO DELISTING ON THE INDONESIA STOCK EXCHANGE USING THE ALTMAN Z-SCORE MODEL

Nurul Azizah¹, Anwar Ramli², Anwar³

Management Study Program, Faculty of Economics and Business, Makassar State University
nurulazizah2401@gmail.com¹, anwar288347@yahoo.com², anwar.rauf@gmail.com³

Abstract

This study aims to determine the potential for bankruptcy experienced by companies that are threatened with delisting on the Indonesia Stock Exchange using the Altman Z-Score Model. This type of research uses descriptive quantitative. The research method uses descriptive quantitative. The sample used is a company that is threatened with delisting on the Indonesia Stock Exchange. The data used is secondary data, namely the company's financial statements listed on the Indonesia Stock Exchange. The sampling technique used a purposive sample and obtained a total sample of 5 (five) companies. Data analysis techniques using the Second Altman Z-Score. The results of the study show that in the last five years the potential for bankruptcy for companies that are threatened with delisting is relatively high because the five companies have the potential to experience bankruptcy, namely PT. Bakrie Telecom Tbk. PT. Dua Putra Utama Makmur Tbk. PT. Food Sejahtera Tbk. PT. Leyand International. PT. Trikonsel Oke Tbk. The company is in the precautionary zone to the distress zone.

Keywords: Financial Distress, Altman Z-Score, Indonesia Stock Exchange, Companies Threatened with Delisting.

INTRODUCTION

Maximizing profit and being able to operate in the long term is the main goal of the company. The greater the profit the company gets, the greater the company's efforts to improve or expand its business. Companies will always improve product quality, innovate, and use resources more effectively to increase their competitiveness, therefore companies need greater funding as the company's business grows.

The company's decision to go public means that the company takes advantage of the capital market to obtain funds by dividing company ownership with the public (investors). In addition, the company's name will be better known in the wider community so that the company will have wider access to loans. This advantage is also accompanied by the company's obligation to maintain public trust.

By registering a company on the Indonesia Stock Exchange, the company will obtain facilities and commodity trading provided by the Indonesia Stock Exchange. Thus additional funds from investors will be obtained by the company. To protect investors, the Indonesia Stock Exchange (IDX) and the Capital Market and Financial Institution Supervisory Agency (Bapepam_LK) always monitor the trading activities of company (issuer) stocks conducted on the stock exchange.

IDX and Bapepam_LK will sanction temporary suspension of stock trading (suspend) if the audited company's financial statements obtain a disclaimer opinion for two consecutive years or receive an adverse opinion, the company is declared bankrupt by creditors, the company does not disclose important and relevant information that can have a significant impact on share prices and investment decisions, there are very large fluctuations in share prices, and the company is unable to pay off its obligations.

Companies that receive sanctions in the form of suspension of shares for a certain period of time and do not take corrective action will receive the heaviest sanction in the form of forced delisting by the IDX and Bapepam_LK. Forced delisting is carried out if the issuer

does not show going concern in the capital market and no longer fulfills the requirements as a listed company. IDX's decision to carry out forced delisting of issuers indicates the bankruptcy of a company listed on the IDX.

There are two reasons for listed companies experiencing delisting. The first reason is that the listed company experienced a significant event that threatened the sustainability of the company and could not show signs of adequate recovery. The company is late in reporting financial reports, 4 companies are in a state of continuous loss, the company's operating income is inadequate, the company is in debt with large amounts and for a long time, the company is exposed to legal problems, or the company is difficult to continue its business is a condition where the company is threatened with delisting (Veni Verlia, 2018).

The second reason is that companies can experience forced delisting because the company's shares are subject to suspension on the cash and regular markets so that they are only traded on the negotiating market for at least the last two years. Referring to the Decree of the Board of Directors of PT Bursa Efek Indonesia Number Kep-00086/BEI/10-2011 concerning Indonesia Stock Exchange Regulation Number III-G concerning Suspension and Revocation of Stock Exchange Membership, the exchange can carry out a suspension based on the request of the member of the relevant stock exchange, sanctions imposed by the exchange, or an order from Bapepam and LK to carry out a suspension.

The 2022 period recorded five issuers that were threatened with delisting from the Indonesia Stock Exchange (IDX), including PT. Bakrie Telecom Tbk (BTEL), PT. Dua Putra Utama Makmur Tbk (DPUM), PT. Food Sejahtera Tbk (AISA), PT Leyand Internasional Tbk (LAPD) and PT. Trikonsel Oke Tbk (TRIO). The six issuers that are threatened with delisting come from different business sectors, including; Food Manufacturing sector, Telecommunications Networks and Services Sector, Fisheries Sector, Power Plant Operation Sector and Telecommunications Equipment sector.

PT. Tiga Pilar Sejahtera Food (AISA) is also still subject to suspension starting February 26, 2020, it is known that the company's financial statements AISA received an opinion not providing income for two consecutive years, namely per 2017 and 2018. If the suspension period reaches 24 months, then the shares concerned are not only threatened with delisting but will actually be deleted from the listing.

In this case, PT. Dua Putra Utama Makmur Tbk (DPUM) is also preparing a number of strategies to improve performance in order to avoid the threat of being kicked out of the Indonesia Stock Exchange, the company's operational secretary stated that Dua Putra Utama was affected by the Covid-19 pandemic because it depended on exports. The cause of this company being threatened with being kicked out from the Exchange was due to the delay in submitting the bankruptcy cassation case register number.

PT. Leyand, which is engaged in the power plant sector, is one of the companies that is threatened with being kicked out of the stock exchange. In 2020 IDX issued an announcement letter for the termination of trading on LAPD shares. This suspension is related to the financial condition of LAPD, which has not recorded any income since March 31, 2020. The company is also in debt and has received subpoenas from creditors, in this case Bank Panin.

Deletion of shares (suspension) also occurred in the company PT. Trikonsel Oke Tbk. The company's suspension period has also reached 24 months on 17 July 2021. Entering 2022, the company is still carrying out a debt restructuring process. The company's revenue continued its downward trend from year to year. During the Covid-19 pandemic, the company depreciated again with sales that no longer exceeded the trillion mark.

If a company experiences problems in liquidity, it is very likely that the company will begin to enter a period of financial distress 2 (financial distress) and if these difficult conditions are not resolved quickly, it can result in business bankruptcy (bankruptcy). The

potential bankruptcy of each company will cause concern from various parties, both internal to the company such as managers and employees, as well as external parties such as investors and creditors, because investors will lose their invested shares and creditors will suffer losses because they have lent capital that cannot be repaid by the company which is uncollectible, so it is necessary to analyze bankruptcy prediction for a company.

Several studies regarding financial distress in a company, including research conducted by Rahmatia, Nurdin and Misfah (2017) researched that using the Altman Z-Score method can show that most companies experience gray, safe, and distress zones where one out of five companies studied has a high potential for bankruptcy in 3 consecutive years, namely PT. Siwani Makmur in the 2013-2016 period.

The following research was conducted by Safitri and Fitri (2018) predicting financial distress through the Altman Z-Score in Wholesale and Retail Trade Sub-sector Companies listed on the IDX. The results of this study indicate that the occurrence of a financial distress is due to the fact that sales in each company have decreased from year to year and the company looks at the internal side. This decline in sales led to the emergence of long-term debt which became one of the reasons for the threat of delisting.

Other researchers by Risnanti, Kustiyah, and Widiyanti (2019) analyzed companies that were threatened with delisting using the Altman Z-Score model. The results of this study were that they experienced fairly good financial conditions and experienced very little bankruptcy. The following research by Arif (2021) also analyzes financial distress using the Altman Z-Score method, also analyzes the financial distress of companies delisted from the Exchange using the Altman Z-Score method.

The results of this study show that the financial distress analysis method can be used as a benchmark to see the financial condition of a company and become a consideration in overcoming the occurrence of a company's financial difficulties.

The difference between this research and previous research that has been described previously lies in the research object, where in previous studies the objects used were manufacturing companies, property and real estate companies, telecommunications companies, companies engaged in transportation and others listed on the Indonesia Stock Exchange. While the object of this study, researchers used companies that were threatened with delisting in the 2017-2021 period during a 24-month suspension period.

RESEARCH METHODS

The type of research that will be used in this research is descriptive research with a quantitative approach. The data in this study is referred to as quantitative data, because it is in the form of numerical data from financial reports in the form of income statements and balance sheets. Whereas data sources in this study using secondary data sources. The data source was obtained from the Indonesian Stock Exchange website (www.idx.co.id), in the form of the company's annual financial reports published for the 2017-2021 period which relate to the discussion in relation to this research. Time for research using financial report data in 2017-2021. The location of the research is through the official website of the Indonesia Stock Exchange (IDX). The population in this study is the financial statements of companies that are threatened with delisting. Meanwhile, the research sample was determined using a purposive sampling technique.

The data collection technique used in this study is the documentation method. Documentation in this study is in the form of financial report data on threatened companies *delisted* consists of five companies, namely PT. Bakrie Telecom Tbk, PT. Dua Putra Utama Makmur Tbk, PT. Food Sejahtera Tbk, PT. Leyand International, PT. Trikomsel Oke Tbk originating from the Indonesia Stock Exchange's internet page or www.idx.co.id.

Methods of data analysis in financial statements are used to measure, determine, and describe the possibility of occurrence of *financial distress* on companies that are threatened with delisting, namely PT. Bakrie Telecom Tbk, PT. Dua Putra Utama Makmur Tbk, PT. Food Sejahtera

Tbk, PT. Leyand International, PT. Trikonsel Oke Tbk. The entire financial report data on the company is analyzed to be able to provide answers to the problems discussed in this study. The criteria for Financial Distress can be seen if a company is classified into one of the following zones:

- If the Z value < 1.8 then it is a company that is in a distress zone.
- If the value is $1.8 < Z < 2.99$ then it is a company that is in the gray zone so that it is categorized as a company that has financial difficulties, but the possibility of being saved and the possibility of going bankrupt are equally dependent on the possibility of bankruptcy as much depending on the policy decisions of the company's management as the decision maker.
- If the Z value > 2.99 , it is a non-distress (non-bankrupt) company.

With a measure of potential bankruptcy in the five companies as follows:

- Low bankruptcy potential with a range of 1-33%
- Moderate bankruptcy potential with a range of 33-66%
- High bankruptcy potential with a range of 66-100%

RESULTS AND DISCUSSION

The following table is presented which is the overall ratio analysis that has been obtained at Threatened Companies *Delisting* on the Indonesian Stock Exchange.

PT. Bakrie Telecom Tbk

The following table presents the value of the ratios of the Altman Z-Score method at PT. Bakrie Telecom Tbk:

Table 1 The value of the ratios of the Altman Z-Score method at BTEL in 2017-2021

NO.	Year	X ₁	X ₂	X ₃	X ₄	X ₅	Z-Scores
1	2017	-12,435	-30,030	-2,236	-0.951	0.005	-27,328
2	2018	-14,149	-31,230	-1.020	-0.955	0.005	-40,312
3	2019	-626,647	-1,420	0.468	-0.999	0.257	-449,297
4	2020	-269,151	-5,726	-33.105	-0.999	1.215	-87,930
5	2021	-43,380	-905,871	-3,646	-0.998	1,753	-802,914

Source: data processed 2023

Based on table 1 above, the ratio of working capital (X₁) to total assets from 2017-2021 has increased every year. This increase was caused by an increase in working capital greater than total assets. The value of the ratio of retained earnings (X₂) to total assets from 2017-2021 has fluctuated and shows a negative value because the resulting retained earnings are negative every year. It can be seen that the calculation of the EBIT ratio (X₃) has fluctuated from 2017-2021. The market value of equity (X₄) to the book value of debt has increased and produced a negative value during 2017-2021. The ratio of sales to total assets (X₅) has increased every year.

PT. Dua Putra Utama Makmur Tbk

The following table presents the value of the ratios of the Altman Z-Score method at PT. Two Main Sons of Makmur Tbk:

Table 2 Value of the ratios of the Altman Z-Score method for DPUM in 2017-2021

NO.	Year	X ₁	X ₂	X ₃	X ₄	X ₅	Z-Scores
1	2017	-0.215	0.130	0.067	2,043	0.616	2.017
2	2018	0.208	0.132	0.006	2.007	0.457	1,940
3	2019	0.330	-0.031	-0.244	1,434	0.211	0.477
4	2020	0.217	-0.029	-0.304	0.907	0.093	-0.235
5	2021	0.222	-0.368	-0.074	0.808	0.125	0.704

Source: processed data

Based on table 2, 2017-2018 the condition of the company's financial health is included in the gray zone category. There was a decrease in the ratio of 0.3% due to a decrease in the liquidity ratio (X₁) and solvency ratio (X₄). A decrease of 3.3% in the liquidity ratio (X₁) was due to an increase in current liabilities.

In terms of solvency ratio (X₄) it decreased by 1.7% in 2018 and fell again in 2019 by 33% which was caused by an increase in total debt, where the company was included in the distress category with a Z-Score value of 0.477. In 2020 the company's condition is also in a state of illness or distress. The results of this ratio decreased by 67% from the previous year.

The profitability ratio (X₃, X₅) has decreased, whereby the ratio (X₃) has decreased by 21% and also 77% in the ratio (X₅). In 2021 the company will again enter a state of distress with a ratio value of more than 1.8, which is 0.704, where the profitability ratio (X₃) has again decreased from the previous year.

PT. Food Sejahtera Tbk

The following table presents the value of the ratios of the Altman Z-Score method at PT. Food Sejahtera Tbk:

Table 3 The value of the ratios of the Altman Z-Score method in the 2017-2021 FKPS

NO.	Year	X ₁	X ₂	X ₃	X ₄	X ₅	Z-Scores
1	2017	-0.215	0.130	0.067	2,043	0.616	2.017
2	2018	0.208	0.132	0.006	2.007	0.457	1,940
3	2019	0.330	-0.031	-0.244	1,434	0.211	0.477
4	2020	0.217	-0.029	-0.304	0.907	0.093	-0.235
5	2021	0.222	-0.368	-0.074	0.808	0.125	0.704

Source: processed data

Based on table 3, in 2017-2018 the health condition of the company is in the gray zone. There was an increase in the ratio of 180% in 2018 due to an increase in the liquidity ratio (X₁) and solvency ratio (X₄). An increase of 187% in the liquidity ratio (X₁) was due to an increase in current liabilities.

In terms of solvency ratio (X₄) also increased by 2.3%. In 2019 the company was included in the healthy category or safe zone with a Z-Score of 2.99. In 2020-2021 the company is again in poor financial condition with the distress category where the Z-Score obtained is less than 1.8. In

2020 the Z-Score value obtained was 0.591, where the ratio results decreased by 133% from the previous year.

Profitability ratios (X3,X5) decreased by 127% in terms of the X3 ratio and 23% in terms of the X5 ratio due to decreased sales. In 2021 the company is again in a state of illness or distress by obtaining a Z-Score of 0.119 where income before interest and taxes has decreased by 57% from the previous year.

PT. Leyand International Tbk

The following table presents the value of the ratios of the Altman Z-Score method at PT. Leyand International Tbk:

Table 4 Value of the ratios of the Altman Z-Score method in the 2017-2021 LAPD

NO.	Year	X1	X2	X3	X4	X5	Z-Scores
1	2017	-0.337	-0.278	-0.137	1,542	0.182	1,084
2	2018	-0.833	1,551	-1,466	0.003	0.379	-3,752
3	2019	-1.402	-3,440	-0.544	-0.350	0.460	-1,850
4	2020	-2,096	-4,792	-0.462	-0.541	0.119	-7,258
5	2021	-3,183	-8,708	-1,391	-1.016	0	0.167

Source: processed data

Based on table 4, the company's financial health condition for the last five years has been in a state of distress and the resulting ratio has fluctuated. The 2017-2018 period experienced an increase of 110%. The liquidity ratio (X1) increased by 84% due to an increase in current assets in 2018. The profitability ratio (X2,X3) also increased.

In terms of the X2 ratio, it increased by 2%, followed by an increase in retained earnings, while in terms of the X3 ratio, it increased by 165%, followed by an increase in earnings before interest and taxes. In terms of solvency ratio, there was also an increase of 70%. In 2019 the Z-Score results fell by 67%. The decrease in X4 that occurred was caused by an increase in total from the previous year.

In 2020-2021 there was an increase in the yield ratio of 11.9%, an increase that occurred due to sales that had decreased in 2020. In 2020 the profitability ratio decreased by 117% from the previous year. In 2021 the company didn't even earn income, followed by the X1 liquidity ratio which increased by 41% from the previous year due to a drastic increase in current liabilities.

PT. Trikomsel Oke Tbk

The following table presents the value of the ratios of the Altman Z-Score method at PT. Trikomsel Oke Tbk:

Table 5 Value of the ratios of the Altman Z-Score method in TRIO 2017-2021

NO.	Year	X1	X2	X3	X4	X5	Z-Scores
1	2017	-1,865	-29,153	-0.469	-0.931	7,623	-20,317
2	2018	-3,619	-40,147	-0.063	-0.931	8,633	-28,460
3	2019	-5,847	57,801	-0.748	-0.964	7,086	-48,393
4	2020	-8.105	-73,267	-2,497	-0.973	4,443	-70,573
5	2021	-12,699	-85,471	-1.585	-0.977	4,901	-63,611

Source: data processed 2023

Based on table 5, in 2017-2018 the Z-score results increased by 33% in 2018. The Liquidity Ratio increased by 63% followed by an increase in current liabilities. In terms of the X2 ratio, it increased by 31%, followed by an increase in retained earnings.

In 2019 the results of the Z-Score also increased by 52% from the previous year. The cause of the decline is the profitability ratio of X5. The decrease in the X5 ratio was due to a 20% decrease in sales from the previous year. In 2020 the value of the ratio increased again by 37% because the profitability ratio experienced a drastic decrease of 45% from the previous year.

In 2021 the company is again in a state of distress, where the Z-Score value obtained is -63,611, which has decreased by 10%. This decrease occurred because the solvency ratio of X4 decreased by 0.4%. The liquidity ratio also increased by 44% due to a decrease in current assets accompanied by an increase in current liabilities.

Z-Score Calculation Results

Based on the results of the calculation of the Altman Z-Score ratios above, it can be seen that the financial condition of companies that are threatened with delisting is in accordance with the criteria determined by Altman. The criteria in question are as follows:

- If the Z value < 1.8 then it is a company that is in a distress zone.
- If the value is $1.8 < Z < 2.99$ then it is a company that is in the gray zone so that it is categorized as a company that has financial difficulties, but the possibility of being saved and the possibility of going bankrupt are equally dependent on the possibility of bankruptcy as much depending on the policy decisions of the company's management as the decision maker.
- If the Z value > 2.99 , it is a non-bankrupt company.

After calculating the value of financial ratios from the Altman Z-Score method. So the next step is to analyze the calculation results from the Altman Z-Score. With that the Z-Score value can be compared with the criteria set by Altman to predict the financial health conditions of companies that are threatened with delisting listed on the Indonesia Stock Exchange in 2017-2021. The following table is presented which will show the financial condition of the analysis of the results of the Z-Score calculation of Companies Threatened with Delisting for five years.

Table 6 Analysis of Z-Score Research Results on Companies Threatened by Delisting on the Indonesia Stock Exchange

Tahun	BTCL		DPUM		FKPS		LAPD		TRIO	
	Z-Score	Prediksi	Z-Score	Prediksi	Z-Score	Prediksi	Z-Score	Prediksi	Z-Score	Prediksi
2017	-27,328	Distress Zone	2,017	Grey Zone	0,591	Distress Zone	1,084	Distress Zone	-20,317	Distress Zone
2018	-40,312	Distress Zone	1,940	Grey Zone	-11,763	Distress Zone	-3,752	Distress Zone	-28,460	Distress Zone
2019	-449,297	Distress Zone	0,477	Distress Zone	2,995	Safe Zone	-1,850	Distress Zone	-48,393	Distress Zone
2020	-87,930	Distress Zone	-0,235	Distress Zone	-0,591	Distress Zone	-7,258	Distress Zone	-70,573	Distress Zone
2021	-802,914	Distress Zone	0,704	Distress Zone	0,119	Distress Zone	0,167	Distress Zone	-63,611	Distress Zone

Source: data processed 2023

Based on table 6, the results of the Z-Score value of companies that are threatened with delisting on the Indonesia Stock Exchange. The results of each company obtain

prediction results that are almost the same. PT. Bakrie Telecom Tbk for the last five years has always been in the distress zone category, on average the company also experiences potential bankruptcy. The prediction results of PT. Bakrie Telecom has continuously increased, this increase is due to the ratio of earnings before interest and taxes being the highest negative value among all other companies that are threatened with delisting.

Company PT. Dua Putra Utama Makmur Tbk, is at *gray zone* in the first two years and enter the distress zone in the following year. The average results are also in the gray zone. The company entered the gray zone category in the first two years due to the fairly good equity market value compared to all other years.

Company PT. Food Sejahtera Tbk, is in almost the same zone. In certain years, the company enters the safe zone, and in another year the company returns to the distress zone, so that the average prediction of bankruptcy in the last five years is at the potential for bankruptcy because the company cannot generate profits from all of its assets.

PT. Leyand Internasional Tbk, in the last five years has been in a distress zone. So that the average results of bankruptcy prediction in the last five years are in the distress zone due to financial difficulties. The company even no longer earns income at the end of the period due to the massive sale of sets to cover the company's liabilities.

PT. Trikonsel Tbk has also been in the distress zone for the last five years. The company shows the potential for bankruptcy by obtaining the highest negative equity value among the five companies that are threatened with delisting. The company also experiences continuous net losses, where this net loss will erode the company's profit balance which will go into equity later.

The results of previous research also conducted by Matahari, Abdi, and Anwar showed that PT. Bakrie Telecom Tbk using the Altman Z-Score model. The results of the analysis show that there are similarities in this study, that PT. Bakrie has been included in the distress zone category for the last five years. There are also differences in this study, namely the Altman Z-Score model used in previous research.

Previous research used a modified Altman which did not include the X5 constellation in the study. Meanwhile, this study uses the Revised Altman Z-Score model which includes the X5 ratio in its research. Although using a different Altman model, there is no difference between the results of previous studies and the results of the current study.

CONCLUSION

Based on bankruptcy analysis using the Altman Z-Score model at PT. Bakrie Telecom Tbk (BTCL), PT. Leyand International (LAPD) and PT. Trikonsel Oke Tbk (TRIO). Of the three companies, the results of the resulting Z-Score are in a condition of financial health that is in an insecure zone or distress zone in the last five years.

PT. Dua Putra Utama Makmur Tbk, showing the Z-Score gray zone results for two years. Companies that are included in the gray zone category or even in a position with the potential to go bankrupt, but the company's performance is in good condition because the total assets are still able to meet the total debt, then enter again into the distress zone in the next three years. PT. Food Sejahtera is the only company that is included in the safe zone category for one year. However, this does not rule out the possibility because in the following year the company will again enter the distress zone category.

The results of the analysis show that more dominant companies experience bankruptcy potential, but this does not guarantee that they will actually experience bankruptcy. Companies that are in a suspension period can mean that their financial performance is in a bad condition. The action of deleting shares from the list of traded shares

or suspension is carried out by the IDX due to financial difficulties. Bankruptcy can be one of the reasons a company is in a period of suspension or even delisted by the IDX.

SUGGESTION

For the management of the five companies, namely PT. Bakrie Telecom Tbk, PT. Dua Putra Utama Makmur Tbk, PT. Food Sejahtera Tbk, PT. Leyand International Tbk, PT. Trikonsel Oke Tbk. it is hoped that the company will continue to manage finances effectively and efficiently by considering the net working capital used with the book value of the company's total debt. Particularly PT. Leyand Internasional Tbk, the company is expected to increase sales in order to generate a net profit taking into account the book value of the company's total debt. Increasing sales can be done by creating product innovations or implementing optimal strategies to increase the company's sales value.

The Altman Z-Score model is only an early detector of the potential for corporate bankruptcy from the point of view of the company's financial statements. Companies must adopt policies and establish strategies to improve company performance.

For investors, do not invest in companies that are threatened with delisting because companies that are threatened with delisting enter a period of suspension where stock trading stops temporarily due to unhealthy financial performance, investors should invest in companies that are still considered capable of surviving and developing in the long term

REFERENCES

- Hanafi, Mamduh M and Halim, Abdul 2017. Financial Performance Analysis. Yogyakarta. College of Management Unit.
- Hope. 2018. Critical Analysis of Financial Reports. Thirteenth Printing. Jakarta. Rajawali Press.
- Harry. 2018. Analysis of Financial Statements. Fourth Printing. Jakarta. PT. Bumi Aksara.
- Kasmir. 2019. Analysis of Financial Statements. Eighth Printing. Jakarta. Rajawali Press
- Purwanti, Endang. 2017. Analysis of Differences in the Altman Z Score Model and the Springate Model in Predicting Bankruptcy in Mining Companies in Indonesia (Empirical Study of Mining Companies Listed on the Indonesia Stock Exchange in 2010-2014). Journal of STIE Semarang. Vol 8, No 2. ISSN : 2252-826. June.
- Pramuditya, Andhika Yudha. 2017. "Analysis of the Influence of Corporate Governance Mechanisms on the Possibility of Companies Experiencing Financial Distress Conditions (Empirical Studies of Manufacturing Companies Listed on the Indonesian Stock Exchange 2010-2012). Thesis. Semarang : Undergraduate Program (S1) Faculty
- Safitri, AR, Nurdin, & Bayumi, EM (2018). Company Bankruptcy Analysis on Sharia Stocks that are Suspended on the Indonesia Stock Exchange Using the Altman Z-Score Method. Proceedings of Islamic Finance and Banking, 4(1), 264-269.
- Setiawati, Mey Handayani. 2017. Analysis of the Altman Z-Score, Springate, and Zmijewski Methods for Predicting Financial Distress in Food and Beverage

Companies Listed on the Indonesia Stock Exchange (IDX) for the 2011-2015 period. Lampung. Thesis: University of Lampung.

Sulo. Meilyana Allo. 2017. Prediction Analysis of Financial Distress Symptoms in Manufacturing Companies Listed on the Indonesia Stock Exchange. Macassar. Thesis: UNM.

Wulandari, Fitria., Burhanudin., Widayanti, Rochmi. 2017. Bankruptcy Prediction Analysis Using the Altman Method (Z-Score) in Pharmaceutical Companies (Case Study of Companies Listed on the Indonesia Stock Exchange in 2011-2015). Benefit Journal of Management and Business. Vol. 2 No. 1.