COMPARATIVE ANALYSIS USING THE ALTMAN, SPRINGATE, GROVER, ZMIJEWSKI, AND TAFFLER MODELS IN ASSESSING FINANCIAL DISTRESS BEFORE AND DURING THE COVID-19 PANDEMIC
(Empirical Study on Transportation and Logistics Companies Listed on the Indonesia Stock Exchange 2017-2022)

Rizki Padia Rachman[1], Ela Widasari[2], Siti Mudawanah[3]

[1]FEB Universitas La Tansa Mashiro, rizkifadi4@gmail.com, Indonesian
[2]FEB Universitas La Tansa Mashiro, elawidasari@gmail.com, Indonesian
[3]FEB Universitas La Tansa Mashiro, sitimudawanah.m.akt@gmail.com, Indonesian
Corresponding author rizkifadi4@gmail.com.

ABSTRACT

The purpose of this study was to find out whether there were major changes in the level of financial distress prior to and during COVID-19outbreak by using the Altman, Springate, Grover, Zmijewski, and Taffler assessment models for companies engaged in the transportation and logistics industry listed on the IDX in 2017-2022, as well as finding out whether there is a model with the highest accuracy among these models. Purposive sampling was used as a sampling technique in this study, resulting in a total sample of 18 companies. At the same time, the data analysis technique uses descriptive statistical analysis, normality tests, hypothesis testing consisting of paired sample t-tests, Wilcoxon signed-rank tests, and Calculation of the accuracy level of each model. The research findings showed no major changes in the level of financial distress prior to and during the COVID-19 outbreak using the Altman, Springate, Grover, Zmijewski, and Taffler models. In addition, there is a model with the highest level of accuracy, namely the Zmijewski model, with an accuracy rate of 74.07%, exceeding the Springate model of 69.44%, the Taffler model of 69.44%, the Grover model of 67.59%, and the Altman model. of 59.26%.

Keywords: ***Financial Distress;*** **Altman Model; Springate Model; Grover Model; Zmijewski Model; Taffler Model.**

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1. Introduction

The emergence of the COVID-19 outbreak has surprised various countries because of its great impact on various aspects, including Indonesia. Based on the results of data from the Central Statistics Agency (2021), in the first year of the COVID-19 outbreak, namely 2020, Indonesia experienced a contraction in Gross Domestic Product (GDP) growth at -2.07%. Which made Indonesia experience deflation because it had less stable economic movements. This economic turmoil occurs not without reason. Various positive policies issued by the government to reduce the chain of the spread of the COVID-19 outbreak hurt the country's economy, such as the restriction of community activities through social distancing simultaneously throughout Indonesia, which ultimately hampered the economic turnover (Mawar et al., 2021).

The transportation and logistics industry has been among those worst hit by the COVID-19 outbreak. Based on Badan Pusat Statistik's Analysis of Survey Data on COVID-19's Effect on Business Actors (2020), the transportation and warehousing industries are placed

in third place with the largest decrease in revenue due to the COVID-19 outbreak, which is 90.34%. This is comparable to what happened to the company PT Air Asia Indonesia Tbk, which experienced a decrease in revenue of 75.98%, and PT Express Transindo Utama Tbk, which experienced a decrease in revenue of 83.95% in the first year of COVID-19, namely 2020.

The existence of the COVID-19 outbreak is a new challenge for every company to prepare the right strategy in dealing with this situation to prevent serious financial problems that can hamper the company's operating activities, such as financial distress. Financial distress itself is a situation when a business cannot fulfill its commitments in paying financial obligations. According to Kristanti (2019:2), the existence of financial distress can endanger the corporation's financial system, as well as management and the organization as a whole. In this case, it means that financial distress can be a natural selection that has the potential to knock the company out of the market if the company is unable to survive and make appropriate strategic steps. Knowing whether the company is experiencing financial distress as early as possible is a very good step because this can be beneficial for the company as a warning before bankruptcy occurs. In measuring the level of financial distress of a company, various analytical approaches can be applied. Among them are using the Altman, Springate, Grover, Zmijewski, and Taffler models.

Based on the results of the previous analysis. According to Putra & Bhilawa's research (2022) using the Altman model, supported by Fitriyani's research (2022) using the Grover model, and also supported by the results of Nafisamuna & Nurfauziah's research (2021) using the Zmijewski model, it shows that between the period prior to and during the COVID-19 outbreak there was no big change in the level of financial distress. This is different from the results of a study by Marselina et al. (2023) using the Springate model and the results of a research by Kassidy & Handoko (2022) using the Taffler model, showing that between the period prior to and during the COVID-19 outbreak showed a big change in the level of financial distress.

Meanwhile, for the accuracy level of each of these models. According to Aadilah (2022), there is the highest level of accuracy between the Altman and Springate models. According to the results of Wahyuni & Rubiah's research (2021) that the Altman model has the highest accuracy (76% accuracy), above the Zmijewski (70.67% accuracy), the Springate (69.33% accuracy), and the Grover (69.33% accuracy). According to the results of a study by Mulyani et al. (2021) that the Springate model has the highest accuracy (83.33% accuracy), above the Grover (72.92% accuracy), Zmijewski (70.83% accuracy), and Altman model (68.75% accuracy). According to the results of a study by Asmaradana & Satyawan (2022) that the Grover model has the highest accuracy (82% accuracy), above the Zmijewski (80% accuracy), Altman (77% accuracy), Springate (48% accuracy), and Ohlson (24% accuracy). According to the results of Listyarini's research (2020), the Zmijewski model has the highest accuracy (100% accuracy), above the Altman (75% accuracy), and the Springate (89.29% accuracy). Finally, according to the results of Wirawan & Pangestu's research (2022), the highest accuracy is in the Taffler model (76.14% accuracy), above the Grover (69.32% accuracy), and the Fulmer (63.64% accuracy).

Based on the explanation above, there are inconsistencies in the results of previous research, and it is suspected that the COVID-19 outbreak can cause major changes in the level of financial distress, especially for companies engaged in the transportation and logistics industry.Therefore, the authors are interested in conducting this research to find out whether there is a large change in the level of financial distress between the period prior to and during the COVID-19 outbreak using several different analytical models so that it is expected to produce comprehensive conclusions because each model has its shape and characteristics. In addition, this study seeks to determine whether, among the Altman, Springate, Grover,

Zmijewski, and Taffler assessment models, there is a model with the best accuracy. The following is the hypothesis proposed in this study:

H1: Prior to and during the COVID-19 outbreak, there was a large change in the value of financial distress using the Altman model for companies operating in the transportation and logistics industry.

H2: Prior to and during the COVID-19 outbreak, there was a large change in the value of financial distress using the Springate model for companies operating in the transportation and logistics industry.

H3: Prior to and during the COVID-19 outbreak, there was a large change in the value of financial distress using the Grover model for companies operating in the transportation and logistics industry.

H4: Prior to and during the COVID-19 outbreak, there was a large change in the value of financial distress using the Zmijewski model for companies operating in the transportation and logistics industry.

H5: Prior to and during the COVID-19 outbreak, there was a large change in the value of financial distress using the Taffler model for companies operating in the transportation and logistics industry.

H6: There is the highest level of accuracy among the Altman, Springate, Grover, Zmijewski, and Taffler models in assessing the level of financial distress in companies engaged in the transportation and logistics industry listed on the IDX in 2017-2022.

2. Literature Review

2.1 Signal Theory

According to Firmansyah & Irawan (2017), the signal theory is a theory that explains how a business can send signals to people who use financial statements, owners, or other interested parties. This signal provides information about the status of the company.

Based on the signal theory that financial reports can be used as positive or negative signals, which can help investors and other parties in making business and investment decisions. (Saputra et al., 2022).

Therefore, it can be concluded that signal theory is a theory that explains how businesses can provide signals or signs to interested parties to support future business decision-making.

2.2 Financial Distress

According to Sjahrial (2014:584), financial difficulties occur when the cash flow of business operations is not sufficient to pay loans to creditors and distribute dividends to investors, so corrective action is required. Meanwhile, according to Kason et al. (2020), financial distress state when the company is struggling to pay debts and has limited ability to do so. Additionally, as a result of this circumstance, the corporation is no longer able to cover its operating expenses.

Therefore, it can be concluded that financial distress occurs when a company cannot fulfill its obligations to creditors and investors. In other words, the company cannot pay its debts and cannot pay dividends.

2.3 Bankruptcy

Financial distress has a relationship with bankruptcy. Where the default faced by the company begins with financial distress first. Bankruptcy, according to Puro et al. (2019), is an

official statement of the corporation's financial condition by the state in which the state announces the termination of a company's business activities because the company faces financial pressures that cannot be resolved, which ultimately leads to bankruptcy. Meanwhile, according to Purnajawa & Merkusiwati (2014), bankruptcy occurs when a corporation lacks the funds to run its operations.

So it can be concluded that bankruptcy is a situation where the company gets financial pressure that cannot be resolved due to insufficient funds, which ultimately stops the company's business activities, and the termination has been recognized by the state.

2.4 Financial Distress Assessment Model

2.4.1 Altman Model

The Altman model financial distress assessment or commonly referred to as the Z-score formula, was first introduced in 1968 as a result of research from Edward I Altman. The Altman model had undergone several developments and, in the end, had the following formulas: (Rudianto, 2013:254)

$$\textbf{Z-Score} = \mathbf{6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4}$$

Description:
X_1 = Working Capitan/Total Asset
X_2 = Retaining Earning/Total Asset
X_3 = EBIT/Total Asset
X_4 = Book Value of Equity/Book Value of Debt
The assessment criteria in the Altman model are:
a. Z-Score > 2.60, then non-distress.
b. Z-Score is 1.1 – 2.60, then in the gray area.
c. Z-Score < 1.1, then in financial distress.

2.4.2 Model Springate

The Springate model financial distress assessment or commonly referred to as the S-Score formula is a model created by Gordon L.V. Springate in 1978 as an extension of the Altman model. The following is the form of the Springate model: (Rudianto, 2013:262)

$$\textbf{S-Score} = \mathbf{1.03X_1 + 3.07X_2 + 0.66X_3 + 0.4X_4}$$

Description:
X_1 = Working Capitan/Total Asset
X_2 = EBIT/Total Asset
X_3 = EBT/Current Liabilities
X_4 = Sales/Total Asset
The assessment criteria in the Springate model are:
a. S-Score > 0.862, then non-distress.
b. S-Score < 0.862, then in financial distress.

2.4.3 Model Grover

The Grover model financial distress assessment, often known as the G-Score formula, was created by Jeffrey S. Grover in 2001. This model is an improvement of the Altman model. The following is the shape of this model: (Sampe et al. 2023:21)

$$\textbf{G-Score} = \mathbf{1.650X_1 + 3.404X_2 + 0.016X_3 + 0.057}$$

Description:
X_1 = Working Capitan/Total Asset
X_2 = EBIT/Total Asset
X_3 = ROA
The assessment criteria in the Grover model are:

a. G-Score ≥ 0.01, then non-distress.
b. G-Score -0.02 – 0.01, then in the gray area.
c. G-Score ≤ -0.\02, then in financial distress.

2.4.4 Model Zmijewski

Zmijewski model analysis or commonly referred to as the X-Score formula is a form of the model created by Mark Zmijewski in 1984 as a form of development of various models that have existed before and is used as a tool to assess the potential survival of the business. The following is the form of the Zmijewski model: (Rudianto, 2013:264)

$$\textbf{X-Score} = -4.3 - 4.5X_1 + 5.7X_2 - 0.004X_3$$

Description:
X_1 = *ROA*
X_2 = *Debt Ratio*
X_3 = *Current Ratio*
The assessment criteria in the Zmijewski model are:
a. X-Score < 0, then non-distress.
b. X-Score ≥ 0, then in financial distress.

2.4.5 Model Taffler

Taffler model analysis or commonly referred to as the T-Score formula is a form of the model created and introduced by Taffler in 1983 and is based on research concerning the Altman model analysis. The following is the shape of this model: (Adamko & Chutka, 2020)

$$\textbf{T-Score} = 0.53X_1 + 0.13X_2 + 0.18X_3 + 0.16X_4$$

Description:
X_1 = EBT/Current Liabilities
X_2 = Current Ratio
X_3 = Current Liabilities/Total Asset
X_4 = Sales/Total Asset
The assessment criteria in the Grover model are:
a. T-Score > 0.3, then non-distress.
b. T-Score 0.2 – 0.3, then in the gray area.
c. T-Score < 0.2, then in financial distress.

3. Research Methodology

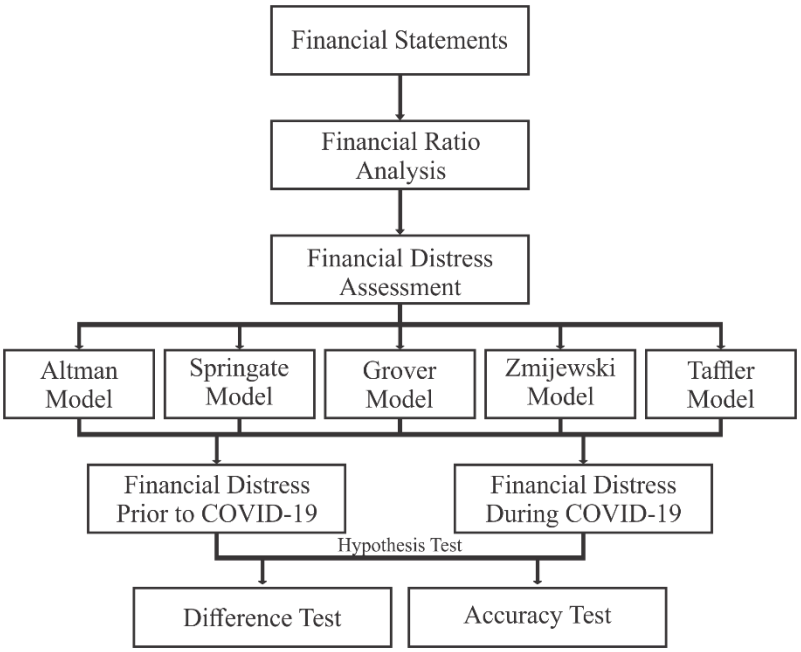
This study uses a quantitative approach because the data is in numbers, and the analysis uses statistics. The population of this study is 32 companies engaged in the transportation and logistics industry listed on the IDX in 2017-2022. The sample selection in this study used a purposive sampling technique with the following criteria. First, companies engaged in the transportation and logistics industry and listed on the IDX from 2017 to 2022. Second, companies publish complete annual financial reports from 2017 to 2022. Third, companies that present financial reports in rupiah. To produce a final sample of 18 companies.

Secondary data in the form of financial reports from the IDX through the website www.idx.co.id is used in this study. Then analyze the required ratios and financial distress using the Altman, Springate, Grover, Zmijewski, and Taffler models for the period prior to the COVID-19 outbreak, from 2017 to the year 2019, and during the COVID-19 outbreak, from 2020 to the year 2022. With the help of the SPSS application version 25, data analysis techniques used descriptive statistical analysis, normality tests, and hypothesis tests consisting of paired sample t-tests for normally distributed data and Wilcoxon's signed ranking test for abnormally data distribution. In addition, an accuracy test was also carried out to determine the

level of accuracy of each analytical model used in this study. While the framework of thought in this study is as follows.

Picture 1. Framework
Source: author's processed data, 2023

4. Result



4.1 Descriptive Statistical Analysis

Table 1. Descriptive Statistical Analysis Results

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Altman Prior to COVID-19	54	-57.28	15.87	-.5291	10.44319
Altman During COVID-19	54	-47.78	12.87	-2.8203	11.76907
Springate Prior to COVID-19	54	-2.86	3.18	.4532	1.11958
Springate During COVID-19	54	-3.00	10.47	.3563	1.92597
Grover Prior to COVID-19	54	-3.58	1.85	.0751	.93635
Grover During COVID-19	54	-4.10	1.57	-.1310	1.13441
Zmijewski Prior to COVID-19	54	-4.21	9.39	-.8228	2.88331
Zmijewski During COVID-19	54	-12.71	14.57	-.6152	4.03326
Taffler Prior to COVID-19	54	-.47	2.23	.5054	.61419
Taffler During COVID-19	54	-.69	9.39	.5452	1.35845
Valid N (listwise)	54				

Source: Output SPSS 25, 2023.

4.2 Normality Test

Table 2. Shapiro-Wilk Normality Test Results

	Shapiro-Wilk			Description
	Statistic	df	Sig.	
Altman Prior to COVID-19	.864	18	.014	Abnormally
Altman During COVID-19	.813	18	.002	Abnormally
Springate Prior to COVID-19	.952	18	.460	Normally
Springate During COVID-19	.940	18	.282	Normally
Grover Prior to COVID-19	.901	18	.059	Normally
Grover During COVID-19	.898	18	.053	Normally
Zmijewski Prior to COVID-19	.857	18	.011	Abnormally
Zmijewski During COVID-19	.841	18	.006	Abnormally
Taffler Prior to COVID-19	.804	18	.004	Abnormally
Taffler During COVID-19	.751	18	.000	Abnormally

Source: Output SPSS 25, 2023.

4.3 Hypothesis Test

Based on the normality test shows that the data prior to and during the COVID-19 outbreak with the Altman, Zmijewski, and Taffler models are not normally distributed. Hence, the difference test uses the Wilcoxon signed-rank test. The following are the results of this test.

Table 3. Wilcoxon Signed Rank Test Results Altman, Grover, and Zmijewski Models

		Sig.
Pair 1	Altman Prior to COVID-19 - Altman During COVID-19	0.102
Pair 2	Zmijewski Prior to COVID-19 - Zmijewski During COVID-19	0.327
Pair 3	Taffler Prior to COVID-19 - Taffler During COVID-19	0.372

Source: Output SPSS 25, 2023.

The test results using the Wilcoxon signed rank resulted in a Sig value in the Altman model of 0.102 > 0.05, a Sig value in the Zmijewski model of 0.327 > 0.05, and the Sig value in the Grover model is 0.372 > 0.05. This shows no big change in the value of financial difficulty experienced by corporations working in the transport and logistics sector using the Altman, Zmijewski, and Taffler models prior to and during the COVID-19 epidemic. Then the first hypothesis (H1), the fourth hypothesis (H4), and the fifth hypothesis (H5) are rejected.

Meanwhile, it is known that the data prior to and during the COVID-19 outbreak using the Springate and Grover models are normally distributed, so the difference test uses the paired sample t-test. Here are the results of paired sample t-test tests.

Table 4. Paired Sample T-Test Results of Springate and Grover Models

		Sig.
Pair 1	Springate Prior to COVID-19 - Springate During COVID-19	0.771
Pair 2	Grover Prior to COVID-19 - Grover During COVID-19	0.253

Source: Output SPSS 25, 2023.

The test results with the paired sample t-test produced a Sig value on the Springate model of 0.771 > 0.05 and a Sig value on the Springate model of 0.253> 0.05. This shows no major change between the value of financial difficulty prior to and during the COVID-19

outbreak in corporations engaged in the transportation and logistics industry using the Springate and Grover models. So the second hypothesis (H2) and the third hypothesis (H3) are rejected.

Finally, test accuracy. In this test, a company is categorized as financial distress if the company has negative net income and does not distribute dividends in the period concerned and is categorized as non-distress if the company has positive net income in the period concerned. In addition, there are two types of errors. First, error type I is when the model assesses that the sample is not distressed, but is distressed. Second, type II error occurs when the model assesses the sample as distressed, but it is not distressed. Here are the results.

Table 5. Accuracy Test Results of Altman, Springate, Grover, Zmijewski, and Taffler Models

No	Model	Correct Assessment	Error Type I	Error Type II	Ranking
1	Model Altman	59.26%	12.04%	28.70%	5
2	Model Springate	69.44%	0.00%	30.56%	2
3	Model Grover	67.59%	18.52%	13.89%	4
4	**Model Zmijewski**	**74.07%**	**21.30%**	**4.63%**	**1**
5	Model Taffler	69.44%	12.96%	17.59%	3

Source: author's processed data, 2023.

The accuracy test results show that there are differences in the accuracy level of each model used in this study, so the sixth hypothesis (H6) is accepted,

5. Discussion

5.1 Financial Distress Levels Using the Altman Model

The first hypothesis shows no major change between the value of financial difficulty prior to and during the COVID-19 outbreak in corporations engaged in the transportation and logistics industry when the Altman model is applied. In addition, the average value of the Z-Score prior to the COVID-19 outbreak was -0.5291, and during the COVID-19 outbreak was -2.8203. Based on the Altman model criteria, prior to the COVID-19 outbreak, the average company experienced financial distress, and the risk of financial distress increased when the COVID-19 outbreak occurred. This study's results align with the results of Putra & Bhilawa's (2022) research.

5.2 Financial Distress Levels Using the Springate Model

The second hypothesis shows no major change between the value of financial difficulty prior to and during the COVID-19 outbreak in corporations engaged in the transportation and logistics industry when the Springate model is applied. In addition, the average value of the S-Score prior to the COVID-19 outbreak was 0.4532, and during the COVID-19 outbreak was 0.3563. Based on the Springate model criteria, prior to the COVID-19 outbreak, the average company experienced financial distress, and the risk of financial distress increased when the COVID-19 outbreak occurred. This study's results differ from those of Marselina et al. (2023) research.

5.3 Financial Distress Levels Using the Grover Model

The third hypothesis shows no major change between the value of financial difficulty prior to and during the COVID-19 outbreak in corporations engaged in the transportation and logistics industry when the Grover model is applied. In addition, the average G-Score prior to the COVID-19 outbreak was 0.0751, and during the COVID-19 outbreak was -0.1310. Based on the criteria of the Grover model, prior to the COVID-19 outbreak, the average company in the transportation and logistics sector did not experience financial distress. Meanwhile, during

the COVID-19 outbreak, the average company experienced financial difficulties. This study's results align with the results of Fitriyani's (2022) research.

5.4 Financial Distress Levels Using the Zmijewski Model

The fourth hypothesis shows no major change between the value of financial difficulty prior to and during the COVID-19 outbreak in corporations engaged in the transportation and logistics industry when the Zmijewski model is applied. In addition, the average X-Score prior to the COVID-19 outbreak was -0.8228, and during the COVID-19 outbreak was -0.6152. Based on the Zmijewski model criteria, both prior to and during the Covid-19 outbreak, companies engaged in the transportation and logistics industry on average did not experience financial distress, but the potential for financial distress increased during the Covid-19 outbreak. This study's results align with Nafisamuna & Nurfauziah's (2021) research.

5.5 Financial Distress Levels Using the Tafflerr Model

The fifth hypothesis shows no major change between the value of financial difficulty prior to and during the COVID-19 outbreak in corporations engaged in the transportation and logistics industry when the Taffler model is applied. In addition, the average T-Score Prior to the COVID-19 outbreak was 0.5054, and during the COVID-19 outbreak was 0.5452. Based on the Taffler model criteria, prior to the COVID-19 outbreak, the average company engaged in the transportation and logistics industry did not experience financial distress. Even during the COVID-19 outbreak, there was a reduction in the risk of financial distress. This study's results differ from those of Kassidy & Handoko's (2022) research.

5.6 Highest Accuracy Among Altman, Springate, Grover, Zmijewski, and Taffler Models

The sixth hypothesis is accepted. This means that there are differences in the accuracy level of each of these models, where the accuracy test results show that the highest level of accuracy is found in the Zmijewski model, which is 74.07%, with a type I error rate of 12.04% and a type II error of 28.70%. Meanwhile, the Springate model is 69.44%, the Taffler model is 69.44%, the Grover model is 67.59%, and the Altman model is 59.26%. This Study's result aligns with the result of Aadillah's (2022) research and Listyarini's (2020) research.

This insignificant change is because the peak of the economic decline during the Covid-19 outbreak only occurred from 2020 to 2021 when restrictions on community activities were still strictly enforced. Whereas for 2022, the restrictions on community activities are not as strict as in the previous year, thus making companies in 2022 begin to rise from the economic downturn. examples such as the following company.

Table 6. Net Income PT.Blue Bird Tbk 2017-2022

Company	Year	Net Income (IDR)
PT. Blue Bird Tbk (BIRD)	2017	427,495,000,000
	2018	460,273,000,000
	2019	315,622,000,000
	2020	(163,183,000,000)
	2021	8,720,000,000
	2022	364,027,000,000

Source: author's processed data, 2023

The table above shows that PT. Blue Bird Tbk, in the first year of the Covid-19 outbreak, namely 2020, suffered a loss of IDR.163,183,000,000. However, in the second year of the Covid-19 outbreak, namely 2021, the company began to adapt so that it managed to regain profits that year, even though it was only IDR.8,720,000,000, and in the third year of

the Covid-19 outbreak, namely 2022, the company began to stabilize again and earned a profit of IDR.364,027,000,000.

In addition, this insignificant change can be based on the existence of several transportation and logistics companies that have not experienced major changes in the level of financial difficulty due to the COVID-19 outbreak when viewed from the score results using the Altman, Springate, Grover, Zmijewski, and Taffler models, for example, the following company.

Tabel 7. Z-Score, S-Score, G-Score, X-Score, and T-Score of PT.Pelayaran Nelly Dwi Putri Tbk Year 2017-2022

Perusahaan	Tahun	Z-Score	S-Score	G-Score	X-Score	T-Score
PT.Mineral Sumberdaya Mandiri Tbk (AKSI)	2017	4.5732	1.7409	0.7854	-3.2867	1.0129
	2018	2.6173	1.3631	0.7216	-1.3150	0.6958
	2019	3.2105	1.4370	0.8860	-0.9499	0.6058
	2020	2.2603	1.0748	0.5183	-0.6867	0.5651
	2021	3.9335	1.6169	0.9113	-1.7021	0.7756
	2022	3.9440	1.5460	0.8734	-1.9494	0.7531
PT. Pelayaran Nelly Dwi Putri Tbk (NELY)	2017	15.8746	1.5225	0.6606	-4.1592	1.5925
	2018	12.3203	2.3723	0.8865	-4.2122	2.1111
	2019	10.7820	2.2799	0.7791	-4.0626	2.0694
	2020	10.9672	2.0376	0.7262	-3.9796	2.0486
	2021	11.3876	1.9402	0.6165	-4.1063	1.6535
	2022	12.8651	3.3487	1.0245	-4.5793	2.5153

Source: author's processed data, 2023.

Based on the score results in the table above, when viewed from the criteria of each model, it shows that PT.Mineral Sumberdaya Mandiri Tbk and PT.Pelayaran Nelly Dwi Putri Tbk, both during prior to and during the COVID-19 outbreak, the corporation is in a state of non-distress. Moreover, in the third year of COVID-19, namely in 2022, it is the year with the best score for PT.Pelayaran Nelly Dwi Putri Tbk according to several assessment models.

Although the results of the research showed that there were no major changes in the level of financial difficulties prior to and after the COVID-19 outbreak, however, that does not mean that companies can ignore the threat of the COVID-19 outbreak because this outbreak still has the potential to increase the risk of financial difficulty for several companies. This can be seen based on descriptive statistical analysis, which shows that the average score of each model is getting worse, except for the Taffler model. This means that the average company in the transportation and logistics sector during the COVID-19 outbreak experienced an increased risk of financial distress, and it could get worse if the company ignored the threat of the COVID-19 outbreak.

6. Conclusion

6. 1 Conclusion

1. Prior to and during the COVID-19 outbreak, there was no major change in the value of financial distress using Altman's model for companies engaged in the transportation and logistics industry.
2. Prior to and during the COVID-19 outbreak, there was no major change in the value of financial distress using Springate's model for companies engaged in the transportation and logistics industry.

3. Prior to and during the COVID-19 outbreak, there was no major change in the value of financial distress using Grover's model for companies engaged in the transportation and logistics industry.
4. Prior to and during the COVID-19 outbreak, there was no major change in the value of financial distress using Zmijewski's model for companies engaged in the transportation and logistics industry.
5. Prior to and during the COVID-19 outbreak, there was no major change in the value of financial distress using Taffler's model for companies engaged in the transportation and logistics industry.
6. There is the highest level of accuracy among the Altman, Springate, Grover, Zmijewski, and Taffler models in assessing the level of financial distress in companies engaged in the transportation and logistics industry listed on the IDX in 2017-2022, that is, the Zmijewski model has the best accuracy (74.07% accuracy), followed by the Springate model (69.44% accuracy), the Taffler model (69.44% accuracy), the Grover model (67.59%), and the Altman model (59.26% accuracy).

6. 2 Suggestions

Hopefully, this research can be developed specifically on the financial distress assessment model used. It is known that there are still several assessment models that are not used in this study, such as the Fulmer, Ohlson, and Foster models. Therefore, the authors suggest this model can be used in further research. In addition, it is hoped that companies can learn from the Covid-19 incident that emerged in 2020 in Indonesia so that when similar conditions occur again, companies are better prepared to face it.

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