



BANKRUPTCY ANALYSIS USING ALTMAN Z-SCORE METHOD AND SPRINGATE METHOD IN MANUFACTURING COMPANIES IN THE FOOTWEAR SUB-SECTOR

¹Rachmawaty, ²Susanto

Pamulang University, Indonesia

¹Dosen01925@unpam.ac.id; ²susantosusanto027@gmail.com

Abstract

This study aims to analyze the bankruptcy of footwear sub-sector manufacturing companies listed on the IDX, namely PT Sepatu Bata Tbk (BATA) and PT Primaindo Asia Infrastructure Tbk (BIMA). Using the Altman Z-Score method and the Springate method in the 2019-2023 financial statements, the bankruptcy of BATA and BIMA was analyzed. Based on the bankruptcy criteria for each analysis method, the results obtained are that BIMA is predicted to go bankrupt by both methods used, namely Altman Z-Score and Springate. While BATA is predicted not to go bankrupt. It can be concluded that BIMA will go bankrupt in the future if it does not prepare steps and strategies to overcome bankruptcy. Meanwhile, BATA is in a healthy financial condition and is expected to always maintain its financial condition to avoid potential bankruptcy. In the result of calculation is different with the reality such as the bankruptcy of BATA, due to external factors such as business model, competition which is not included in the calculation.

Key words : Altman Z Score, Bankrupt, BATA, BIMA

INTRODUCTION

The footwear sub-sector manufacturing industry is one of the sectors that plays an important role in the Indonesian economy, especially the shoe industry. The shoe industry in Indonesia is one of the important manufacturing sectors, contributing significantly to the economy and providing employment. Starting in the colonial era, this industry has grown rapidly since the 1970s, making Indonesia one of the largest shoe producers in the world, with many factories producing for international brands. The availability of raw materials, such as leather and fabric, supports production including sports shoes, formal shoes, casual shoes, and sandals. Along with the development of the era and increasingly tight competition, footwear manufacturing companies in Indonesia face various complex challenges. One of the main challenges faced by manufacturing companies is the risk of bankruptcy. Bankruptcy is a condition where a company is unable to meet its financial obligations and can have an impact on various aspects, such as loss of jobs, losses for shareholders, and decreased investor confidence. Every company certainly has a desire to advance and develop its business by providing good service and product quality so that the company's finances will remain healthy. However, in reality, the company's desires are not always in line with what has been planned. In practice, companies may experience financial problems that lead to the risk of bankruptcy. Bankruptcy is a situation where a company faces very serious financial problems so that it is no longer able to carry out its operational activities properly. This condition is the final stage of financial problems or distress that occurs due to management failure to overcome these problems. Based on Law Number 4 of 1998, bankruptcy is defined as a situation where an entity is declared by the court to have at least two creditors and is unable to pay off at least one debt that is due and collectible.

In April 2024, PT Sepatu Bata Tbk decided to close its factory in Purwakarta and lay off its employees due to recurring losses and declining demand for products. In its financial report, BATA management explained that the decision was taken in response to losses that

had continued to occur over the past four years and declining demand for products produced at the factory. BATA's financial report recorded total liabilities of IDR548.17 billion, consisting of short-term liabilities of IDR503.75 billion and long-term liabilities of IDR44.42 billion. Meanwhile, the company's equity until the end of March 2023 was recorded at IDR117.75 billion, with total assets reaching IDR665.93 billion. BATA also recorded a net loss attributable to owners of the parent entity of IDR13.85 billion, 49.10% lower compared to the net loss in the same period the previous year of IDR24.14 billion. To overcome the risk of bankruptcy, companies need to conduct in-depth financial analysis. One method that can be used to analyze bankruptcy is the Altman Z-Score method and the Springate method. The Altman Z-Score method was developed by Edward I. Altman in 1968 and has proven effective in predicting corporate bankruptcy. Meanwhile, the Springate method is also a method used to analyze corporate bankruptcy by considering relevant financial ratios.

. Bankruptcy is basically not a condition that occurs immediately without any signs of financial difficulties in a company. Therefore, bankruptcy can be predicted early, so that parties in the company can make decisions to anticipate bankruptcy. According to Prihatini & Sari (2013) there are several methods that can be used to predict bankruptcy based on financial reports, including Altman (1968) who formulated a formula or model known as the Altman Z-Score model. Altman Z-Score is a formula that can be used as a tool to predict the possibility of bankruptcy in a company early by calculating the value of several financial ratios related to the company's liquidity capacity. Furthermore, these ratios are entered into a discriminant equation that has been formulated. In 1983 and 1984, Altman conducted a survey of bankruptcy prediction models developed in several countries. Through this study, a new Z value was found for companies that go public, and it turned out that the Altman Z-Score method had a fairly good prediction rate of up to 95% (Hanafi & Halim, 2016).

Altman (1968) in his study used a statistical method, namely Multiple Discriminant Analysis. This method can show clear differences in characteristics based on certain variables to determine the classification of an object that is the object of research, for example healthy or sick, rich or poor, good or bad, and so on (Alim, 2017). According to Nurcahyanti (2015), the advantage of the Multiple Discriminant Analysis method is that based on the values of several existing variables, a single value can be used to conclude a characteristic owned by a certain group of objects. For companies that have gone public where the company has been listed on the stock exchange so that its shares can be traded on the capital market, the Altman Z-Score formula that can be used to predict bankruptcy is as follows:

Altman Z-Score for Manufacturing Companies

$$Z = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E$$

Altman Z-Score for Non-Manufacturing Private Companies

$$Z = 0.717A + 0.847B + 3.107C + 0.420D + 0.998E$$

Altman Z-Score for General Non-Manufacturing Companies

$$Z = 6.56A + 3.26B + 6.72C + 1.05D$$

Information :

Z = Bankruptcy Index

A = Working capital / Total assets

B = Retained Earnings / Total Assets

C = Earnings before interest and taxes / Total Assets

D = Market value of common and preferred stock / Total Liabilities

$$E = \text{Sales} / \text{Total Assets}$$

Z-Score is a cumulative index generated through multiple discriminant analysis, which takes into account various variables as indicators of potential distress in a company. Z-Score has a cut-off number that is used to determine whether a company is in a healthy condition, in a gray area, or experiencing distress. Based on the Z-Score calculation, the health level of the company is classified into three categories, namely: If $Z < 1.8$, the company is considered to be in distress or financial difficulties that have the potential to cause bankruptcy, if $1.8 < Z < 2.99$, the company is in the gray area category, where its condition cannot be definitely categorized as healthy or experiencing distress. And if $Z > 2.99$, the company is classified as healthy (Alim, 2017). In predicting corporate bankruptcy, the Altman Z-Score method has advantages and disadvantages. According to the Capital Market and Financial Institution Supervisory Agency (Bapepam-LK) in Setiawati (2017), the advantages of this method are that it is easy to apply to various companies, uses a combination of several financial ratios simultaneously, provides a value for each coefficient of each variable of the financial ratio used, can describe the bankruptcy prediction of a company according to the actual situation because it has a fairly high level of accuracy, and the bankruptcy index value is more specific because it consists of three categories. Meanwhile, the disadvantages of the Altman Z-Score method are that it is not suitable for companies that are still new and are making losses and the bankruptcy index can be easily engineered by engineering a company's financial statements.

Springate developed a financial distress prediction model in 1978. In the development process, Springate used the same method as Altman, namely Multiple Discriminant Analysis (MDA). As done by Beaver (1966) and Altman (1968), Springate initially collected 19 popular financial ratios that could potentially be used to predict financial distress. After going through a test similar to Altman's method (1968), Springate finally chose 4 ratios that were considered capable of distinguishing companies that were in distress from those that were not. Springate's research used a sample of 40 companies, 36 of which were located in Canada (Setiawati, 2017; Burhanuddin, 2015).

The form of the model formulated by Springate is as follows:

$$Z = 1.03A + 3.07B + 0.66C + 0.4D$$

Information :

Z = Bankruptcy Index

A = Working Capital / Total Assets

B = Net Profit Before Interest And Taxes / Total Assets

C = Net Profit Before Taxes / Current Liabilities

D = Sales / Total Asset

Springate suggests that the cut-off value applicable to this model is 0.862. A Z value smaller than 0.862 indicates that the company is predicted to experience distress. This model has an accuracy of 92.5% in tests conducted by Springate. Several others have also tested this model and found varying levels of accuracy. The research that has been conducted uses samples of companies with different asset values. Botheras (1979) tested the Springate model using a sample of 50 companies with an average asset value of \$2.5 million and obtained an accuracy of 88%. Sands (1980) tested the Springate model on 24 companies with an average asset value of 63.4 million Dollars and obtained an accuracy level of 83.3% (Alim, 2017). The advantages of the Springate method according to Bapepam-LK are that it is easy to apply to various companies, uses several financial ratios as independent variables, provides

coefficient values for each financial ratio used, and has the best indicator in predicting bankruptcy, namely the ratio of profit before tax and interest to total assets. The only drawback of the Springate method is that it is easy to manipulate if the financial reports are also manipulated (Setiawati, 2017).

METHOD

The footwear company is a manufacturing company listed on the IDX. Every year the company will issue financial reports that are useful for providing financial information to investors, shareholders, capital market analysts, managers, employees, tax agencies, creditors, and suppliers. From the published financial reports, information can be obtained about the company's performance, whether the company is in good financial condition or not. There are two footwear companies that will be analyzed using the Altman Z-Score and Springate Methods to predict Financial Distress conditions. The final results of this study can be seen whether the company is experiencing financial difficulties (Financial Distress) or not experiencing financial difficulties (Financial Non Distress).

According to Sugiyono (2017: 93) "a hypothesis is a temporary answer to the formulation of a problem. Therefore, the answer given is only based on relevant theories, not based on actual facts obtained through data collection and data processing". The hypothesis usually explains behavior, phenomena, or a condition that has occurred or may occur.

Based on the formulation of the research problem, the research hypothesis is:

Hypothesis 1: It is suspected that Alman Zscore can predict the bankruptcy of BATA and BIMA.

Hypothesis 2: It is suspected that Alman Zscore cannot predict the bankruptcy of BATA and BIMA.

Hypothesis 3: It is suspected that Springate can predict the bankruptcy of BATA and BIMA.

Hypothesis 4: It is suspected that Springate cannot predict the bankruptcy of BATA and BIMA.

RESULTS

This study uses data sourced from the financial statements of footwear sub-sector manufacturing companies listed on the Indonesian Stock Exchange on its official website www.idx.co.id from 2019 to 2023. Data taken from financial statements such as current assets, current liabilities, total assets, profit before tax, sales, retained earnings, stock market value and processed data such as working capital and EBIT (earnings before interest and taxes). The methods used are the Altman Z-Score method and the Springate method which use different financial ratios.

Table 1
Bankruptcy Index Altman Z-Score Method (Z)
Footwear Sub-Sector Manufacturing Companies 2019-2023 Period

Code	Year	A	B	C	D	E	Z-Score	Prediction
BRICK	2019	0.4403	0.7370	0.0415	4,026	1,0789	5,1916	Healthy
	2020	0.1226	0.5912	-0.2902	2,776	0.5927	2,2754	Grey Area
	2021	0.1539	0.6238	-0.0980	3,109	0.6717	3,2717	Healthy

	2022	0.0075	0.4160	-0.0941	1,672	0.8886	2,1726	Grey Area
	2023	- 0.0738	0.1894	-0.2768	4.03	1.0407	2,7218	Grey Area
BIMA	2019	0.1090	- 0.8244	0.0164	0.1670	0.5130	-0.3560	Bankrupt
	2020	- 0.0139	- 1.0490	-0.1803	0.1564	0.2549	-1.7315	Bankrupt
	2021	- 0.1151	- 1,1663	-0.1188	0.7148	0.1913	-1.5428	Bankrupt
	2022	- 0.078	- 0.8290	-0.0032	0.3178	0.3669	-0.7071	Bankrupt
	2023	- 0.1707	- 0.8371	-0.0189	0.2346	0.2920	-1.0063	Bankrupt

Source: Processed Secondary Data, 2024.

Then the bankruptcy index obtained from each company will be determined as an average value and classified according to the Altman Z-Score method criteria. If the Z value <1.8 means that the company in question is experiencing distress or financial difficulties and is potentially bankrupt. If the results obtained are $1.8 < Z < 2.99$, it means that the company is included in the gray area category where in this condition it cannot be determined whether the company is healthy or experiencing distress, and if the Z value obtained is >2.99 , it means that the company is classified as healthy. The following are the results of the bankruptcy prediction of footwear sub-sector manufacturing companies listed on the IDX:

Table 2
Bankruptcy Prediction Altman Z-Score Method (Z)
Footwear Sub-Sector Manufacturing Companies 2019-2023 Period

Code	Bankruptcy Index					Average	Prediction
	2019	2020	2021	2022	2023		
BRICK	5,1916	2,2754	3,2717	2,1726	2,7218	3,1266	Healthy
BIMA	-0.35604	-1.73153	-1.5428	-0.7071	-1.0063	-1.0688	Bankrupt

Source: Processed Secondary Data, 2024.

Based on table 2, it can be seen that the average bankruptcy index at PT Sepatu Bata Tbk (BATA) for the 2019-2023 period using the Altman Z-Score method is 3.1266. This means that BATA's bankruptcy index is more than 2.99, so according to the Altman Z-Score method, BATA can be declared healthy. Meanwhile, PT Primaindo Asia Infrastructure Tbk (BIMA) for the 2019-2023 period only obtained an average index below zero, which was -1.0688. This means that BIMA is predicted to go bankrupt. So it can be concluded that using the Altman Z-Score method, only PT Primaindo Asia Infrastructure Tbk (BIMA) is predicted to go bankrupt in the future.

Table 3
Springate Method Bankruptcy Index (S)
Footwear Sub-Sector Manufacturing Companies 2019-2023 Period

Code	Year	A	B	C	D	Springate	Prediction
BRICK	2019	0.4403	0.0415	0.2178	4,026	4,7256	Healthy
	2020	0.1226	-0.2902	-0.9047	2,776	1,7037	Healthy

BIMA	2021	0.1539	-0.0980	-0.3246	3,109	2,8403	Healthy
	2022	0.0075	-0.0941	-0.1899	1,672	1.3955	Healthy
	2023	- 0.0738	-0.2768	-0.4162	4.03	3,2632	Healthy
	2019	0.1090	0.0164	0.0717	0.1670	0.3641	Bankrupt
	2020	- 0.0139	-0.1803	-0.7359	0.1564	-0.7737	Bankrupt
	2021	- 0.1151	-0.1188	-0.3970	0.7148	0.0839	Bankrupt
	2022	- 0.078	-0.0032	-0.0122	0.3178	0.2244	Bankrupt
	2023	- 0.1707	-0.0189	-0.0522	0.2346	-0.0072	Bankrupt

Source: Processed Secondary Data, 2024.

Then the bankruptcy index that has been obtained from each company will be determined the average value and classified according to the Springate method criteria. If the S value > 0.862 then the company does not experience bankruptcy. However, if the S value < 0.862 then the company can experience bankruptcy. The following are the results of bankruptcy predictions using the Springate method in footwear sub-sector manufacturing companies listed on the IDX:

Table 4
Springate Method Bankruptcy Prediction (S)
Footwear Sub-Sector Manufacturing Companies 2019-2023 Period

Code	Bankruptcy Index					Average	Prediction
	2019	2020	2021	2022	2023		
BRICK	5,4211	2,5851	3,5621	1,9056	3,7294	3,4406	Healthy
BIMA	-0.4767	-1.6424	-0.9636	-0.6014	-0.8254	-0.8864	Bankrupt

Source: Processed Secondary Data, 2024.

Based on table 4, it can be seen that the average bankruptcy index at PT Sepatu Bata Tbk (BATA) for the 2019-2023 period using the Springate method is 3.4406. This means that BATA's bankruptcy index is more than 0.862, so according to the Springate method, BATA can be declared healthy. Meanwhile, PT Primaindo Asia Infrastructure Tbk (BIMA) for the 2019-2023 period only obtained an average index below 0.862, which is -0.8864. This means that BIMA is predicted to go bankrupt. So it can be concluded that using the Springate method, only PT Primaindo Asia Infrastructure Tbk (BIMA) is predicted to go bankrupt in the future.

Based on the calculations carried out above, it can be explained that the results of the Altman Z-Score method and the Springate method calculations on footwear sub-sector manufacturing companies listed on the IDX for the period 2019 to 2023, can be concluded in both models as follows:

Table 5
Difference Between Z-Score and Springate Results
Footwear Sub-Sector Manufacturing Companies 2019-2023 Period

No	Code	Year	Information	
			Z-Score	Springate
1	BRICK	2019	Healthy	Healthy
		2020	Grey Area	Healthy

		2021	Healthy	Healthy
		2022	Grey Area	Healthy
		2023	Grey Area	Healthy
2	BIMA	2019	Bankrupt	Bankrupt
		2020	Bankrupt	Bankrupt
		2021	Bankrupt	Bankrupt
		2022	Bankrupt	Bankrupt
		2023	Bankrupt	Bankrupt

Source: Processed Secondary Data, 2024.

This study uses 2 samples of footwear sub-sector manufacturing companies listed on the Indonesia Stock Exchange for the period 2019 to 2023. Table 5 shows that there are differences in bankruptcy prediction results using the Altman Z-Score and Springate methods. The differences are caused by differences in the use of financial ratios where the Z-Score method uses 5 variables in its calculations, while the Springate method only uses 4 variables. In addition, differences in bankruptcy criteria are also a factor that distinguishes between the two methods. The Altman Z-Score method has criteria for a company that is said to be healthy when the Z-Score value is more than 2.99, the gray area condition is between 1.18 - 2.99, while when the company is in a condition of potential bankruptcy the Z-Score value is less than 1.18. However, in the Springate method, a company is said to be healthy when the S-Score value is more than 0.862 and when a company produces an S-Score value below 0.862 the company is in a condition of potential bankruptcy.

PT Sepatu Bata Tbk when using the bankruptcy ratio of the Altman Z-Score method for the 2019 and 2021 periods, the company is in a healthy condition. While in the 2020, 2022, and 2023 periods, the company is in a gray area condition. This is due to a decrease in the value of the working capital variable (A) and the sales variable (E) in the 2020, 2022, and 2023 periods which can be seen in table 4.6. While in the results of the Springate method calculation, the company is in a healthy condition in the period 2019 to 2023. This shows that there is a difference in results between using the Altman Z-Score method and the Springate method. When viewed from the prediction results above, the results are in line with the reality in the field. Because in reality PT Sepatu Bata Tbk has closed one of its factories in Purwakarta in May 2024. There are several reasons why BATA closed its factory. The reasons are first, the decline in Product Demand: During the COVID-19 pandemic, the demand for shoes decreased significantly due to restrictions on social activities and changes in people's lifestyles. This resulted in a decline in sales and production. Second, Operational Efficiency and Cost Savings: Factory closures are carried out as a step to increase efficiency and reduce the company's operational costs. By closing less efficient factories, companies can focus on more optimal production facilities. Third, Financial Pressure: The pandemic has created economic challenges for many companies, including PT Bata. The factory closure step is the company's effort to survive amidst existing financial pressures. Fourth, Restructuring Strategy: This closure is also part of the company's restructuring strategy to be more adaptive to market changes and uncertain economic conditions.

PT Primaindo Asia Infrastructure Tbk when using the Altman Z-Score bankruptcy ratio method for the period 2019 to 2023, the company is in a potential bankruptcy condition. This is because the working capital variable (A), retained earnings variable (B), and EBIT variable (C) always experience a decline and even reach negative values, causing the company to be predicted to have the potential to go bankrupt, which can be seen in table 4.6. Likewise with

the calculation using the Springate method, in the period 2019 to 2023 the company is in a potential bankruptcy condition. This shows that there are similarities between the use of the Altman Z-Score method and the Springate method. When viewed from each bankruptcy analysis method used, there are several factors that cause BIMA to be predicted to go bankrupt. These factors are first, based on the Working capital to total asset ratio in table 4.1, it can be seen that in a five-year period, BIMA has fluctuating current assets and increasing total debt. In 2019, it still had assets greater than total debt with a difference of 26.8 billion rupiah. In 2020, current assets decreased by 38% from the previous year followed by current liabilities which also decreased but BIMA's current assets were still below current liabilities by 0.05%. In 2021, BIMA's current assets again shrank significantly by 22% from 2020. Meanwhile, current liabilities increased by 19% from the previous year. In the following year, 2022, BIMA's assets increased by 45.6% from the previous year and current liabilities also increased again by 26.7% from the previous year. In 2023, BIMA's assets increased by 0.02% from the previous year. Meanwhile, current liabilities increased significantly by 36.5% from the previous year. This situation has caused BIMA's working capital for five years to always decrease and even touch negative values. If working capital is negative, it can be concluded that there is a serious problem with liquidity in PT Primaindo Asia Infrastructure Tbk (BIMA). Therefore, BIMA must take concrete steps to increase its current assets and reduce its current liabilities. Second, in the last five years, BIMA has been less able to generate profits, both retained earnings and operating profits. Retained earnings are profits that are used as working capital and are not given to shareholders. As can be seen in table 4.2, BIMA does not have retained earnings because the nominal value is negative. This means that BIMA is experiencing losses because it lacks the ability to generate profits. This financial problem is also exacerbated by the increase in the company's operating expenses which are not comparable to revenue. If seen from table 4.3, the EBIT ratio value produced by BIMA is not optimal because it fluctuates every year and is always negative, causing BIMA to be in poor financial condition. In this case, it is better to avoid unnecessary expenses. This statement is supported by the statement of Efendi et al. (2022) that the company will be in a good category if the value generated is still positive.

CONCLUSION

Based on the calculation results and discussions, it can be concluded that the Altman Z-Score method and the Springate method used to predict the bankruptcy rate of footwear sub-sector manufacturing companies listed on the Indonesia Stock Exchange for the 2019-2023 period predict that PT Primaindo Asia Infrastructure Tbk will go bankrupt while PT Sepatu Bata Tbk will be in a healthy condition. The results of the bankruptcy analysis between the Altman Z-Score method and the Springate method show differences in the results of the calculations each year at PT Sepatu Bata Tbk. However, for PT Primaindo Asia Infrastructure Tbk there is no difference in the results of the bankruptcy analysis.

SUGGESTION

For investors who will invest, they should choose a company that has good financial performance and is in a healthy condition to reduce the risk by calculating bankruptcy predictions using the Altman Z-Score method and the Springate method. For company management, the results of bankruptcy research can be used as a consideration to take

certain steps in detecting early indications of bankruptcy so that the company can avoid the risk of bankruptcy. For further researchers, additional variables are highly recommended because there are still many methods that can be used such as the Zmiejewski, Grover, Beaver methods, and others.

REFERENCES

- Alim, alif fikri. 2017. "Skripsi Alif Fikri Alim - 13311238." Analisis Prediksi Kebangkrutan Dengan Model Altman Z_Score Pada Perusahaan Makanan Dan Minuman Yang Terdaftar Di Bursa Efek Indonesia.
- Annuri, Ilmi Furqan Al, and Ruzikna. 2017. "Analisis Penggunaan Metode Altman (Z-Score) Dalam Memprediksi Terjadinya Financial Distress Pada Perusahaan Minyak Bumi Dan Gas (Migas) Yang Tedaftar Di Bursa Efek Indonesia (BEI) Periode 2010-2014." *Jom FISIP* 4(2):1-13.
- Efendi, A. I., M. S. Tato, and M. Ni'mah. 2022. "Analisis Prediksi Kebangkrutan Dengan Menggunakan Metode Altman Z-Score 'Studi Kasus Pada PT. Sepatu Bata Tbk.'" *Economics And Business ...* 1(3):161-68.
- Hery. (2023) Analisis Laporan Keuangan: Intergrated and comperhesive edition. Jakarta: Gramedia Widiasarana Indonesia.
- Masdiantini, Putu Riesty, and Ni Made Sindy Warasniasih. 2020. "Laporan Keuangan Dan Prediksi Kebangkrutan Perusahaan." *Jurnal Ilmiah Akuntansi* 5(1):196. doi: 10.23887/jia.v5i1.25119.
- Nainggolan, Florentina Stefhani, and Asep Maulana Novianto. 2022. "Pengaruh Promosi Dan Brand Ambassador Terhadap Keputusan Pembelian Sepatu Pada PT. Sepatu Bata Tbk. Cabang Karawang." *Widya Manajemen* 4(2):127-39. doi: 10.32795/widyamanajemen.v4i2.2629.
- Nurchayanti, Wahyu. 2015. "Studi Komparatif Model Z-Score Altman, Springate Dan Zmijewski Dalam Mengindikasikan Kebangkrutan Perusahaan Yang Terdaftar Di BEI." *Jurnal Akuntansi* 3(1):1-24.
- Prihanthini, Ni Made Evi Dwi, and Maria M. Ratna Sari. 2013. "Z-SCORE , SPRINGATE DAN ZMIJEWSKI PADA PERUSAHAAN FOOD Fakultas Ekonomi Dan Bisnis Universitas Udayana (UNUD), Bali , Indonesia Fakultas Ekonomi Dan Bisnis Universitas Udayana (UNUD), Bali , Indonesia ABSTRAK Perkembangan Zaman Yang Diikuti Dengan Per." *E'jurnal Akuntansi Universitas Udayana* 2:417-35.
- Setiawati, Mey Handayani. 2017. "Analisis Metode Altman Z-Score, Springate, Dan Zmijewski Untuk Memprediksi Financial Distress Pada Perusahaan Food and Beverage Yang Terdaftar Di Bursa Efek Indonesia (BEI) Periode 2011-2015." *Administrasi Bisnis* 2015:1-15.
- Sugiyono. (2021) Panduan Praktis Dasar Analisa Laporan Keuangan. Jakarta: PT Gramedia
- Sugiyono (2021) In Metode Penelitian Kuantitatif, Kualitatif dan R & D (p. 394). Bandung: Alfabeta.
- Tuhuteru, J. 2022. "Altman Z-Score Dan Grover G-Score Dalam Analisis Kebangkrutan PT. Sepatu Bata Tbk Periode Tahun 2014-2020." *Journal of Business Application* 1:19-26.
- Wahyuni, Sri Fitri, and Rubiyah. 2021. "Analisis Financial Distress Menggunakan Metode Altman Z-Score, Springate, Zmijewski Dan Grover Pada Perusahaan Sektor Perkebunan Yang Terdaftar Di Bursa Efek Indonesia." *MANIEGGIO: Jurnal Ilmiah Magister Manajemen* 4(1):62-72.