Bankruptcy Prediction Analysis with the Altman Z–Score, Springate and Zmijewski Models in Fisheries Sub Sector Companies Listed on the Indonesia Stock Exchange (IDX) for the 2019-2021 Period

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Abstract: This article aims to determine the potential for bankruptcy in fisheries sub-sector companies listed on the Indonesia Stock Exchange (IDX) for the period 2019 to 2021. The scope of discussion in this article is financial management. The analytical tool used in this article is the Altman Z-Score, Springate and Zmijewski bankruptcy prediction models. There are three fishing companies that are the object of research in this article, namely PT Era Mandiri Cemerlang, TBK, PT Morenzo Abadi Perkasa, TBK and PT Asia Sejahtera Mina, TBK. From research on the three companies, test results obtained with the Altman Z-Score model, PT Era Mandiri Cemerlang have the potential to experience bankruptcy, PT Morenzo Abadi Perkasa has a gray area condition and PT Asia Sejahtera Mina is in a healthy condition. Test results with the PT Era Mandiri Cemerlang Springate model, TBK is in a state of bankruptcy, while PT Morenzo Abadi Perkasa and PT Asia Sejahtera Mina are in good health. The test results with the Zmijewski model of the three fishing companies are in a sound financial condition and have no potential for bankruptcy. Of the three bankruptcy prediction models, the one with the highest accuracy is the Zmijewski model.

Keyword: Financial Statements, Bankruptcy, Altman Z-score, Springate, Zmijewski, Fisheries

INTRODUCTION

The company's inability to maintain financial stability is a factor in the occurrence of financial distress so that the potential for corporate bankruptcy is greater. One of the triggers for the company's inability to stabilize its finances was caused by the Covid - 19 Pandemic, which is still having an impact on the company–fishing company. The potential for bankruptcy can be measured through an analysis of the company's financial statements. To measure the potential value of bankruptcy, several measurement models can be used, namely the Altman Z-score, Springate and Zmijewski models. With this bankruptcy analysis, it is hoped that fishing companies can consider strategies and mitigation to minimize bankruptcy.

Based on the background that has been described, the problems that will be discussed in this article can be formulated as follows:
1. What is the prediction of bankruptcy using the Altman Z-score model for fisheries sub-sector companies listed on the IDX for the 2019-2021 period?
2. What is the prediction of bankruptcy using the Springate Model for fisheries sub-sector companies listed on the IDX for the 2019-2021 period?
3. What is the prediction of bankruptcy using the Zmijewski Model for fisheries sub-sector companies listed on the IDX for the 2019-2021 period?
4. Which prediction model is the most accurate among the Altman Z-Score, Springate or Zmijewski models to predict bankruptcy in fisheries sub-sector companies listed on the IDX for the 2019-2021 period?

LITERATURE REVIEWS
Financial Accounting
Accounting creates financial information about companies. The financial information produced through the accounting process is known as financial reports. Degrees can be used for both general and specific purposes. Financial reports prepared according to standards are in the form of general purpose financial reports (Satria, 2016).

Financial accounting is an accounting field that is responsible for carrying out the entire accounting process so that financial information can be produced for external parties, namely Profit and Loss Reports, Changes in Retained Earnings Reports, Balance Sheets and Statements of Cash Flows (Rudianto, 2018).

According to Dwi in Adriansyah (2020), financial accounting is based on external reporting. The large number of external parties, each of which has different objectives, forces the parties involved in the preparation of financial reports to use principles and assumptions in preparing their financial statements.

Financial statements
Financial reports are documents that inform the financial condition of a company, besides that this information can function as an overview of a company's financial processes (Fahmi, 2014).

Financial reports can also be used as a source of information regarding a company's financial position. Financial reports can be used as a determinant of decision making for companies (Hery, 2019).

According to Kartikahadi (2016), the financial statement components have the following components:
a) Statement of Financial Position
b) Statement of profit or loss and other comprehensive income
c) Statement of Changes in Equity
d) Cash flow statement
e) Notes to Financial Statements

Bankruptcy
Bankruptcy occurs when a company is unable to pay off its short-term and long-term debts. This bankruptcy condition cannot occur suddenly, but can be investigated carefully from the periodic financial reports (Prihadi, 2011).

Bankruptcy can be interpreted as a company's failure to operate the company to make a profit (Aminah & Sanjaya, 2020). When the company has not having the ability to pay debts and the interest can be referred to as a bankruptcy condition. This condition can be seen from financial ratios, because financial ratios function as an indicator of company bankruptcy

(Prihadi, 2011).

Bankruptcy is also interpreted as the failure of a company to operate its company to generate profits (Peter & Yoseph, 2011).

According to Jauch and Glueck quoted from Adriansyah (2020), there are factors that cause the bankruptcy of a company, including:

a) Common factors which include:Economic sector; social sector; technology sector; and the government sector.
b) The company's external factors include: the customer sector; supply sector; and competing sectors.
c) The company's internal factors include: failure to pay consumers or customers in providing loans which eventually become bad debts.

Altman Z-Score models

The Altman Z-Score model can be used as a tool to predict corporate bankruptcy for the next one to three years, especially in today's modern economic conditions (Anjum, 2012).

The model known as the Revised Altman Z-Score has a mathematical formula invented by Altman in 1968, following the Altman Z-Score model formula:

$$Z = 1.2\,X1 + 1.4\,X2 + 2.3\,X3 + 0.6\,X4 + 0.99\,X5$$

Information:

Z =*Bankruptcy Index*(Bankruptcy value)
$X1$ = *Working Capital / Total Assets*
$X2$ = *Earnings Before Interest and Taxes / Total Assets*
$X3$ = *Retained Earnings / Total Assets*
$X4$ = *Market Value of Equity to Book Value of Total Debt*
$X5$ = *Sales / Total Assets*

To determine whether or not a company is bankrupt, Altman has divided three categories of values that can determine a company's bankruptcy, namely:

a) If the Z value <1.8, it can be said that the company is bankrupt.
b) If the value is $1.8 < Z < 2.99$ then it is categorized as a gray area (it cannot be determined whether the company is healthy or will experience bankruptcy).
c) If the Z value > 2.99, it can be said that the company is healthy and not bankrupt.

Springate model

In 1978, modelSpringatedeveloped by Springate using multidiscriminant analysis. This multidiscriminant analysis can identify financial ratios that are said to have an influence on an event, so that this model can be used to facilitate drawing conclusions from an event (Sunaryo, 2015).

This model succeeded in creating the following mathematical formula:

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

Information:

A = *Working Capital to Assets*
B = *Earnings Before Interest and Taxes to total Assets*
C = *Earnings Before Taxes to Current Liabilities*
D = *Sales to Total Assets*

The Springate model has indicators to determine whether a company is bankrupt or not with the following indicator values:

a) If the value of S <0.862, it can be said that the company has the potential to experience bankruptcy

b)   If the value of S> 0.862, it can be said that the company has no potential for bankruptcy.

Zmijewski model

According to Prihatini and Maria (2013), the Zmijewski Model has been researched for 20 years and the following formula is produced:

$X = -4.3 - 4.5\,X1 + 5.7\,X2 + 0.004\,X3$

Information:

X1   =*Return of Assets*(ROA) X2   = *leverage*

X3   = *Liquidity*

Indicators to assess a bankrupt or bankrupt company cannot be seen from the value *cut-off*it, namely:

a)   If the score is > 0, the company has the potential to go bankrupt

b)   If the score < 0 then the company has no potential to go bankrupt

Level of accuracy

To determine the accuracy of the bankruptcy prediction calculation model, it is necessary to test the three calculation models, namely the Altman Z-Score, Springate and Zmijewski models. According to Januri et al (2017), an accuracy test can show the most accurate forecasting model and the percentage of types of errors that exist by comparing the forecast results with the actual situation. Accuracy test can be calculated using the following formula;

$$Tingkat\ Akurasi = \frac{Jumlah\ Prediksi\ Benar}{Jumlah\ sampel} x\ 100\%$$

$$Tingkat\ Error = \frac{Jumlah\ prediksi\ salah}{jumlah\ sampel} x\ 100\%$$

$$Grey\ area = \frac{Jumlah\ grey\ area}{total\ sampel} x\ 100\%$$

Table 1. Study relevant past

No	Author	Results Research Previously	Equality With Article	Difference With article
1	(Ariyati, 2021)	Results analysis said the Altman method is the most effective method for predicting Financial Distress or bankruptcy	Method which used Altmanz and Zmijewski	Some of the methods used in previous research are not used in this article
2	Anggreai, 2019)	Method Springate Have level accuracy highestin predict corporate bankruptcy because focus on liquidity and company profitability	The method used is Altman Z-score, Springate, and Zmijewski	The company that is the object is different
3	(Kusdiana, 2014)	Accuracy prediction Alman's Z-score method is better at predicting bankruptcy bank general compared to with method CAMEL	Method which used is the Altman Z-score	The company that is the object is different

| No	Author	Results Research Previously	Equality With Article	Difference With article
4.	(Sondakh et al., 2014)	Springate analysis has the best accuracy among the Altman Z-score, Springate and Zmijewski methods	The method used is Altman Z-score, Springate, and Zmijewski	The company that is the object is different
5.	(Sinaga et al., 2019)	Companies that have more cash value tall compared to its reliability potentially safer	Method which used is the Altman Z-score	The company that is the object is different, the company that is the object is an insurance company
6.	(Rosmalin da et al., 2022)	Financial conditions that have decreased continuously over the last 5 years can indicate that the company is not healthy and can potentially bankrupt	Method which used is the Altman Z-score	The company that is the object is different, the company that is the object is PT Goodyear Indonesia TBK
7.	(Wardhani, 2022)	There is a significant difference between the Altman Z-score model and the Grover model in predicting bankruptcy	Method which used is the Altman Z-score	Some of the methods used in previous research were not used in this article and the difference between the companies, in this study the companies that were examined were food and beverage companies. Drink
8.	(Aminah & Sanjaya, 2013)	Method Altman Z- scores suitable Used for predict bankruptcy on banking companies go public in Indonesia	Method which used is the Altman Z-score	Some of the methods used in previous research were not used in this article and the differences between companies, in this study the companies that were examined were banking companies in Indonesia
9.	(Adriansy ah, 2020)	Method Altman Have level high accuracy compared to Springate, Zmihewski and more suitable used forpredict the company BUMN are the altman and springate methods	The method used is Altman Z-score, Springate, and Zmijewski	Differences in the sectors that are the object of research earlieru sing state-owned enterprises in the agricultural sector
10.	(Silk & Mais, 2019)	Profitability, liquidity and operating capacity influential negativ financialdistress then leverage and sales growth influential positiveto financial	Method which used is the Altman Z-score	Some of the methods used in previous research were not used in this article and the difference between companies, in this study the companies that were examined were mining companies in Indonesia.

Conceptual Framework
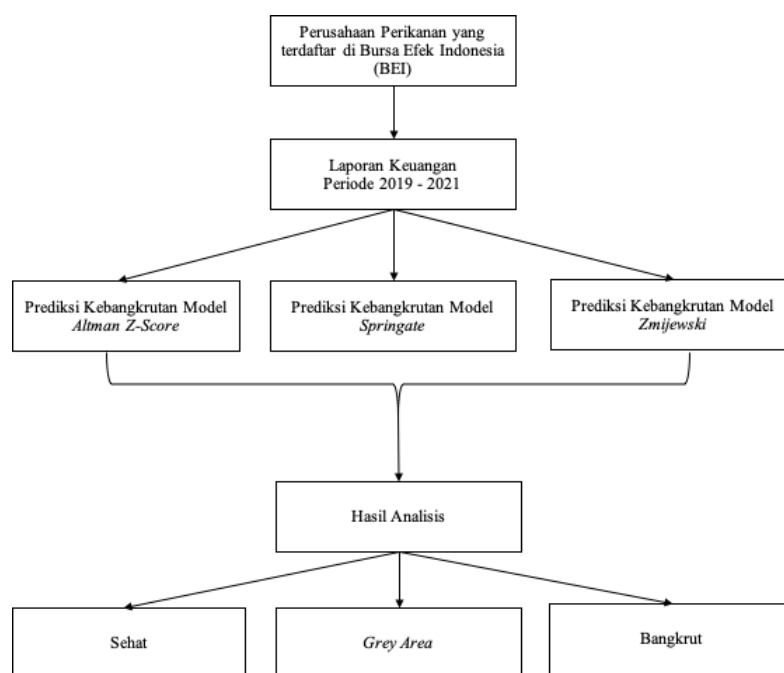
Figure 1: Thinking Framework

METHOD

The object under study isfishing companies listed on the Indonesia Stock Exchange (IDX) in 2019-2021. The number of companies to be studied is three companies. Data analysis that will be used in this study is descriptive statistics and qualitative methods through literature review using books, journals and research articles as sources.

ANALYSIS RESULTS AND DISCUSSION

Table 2. Results Calculation of the Altman Z-Score in the Fisheries Sub Sector for the 2019 - 2021 period

No	Name Company	Year	Ratio - Altman Z-Score ratio					Z-Scores
			X1	X2	X3	X4	X5	
1	FISH (PT Era Mandiri Cemerlang, TBK)	2019	0.00	0.10	0.20	0.24	1,13	1.67
		2020	0.36	-0.01	0.13	0.39	0.63	1.50
		2021	0.41	0.02	0.16	0.43	0.85	1.87
2	ENZO (PT. MorenzoAbadi Perkasa Tbk)	2019	0.33	0.02	-0.01	0.32	1.69	2.34
		2020	0.21	0.01	0.00	0.50	1.84	2.56
		2021	0.03	0.06	0.08	0.47	3.80	4.45
3	SO THAT (PT. Asia Sejahtera Mina, Tbk)	2019	0.48	0.01	0.03	0.68	1.93	3,12
		2020	0.51	-0.01	0.02	0.93	1.91	3,36
		2021	0.49	0.02	0.04	0.85	2,17	3.56

Source: Processed data, 2022

The results in Table 2 show the results of the Altman Z-score calculation, with the results in the fisheries sub-sector listed on the IDX for the period 2019 to 2021 there are companies that have the potential to go bankrupt, are in the gray area and are in good health. Companies that have a healthy condition are companies with the issuer code AGAR or PT Asia Sejahtera Mina, TBK, the company has always been in a healthy condition for the last 3 years which indicates that the management of financial ratios is very good and the company is able to maintain a healthy company financial condition. For companies with the code

ENZO or PT Moreno Abadi Perkasa, TBK will be in the gray area in 2019 and 2020 but in 2021 financial conditions will start to show a healthy value, in other words ENZO can get out of the gray area zone. Meanwhile, for the IKAN code or PT Era Mandiri Cemerlang.

Table 3. Springate Calculation Results in the Fisheries Sub-Sector for the 2019-2021 Period

Variable	FISH (PT Era Brilliant Independent, TBK)			ENZO (PT. Morenzo Abadi Perkasa Tbk)			AGAR (PT. Asia Sejahtera Mina, Tbk)		
	2019	2020	2021	2019	2020	2021	2019	2020	2021
A	0.000	0.357	0.410	0.329	0.212	0.032	0.475	0.513	0.488
B	0.097	-0.013	0.023	0.015	0.010	0.062	0.005	-0.006	0.017
C	0.108	-0.019	0.038	0.026	0.019	0.106	0.011	-0.015	0.036
D	1.144	0.639	0.863	1,686	1,839	3,799	1,933	1,906	2,169
S	0.826	0.572	0.863	1,078	0.997	1,813	1,286	1,262	1,447

Source: Processed data, 2022

According to Table 3 it can be seen that there isa company that has the potential to experience bankruptcy, namely PT Era Mandiri Cemerlang with the IKAN code because in two consecutive years 2019 and 2020 it reflects a value of S<0.862 which means it has the potential for bankruptcy, but in 2021 it managed to get out of the bankruptcy zone because in 2021 the value of S> 0.862 which is 0.863. Meanwhile, two other fishing companies, namely PT Morenzo Abadi Perkasa, TBK (ENZO) and PT Asia Sejahtera Mina, TBK (AGAR) have a value of S> 0.862 for three consecutive years which means that these companies have no potential for bankruptcy.

Table 4. Results Table Zmijewski's Calculations in the Fisheries Sub-Sector for the 2019-2021 Period

Variable	FISH (PT Era Brilliant Independent, TBK)			ENZO (PT. Morenzo Abadi Perkasa Tbk)			AGAR (PT. Asia Sejahtera Mina, Tbk)		
	2019	2020	2021	2019	2020	2021	2019	2020	2021
X1	0.049	-0.008	0.012	0.004	0.004	0.035	0.002	-0.004	0.009
X2	0.650	0.478	0.452	0.638	0.468	0.464	0.450	0.377	0.394
X3	1,001	1.635	1,777	1.085	1,469	1,489	2.075	2,448	2,227
Zmijewski	-0.812	-1,530	-1,771	-0.679	-1,644	-1,804	-1,735	-2,119	-2,086

Based on table 4, it can be seen that if calculations are carried out using the Zmijewski model there is not a single fisheries sub-sector company listed on the IDX for the period 2019 to 2020 that has the potential to experience bankruptcy, from the last three years it can be seen from the three companies namely IKAN or PT Era Mandiri Cemerlang, TBK, ENZO or PT Morenzo Abadi Perkasa, TBK and AGAR or PT Asia Sejahtera Mina, TBK have a value less than zero means that the company has no potential for bankruptcy.

Table 5. Testing the Prediction Accuracy of the Altman Z-Score, Springate and Zmijewski Models

predictions	Altman Z-Score	Springate	Zmijewski
Bankrupt	2	2	0
Gray Area	3	0	0
Healthy	4	7	9
Total	9	9	9
Accuracy (%)	**44%**	**78%**	**100%**
Error Type (%)	**22%**	**22%**	**0%**

| *Gray Area (%)* | **33%** | **0%** | **0%** |

Source; Data processed, 2022

Based on table 5 it can be seen that the level of accuracy of the three bankruptcy prediction models, namely the Altman Z-Score, Springate and Zmijewski models have different levels of accuracy. Of the three models that have the highest accuracy, namely Zmijewski with a value of 100%, then Springate with a value of 78% and the last is the Altman Z-Score model with a value of 44%. With this accuracy test, it can be said that the most appropriate bankruptcy prediction for use in predicting the bankruptcy of fishing companies listed on the Indonesia Stock Exchange is the Zmijewski model.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

1. Based on an analysis of the Altman Z-Score model bankruptcy prediction for the last three years, fishing companies listed on the Indonesia Stock Exchange for the 2019-2021 period that are predicted to experience bankruptcy are PT Era Mandiri Cemerlang, TBK with the code IKAN even in 2021 it will still be in the gray area. PT Morenzo Abadi Perkasa, TBK with the ENZO code is in the gray area for two consecutive years in 2019 and 2020 while in 2021 it has experienced a healthy financial condition. At PT Asia Sejahtera Mina, TBK with code AGAR has had a healthy financial condition for the last three years.

2. Based on an analysis of the Springate model bankruptcy prediction for the last three years, namely 2019 to 2021, fishing companies listed on the Indonesia Stock Exchange for the period 2019 - 2021, companies that have the potential to experience bankruptcy are PT Era Mandiri Cemerlang, TBK with the code IKAN due to the value in 2019 and 2020 shows a value of <0.862 which indicates a bankruptcy value but in 2021 a prediction value of <0.863 is obtained which indicates that the company has started to have a healthy financial condition. At PT Morenzo Abadi Perkasa, TBK with the ENZO code and PT Asia Sejahtera Mina, TBK with the AGAR code have a value of >0.863 over the past three years which indicates that the company's financial condition is in good health.

3. Based on the analysis of Zmijewski's bankruptcy prediction model for the last three years, namely 2019 to 2021, fishing companies listed on the Indonesia Stock Exchange for the period 2019 - 2021, companies that have the potential to go bankrupt do not exist because the three companies, namely PT. Era Mandiri Cemerlang, TBK with the code IKAN, PT Morenzo Abadi Perkasa, TBK with the ENZO code and PT Asia Sejahtera Mina, TBK with the AGAR code have a test result value of less than 0 (<0) which means that the financial condition of the three companies is in a healthy condition.

4. Based on the accuracy test of the three bankruptcy prediction models, the result is that the Zmijewski model is the most accurate model for predicting bankruptcy for fishing companies listed on the Indonesia Stock Exchange for the period 2019 to 2021 because the test results for its accuracy are 100% while the Springate model has a test value of 78% and the Altman Z-Score model has an accuracy test value of only 44%.

Suggestion

There are quite a number of bankruptcy research models currently available, it is hoped that future research can test this research with other prediction models such as the Grover prediction model or others and add a time period, so that this research is more comprehensive.

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