Analysis of Financial Distress with The Altman, Springate, Zmijewski, Grover, and Taffler Models in The Consumer Cyclicals Sector in The Covid-19 Pandemic

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Abstract. The Covid-19 pandemic has changed the order of the world economy, which allows for financial distress (financial distress) in a company. This study aims to determine the financial distress condition of companies in the consumer cyclicals sector in 2018-2021 using the Altman, Springate, Zmijewski, Grover, and Taffler models. In addition, to find out the difference in financial distress before the Covid-19 pandemic occurred with during the Covid-19 pandemic and the level of accuracy of each model used. This research is a type of quantitative research using a purposive sampling technique so 66 samples were selected. The data used is secondary data, in the form of financial statements for 2018-2021. The results of the study show that there are differences in each of the financial distress prediction models used. The results of the average difference test (paired simple T-test) from the prediction model used only the Altman model which shows no difference in financial distress conditions before the Covid-19 pandemic occurred during the Covid-19 pandemic. Meanwhile, the Springate, Zmijewski, Grover, and Taffler models show differences in financial distress conditions. The accuracy level of the Altman model is 87.88%, Taffler 83.71%, Grover 74.24%, Springate 73.48%, and Zmijewski 68.18%. So it can be concluded that the Altman model is the model with the highest level of accuracy in predicting financial distress in the consumer cyclicals sector of companies.

Keywords: consumer cyclicals; financial distress; Altman; Springates; Zmijewski; Grover; Taffler; covid-19 pandemic.

1. Introduction

Covid-19 has changed the entire structure of social life, created a global health crisis, and reduced economic performance in most countries in the world, and Indonesia is no exception. Based on BPS data for 2022, there is a significant difference between economic growth before and during the Covid-19 pandemic in Indonesia. Indonesia's economic growth before the Covid-19 pandemic was relatively stagnant, namely around 5.04%. Meanwhile, during the Covid-19 pandemic in 2020, Indonesia's economic growth dropped drastically and even reached -2.07%. Economic growth is known to be positive again in 2021, which is 3.69%.

The Covid-19 pandemic that has occurred throughout the world has also affected the investment world in Indonesia. One sector that is greatly affected by the Covid-19 pandemic is *consumer cyclical*. This sector is directly proportional to economic growth and moves along the economic cycle through expansion, peak, recession, and recovery. Stock prices in the *consumer cyclicals sector* are influenced by macroeconomic changes or the economy in a country as a whole. When the economy grows, people's purchasing power in this sector will also increase. Vice versa, if the economy in a country experiences a slowdown, the

purchasing power of the people in the country concerned in this sector will decrease. [1] reveals that companies in the *consumer cyclicals* are companies whose sales and profits rise and fall periodically or predictably. The *consumer cyclicals sector* based on data released by the IDX has 14 sub-sectors, namely *Auto Components, Automobiles, Household Goods, Consumer Electronics, Sports Equipment & Hobbies Goods, Apparel & Luxury Goods, Tourism & Recreation, Education & Support Services, Media, Entertainment & Movie Production, Consumer Distributors, Internet & Homeshop Retail, Department Stores*, and *Specialty Retail* [2]

Since the Government of Indonesia implemented the Large-Scale Social Restrictions (PSBB) policy, several companies engaged in the *consumer cyclicals sector* have had to temporarily close their activities and lay off some of their employees to reduce operational costs. Inability and unpreparedness to compete in the era of the Covid-19 pandemic will cause the company's financial performance to become unhealthy *(financial distress)* and the worst possibility will be bankruptcy. The problem of bankruptcy is a serious matter, so management needs to create a system that can provide information that can be used as an early warning that there are indications that the company will experience financial diff, eventually leading company to bankruptcy.

Based on the background that has been described, the formulation of the problem is:

1. What is the prediction of *financial distress in consumer cyclicals* sector companies using the Altman *Z-Score*, Springate, Zmijewski, Grover, and Taffler models?
2. Are there differences in the prediction results of *financial distress* from the Altman, Springate, Zmijewski, Grover, and Taffler models in the period before and during the Covid-19 pandemic?
3. What model is more accurate for predicting the occurrence of *financial distress* in companies in the *consumer cyclicals sector*?

The research objectives based on the above problem formulation are as follows:

1. Predict the occurrence of *financial distress* in companies in the *consumer cyclicals sector*
2. Comparing the prediction results of *financial distress* using the Altman, Springate, Zmijewski, Grover, and Taffler models in the period before and during the Covid-19 pandemic; as well as
3. Knowing a more accurate model in predicting the occurrence of *financial distress* in companies in the *consumer cyclicals sector*.

2. Literature Review

2.1. Financial statements

[3] revealed that financial statements are a source of company information used in *decision-making* by presenting financial information that occurred in the past. According to [4–6], published financial reports have an important meaning for the company, because they can be used by interested parties to analyze the company's condition. Meanwhile, according to [7–10] in general, financial statements have several purposes in the form of being a means of information, understanding, forecasting, diagnosis, and evaluation.

2.2. Financial Distress

The company's inability to meet payment plans or cash flow conditions that indicate an inability to pay short-term obligations is an early indication of a company experiencing financial difficulties [11] Increased opportunities for *financial distress* occur when income is sensitive to a recession, company costs increase, and assets owned are illiquid [12] In the view of [13] *financial distress* is the inability of a company to continue its business activities, due to a declining financial situation and the presence of liabilities whose nominal value is greater than the value of the company's assets. It can be concluded that *financial distress* is the first phase of a company towards bankruptcy, due to the company's inability to finance operations and fulfill its obligations. *Financial distress* can ultimately give the company a bad reputation, so investors may decide that the company is run by incompetent management [12].

2.3. Parties Needing *Financial Distress Information*

The purpose of *financial distress information is* to ensure the health condition of a company. According to Hanafi and Halim in [14], several parties need *financial distress information*, namely:

a. Creditor

Deciding on granting a loan to a company.

b. Investors

Deciding on the purchase of securities sold by a company.

c. Government

In the public business sector, the government is responsible for overseeing the conduct of business.

d. Auditors

To assess the company's ability to continue its business.

2.4. Altman Model (*Z-Score)*

$$Z = 0{,}717X1 + 0{,}847X2 + 3{,}107X3 + 0{,}420X4 + 0{,}998X5$$

$$X1 = \frac{\text{Capital work}}{Total\ Asset}$$

$$X2 = \frac{\text{Retained Earning}}{Total\ Asset}$$

$$X3 = \frac{\text{EBIT}}{Total\ Asset}$$

$$X4 = \frac{\text{The value of Equity book}}{Total\ \text{Debt}}$$

$$X5 = \frac{\text{Selling Point}}{Total\ Asset}$$

The classification of *financial distress* in the Altman *Z-Score Model* is if the *Z value is > 2.9* then the company is in the healthy category, if the *Z-Score value is 1.23<Z<2.9* then the company is in the gray category, and if the *Z value <1.23* then the company is in the bankrupt category.

2.5. Springate Model (*S-Score*)

$$S = 1{,}03X1 + 3{,}07X2 + 0{,}66X3 + 0{,}4X4$$

$$X1 = \frac{\text{Capital work}}{Total\ Asset}$$

$$X2 = \frac{\text{Retained Earning}}{Total\ Asset}$$

$$X3 = \frac{Earning\ Before\ Tax}{Current\ Debt}$$

$$X4 = \frac{Selling\ Point}{\text{Total Asset}}$$

The classification of financial distress on the S-Score value is if the S-Score value is > 0.862 then the company is in the healthy category, and if the value of S-Score value is < 0.862 then the company is in the bankrupt category.

2.6. Zmijewski Models (X -*Score)*

$$X = -4{,}3 - 4{,}5X1 + 5{,}7X2 - 0{,}004X3$$

$$X1 = \frac{Net\ Profit}{Total\ Assets}$$

$$X2 = \frac{Total\ Debt}{Total\ Assets}$$

$$X3 = \frac{Current\ Assets}{\text{Current Debt}}$$

The classification of *financial distress* on the *X-Score* value is if the *X-Score value is* <0 then the company is in the healthy category, and if the *X-Score value is* >0 then the company is in the bankrupt category.

2.7. Model Grover *(G-Score)*

$$G = 1{,}650X1 + 3{,}404X2 - 0{,}016X3 + 0{,}05$$

$$X1 = \frac{\text{Working Capital}}{Total\ Assets}$$

$$X2 = \frac{EBIT}{Total\ Assets}$$

$$X3 = \frac{\text{Net Profit}}{Total\ Assets}$$

The classification of *financial distress* on the *G-Score* value is if the *G-Score value* <0.01 then the company is in the healthy category, whereas if the value of the *G-Score value-0.02 < G <0.01* then the company is in the gray category, and if the *G-Score* <-0.02 then the company is in the bankrupt category.

2.8. Taffler model

$$T = 3{,}20 + 12{,}18X1 + 2{,}50X2 - 10{,}68X3 + 10{,}0289X4$$

$$X1 = \frac{\text{Profit before tax}}{\text{Current Debt}}$$

$$X2 = \frac{\text{Current Assets}}{\text{Total Debt}}$$

$$X3 = \frac{\text{Net Profit After Tax}}{\text{Total Assets}}$$

$$X4 = \frac{\text{Selling Point}}{\text{Total Assets}}$$

The classification of *financial distress* on the *T-Score* value is if the *T-Score value is* > 0,3 then the company is in a healthy category, whereas if the *T-Score value is 0.2 < G < 0.3* then the company is in the gray category, and if the *T-Score* < 0.2 then the company is in the bankrupt category.

2.9. Previous Research

[14] with the title " Comparative Analysis of the *Financial Distress Prediction* Model with the Springate, Ohlson, Zmijewski, and Grover Models" this study resulted in significant differences in the prediction results between the Springate, Ohlson, Zmijewski, and Grover

models. Research from [15] entitled " Analysis of Differences in Levels of *Financial Distress* Using the Zmijewski Method Before and During the Covid-19 Pandemic (Empirical Study of Companies Listed on the Indonesian Stock Exchange in 2019 and 2020)" resulted in no significant difference in the level of *financial distress*. significantly between before and during the Covid-19 pandemic using the Zmijewski method. Subsequent research by [16] with the title "Bankruptcy Prediction Analysis with the Altman *Z-Score*, Springate, and Zmijewski Models for Manufacturing Companies in the Consumer Goods Industry Sector on the IDX" resulted in significant differences between bankruptcy prediction models, and the highest level of accuracy is the Springate Model.

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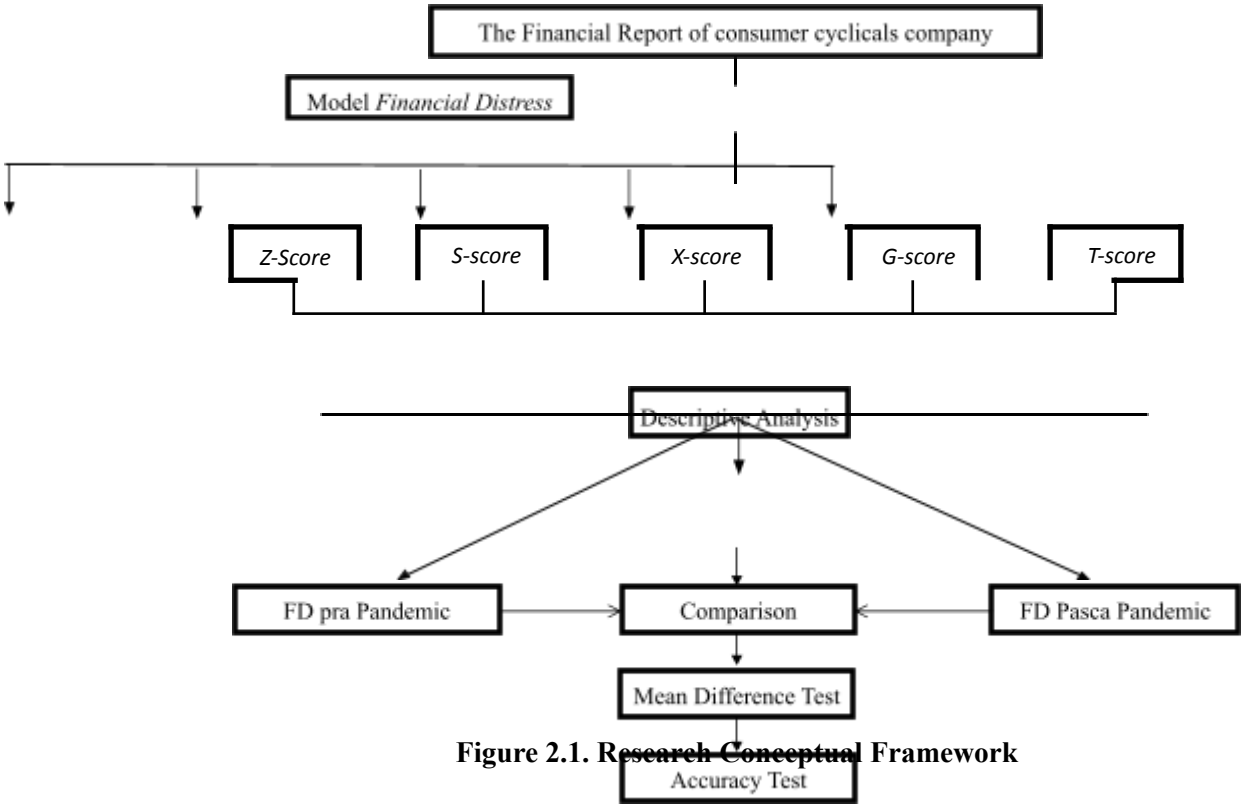

Figure 2.1. Research Conceptual Framework

The hypotheses to be tested in this study are:

H 0: There is no difference in the prediction results of *financial distress* before and during the Covid-19 pandemic.

H A: There are differences in the results of *financial distress* predictions before and during the Covid-19 pandemic.

3. Research Method

This research is included in quantitative research, according to [17] it is called quantitative research because the data used is in the form of numbers. This research can also be classified as a comparative study, which will compare the conditions of *financial distress* in companies engaged in the *consumer cyclicals sector* in the period before and during the Covid-19 pandemic. The sampling technique used is a *purposive sampling technique* or sample selection based on certain considerations [18]. Based on the *purposive sampling technique*, 66 companies will be studied. The data used in this study is secondary data obtained from the official IDX website *(www.idx.co.id)* in the form of financial reports for companies in the *consumer cyclicals sector* for 2018-2021. Variables used in predicting *financial distress* in this study are the Altman, Springate, Zmijewski, Grover, and Taffler models.

The research was conducted by calculating the company's financial ratios according to the *financial distress prediction model* used by multiplying the coefficient values of each model, namely the Altman, Springate, Zmijewski, Grover, and Taffler models so that the value of *financial distress was found*. From the *financial distress* prediction value, the condition of each company is classified according to the predetermined *cut*-off. The next stage, dividing into two groups of circumstances, namely the situation before the Covid-19 pandemic occurred (2018-2019) and the situation during the Covid-19 pandemic (2020-2021), which then carried out an average difference test (Paired Simple T-test) that aims to find out whether there are differences in the prediction results of financial distress between before the Covid-19 pandemic occurred and during the Covid-19 pandemic from each prediction model used. The results of financial distress from each model are then calculated for the level of accuracy with the following formula:

$$\text{Accuracy} = \frac{Correct\ Prediction}{Sample} \times 100\%$$

The predictions produced by each model can produce the following two types of error *rates*. Prediction error results because it shows that the company is not experiencing *financial distress*, but in reality, the company is experiencing *financial distress.* The equation used to calculate this error is:

$$\text{Type eror 1} = \frac{Error\ Type\ 1}{Sampling} \times 100\%$$

Then prediction results are wrong because it shows that the company is experiencing *financial distress*, but the company is not experiencing *financial distress.* The equation used to calculate this error is:

$$\text{Type eror II} = \frac{Error\ Type\ 2}{Sampling} \times 100\%$$

4. Results And Discussion

Based on the sampling technique, calculations were made from 66 companies using a predetermined financial distress prediction model, namely the Altman, Springate, Zmijewski, Grover, and Taffler models.

Table 1. Calculation Results of the *Financial Distress Prediction Model*

FD models	Year	Company Category			Total
		Healthy	Gray	Bankrupt	
Altman	2018	25	26	15	66
	2019	25	26	15	66
	2020	14	28	24	66
	2021	17	27	22	66
Springate	2018	34	-	32	66
	2019	33	-	33	66
	2020	23	-	53	66
	2021	26	-	40	66
Zmijewski	2018	61	-	5	66
	2019	60	-	6	66
	2020	54	-	12	66
	2021	55	-	11	66
Grover	2018	56	1	9	66
	2019	58	1	7	66
	2020	48	0	18	66
	2021	48	1	17	66
Traffler	2018	52	1	13	66
	2019	54	1	11	66
	2020	32	1	33	66
	2021	40	2	24	66

Financial distress calculation table above, all models used to calculate *financial distress* in *consumer cyclicals* sector companies produce different *financial distress* predictions because the financial ratios used for each model are different. From the results of financial distress, almost all of the models used for the healthy company category experienced a decline during the Covid-19 pandemic, namely in 2020, while bankrupt companies during the Covid-19 pandemic experienced an increase. This is because in 2020 Indonesia's economic growth has decreased by -2.70 %, thus affecting the financial condition of companies in the *consumer cyclicals sector.*

Based on the results of *financial distress* for each model, then the average difference test (*Paired Simple T-test) is carried* out to find out whether there are differences in *financial distress conditions* between before the Covid-19 pandemic and during the Covid-19 pandemic.

Table 2. Results of *Paired Simple T-Test* for Each *Financial Distress Model*

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Means	Std. Deviation	Std. Error Mean	Lower	Upper	Q	df	Sig. (2-tailed)
Altman	Before the Pandemic – After the Pandemic	,098	,799	,070	-.039	,236	1.415	131	,159
Springate	Before the Pandemic – After the Pandemic	,212	,510	.044	,124	,300	4,779	131	,000
Zmijewski	Before the Pandemic – After the Pandemic	,091	,337	,029	.033	,149	3,096	131	,002
Grover	Before the Pandemic – After the Pandemic	,152	,502	.044	,065	,238	3,470	131	,001
Tafler	Before the Pandemic – After the Pandemic	,242	,581	0.051	,142	,342	4,793	131	,000

Based on the table above, from the results of the average different test of the five models, only the Altman Z-Score model stated that there was no difference in financial distress between before the Covid-19 pandemic and during the Covid-19 pandemic. This is due to the value of Sig. (2-tailed) Altman model of 0.159, or greater than 0.05. Meanwhile, for the Springate, Zmijewski, Grover, and Taffler models, there is a difference in financial distress between before the Covid-19 pandemic and during the Covid-19 pandemic, because

the four models have a Sig value. (2-tailed) below 0.05.

The next stage is to calculate the level of accuracy of each model used. The results of the accuracy level of each model are as follows:

Table 3. Level of Accuracy of the *Financial Distress Model*

Prediction Models	Correct Prediction (Company)	Wrong prediction (Company)	Number of Samples (Company)		Correct Prediction (Company)
			Error I	*Error II*	
Altman Z-Score	2018	56	2	8	66
	2019	59	4	3	66
	2020	60	6	0	66
	2021	57	5	4	66
	Total	232	17	15	264
	Level of accuracy (%)	87.88	6,44	5,68	100
Springate	2018	44	2	20	66
	2019	48	2	16	66
	2020	55	2	9	66
	2021	47	1	18	66
	Total	194	7	63	264
	Level of accuracy (%)	73.48	2.65	23.86	100
Zmijewski	2018	51	12	3	66
	2019	51	14	1	66
	2020	32	34	0	66
	2021	46	19	1	66
	Total	180	79	5	264
	Level of accuracy (%)	68,18	29,92	1.89	100
Grover	2018	55	8	3	66
	2019	50	13	2	66
	2020	40	26	0	66
	2021	51	13	2	66
	Total	196	61	7	264
	Level of accuracy (%)	74,24	23,11	2.65	100
Tafler	2018	55	6	5	66
	2019	54	9	3	66
	2020	53	12	1	66
	2021	59	6	1	66
	Total	221	33	10	264
	Level of accuracy (%)	83.71	12.50	3.79	100

Based on the table above, the Altman model is the most accurate model in predicting *financial distress* , with an accuracy rate of 87.88%. Then followed by the Taffler Model with an accuracy rate of 83.71%, the Grover Model with an accuracy rate of 74.24%. The two

models with the lowest predictive ability are the Springate Model with an accuracy rate of 73.48% and the Zmijewski Model with an accuracy rate of only 68.18%.

5. Conclusions

Based on the results of the study it can be concluded that there are differences in the results of financial distress for each prediction model used. Based on the results of the average difference test, only the Altman model stated that there was no difference in financial distress before the Covid-19 pandemic and during the Covid-19 pandemic, while the other four models stated that there was a difference in financial distress before the Covid-19 pandemic and during the Covid-19 pandemic. The accuracy level of the model used, the Altman model, which has the highest accuracy rate is 87.88%.

Some suggestions are given based on the research results, including for company managers in the consumer cyclicals sector who will analyze the company's health, it is better to use the Altman Model which has the highest accuracy rate of 87.88% so that the risk in predicting can be minimized. As for investors who will invest in the consumer cyclicals sector, they should not only look at stock prices but also pay attention to the company's financial condition and the current macroeconomic conditions. This information is important as a basis for making investment decisions. Further researchers are advised to add other prediction models that have been found by previous researchers, conduct research with different company objects and conduct research on predicting financial distress after the Covid-19 pandemic.

References

[1] Lynch P. One Up on Wall Street. New York: SIMON & SCHUSTER; 2000.

[2] Financial Distress (Empirical Study on Banking n.d.

[3] Karyoto. Analysis of financial statements. Malang: UBMedia; 2017.

[4] Foster, Grover. Methods for Transportation Service Issuers. PARISMONIA, Vol; n.d.

[5] Effendi R. Bankruptcy Prediction Analysis with the Altman. Zmijewski: Springate; 2018.

[6] Hidayat WW. Fundamentals of Financial Statement Analysis. Ponorogo: Uwais; 2018.

[7] Primadani NM, Ariasih NK. Design and Build a Financial Distress Prediction 2021.

[8] Saputri HA, Krisnawati A. Comparative Analysis of Modified Altman Z-Score 2020.

[9] Permatasari I, Aziz A, Siswantini T. Analysis of Financial Distress in Retail 2021.

[10] Model Z-S. Springate and Zmijewski Listed on the Indonesian Stock Exchange n.d.

[11] Sudarman E, Y., Savitri E. Comparison of the Springate 2020.

[12] Akyuwen R, Rahmatika DN, Subagyo A. Comparison of Financial Distress 2022.

[13] Kusumaningrum TM. Comparison of Accuracy Levels of Financial Distress 2021.

[14] Piscestalia N, Priyadi MP. Comparative Analysis of Financial Distress 2019.

[15] Fitriani1 AA, Christin2 M. No Title. Pengaruh Daya Tarik; 2019.

[16] Melissa P, Banjarnahor H. Bankruptcy Prediction Analysis Using the Altman 2020.

[17] Sugiyono S. Metode Penelitian Kuantitatif Kualitatif dan R&D. Alfabeta; 2013.

[18] Sugiyono. Metode Penelitian. Bandung: Penerbit Alfabeta; 2016.