Accuracy Analysis of Financial Distress Prediction Models for Companies on the IDX Watchlist Board in 2020-2022 Period

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Abstract: The research aims to examine the accuracy level of the Altman, Grover, Zmijewski, and Springate financial distress prediction models, to determine the most accurate financial distress prediction model in analyzing companies on the IDX Watchlist Board criteria 5 or 8 between 2020 and 2022. This study employs a quantitative method with descriptive analytical techniques. Data testing utilizes the Kruskal-Wallis One-Way ANOVA test due to the comparison of more than two prediction models and the non-normal distribution of the data. A total of 44 samples, purposively selected from the population of 55 listed issuers within the DPK-BEI, were used. The research findings reveal no significant differences in the accuracy among the Altman, Grover, Zmijewski, and Springate models. This is evidenced by the accuracy results based on the number of correct predictions from each model. Zmijewski emerges as the most accurate model with a 67% accuracy rate, followed by Altman and Grover at 65% each, and Springate with the lowest accuracy at 60%.

Keyword: Financial Distress, Watchlist Board IDX, Altman, Grover, Zmijewski, Springate.

INTRODUCTION

Spence (1973) posited that signaling theory embodies a scenario where an information provider transmits signals comprising beneficial information for the company. Within this framework, companies must adeptly decipher these signals to prevent positive or negative developments that could impact the company's future sustainability. Financial distress represents a phase marked by a downturn in a company's financial health, often culminating in bankruptcy or corporate liquidation (Platt & Platt, 2002). It stands as a precursor to bankruptcy (Pratama & Mulyana, 2020). It can be contended that financial distress serves as a signal compelling companies to devise astute strategies aimed at maintaining business continuity.

The inception of the Special Monitoring Board at the Indonesia Stock Exchange (IDX) in June 2023 categorizes companies according to distinct problem criteria. These criteria potentially function as indicators of financial distress, notably criterion (5), Having negative equity in the latest financial statement, and criterion (8), The Listed Company is facing an

application of Suspension of Debt Payment Obligations, bankruptcy, or homologation cancellation.

As per Salim & Ismudjoko (2021), a company meets the criteria for financial distress when it registers negative profits persistently for three or more years, exhibits a reduction in dividends or ceases dividend payments altogether, and experiences an uptick in its debt-to-equity (DER) ratio. Notably, net income and debt value significantly influence the occurrence of negative equity in financial statements (Suwandi, 2022). suggesting that alterations in negative equity can be attributed to fluctuations in both net income and debt value.

The net income, derived from the net profit margin, and the debt value, assessed through the debt-to-equity ratio, holds considerable sway over financial distress (Panjaitan et al., 2022). The company's negative profitability poses challenges in meeting expenses, signaling an indication that the company is sliding into financial distress (Sudaryanti & Dinar, 2019).

In the realm of financial distress prediction analysis, this study aims to compare the predictive accuracy among the Altman, Grover, Zmijewski, and Springate models. The Altman model (1968) stands out as the foremost model utilized for forecasting financial distress, employing the Altman Z-score developed by Edward I. Altman. Notably, Altman revised the Z-score in 1995, refining its predictive capacity. The Grover model, known as the G-Score formula, was introduced by Jeffrey S. Grover in 2001, offering an alternative framework for predicting financial distress.The Zmijewski model, also recognized as the X-Score model, originated from the work of Mark Zmijewski in 1984, evolving from various antecedent models, to provide an additional avenue for predicting financial distress.Meanwhile, the Springate model, conceived by Gordon L.V. Springate in 1978, represents a development stemming from the foundational concepts of the Altman model, enhancing its predictive capabilities in assessing financial distress.

The variance in accuracy among these models stems from multiple studies conducted on their efficacy in predicting financial distress. Supitriyani et al. (2022) highlighted the Altman Z-Score model as the most precise among the Grover, Springate, and Zmijewski models, focusing on transportation sub-sector companies listed on the IDX. Conversely, Indrawan & Gusmarani (2023) revealed the Zmijewski model's superior accuracy compared to the Altman Z-Score, Grover, and Springate models in their study, while examining a different context or set of companies. In a distinct sector analysis, Pratiwi & Wiweko (2022) discovered that the Springate model outperformed the Altman Z-Score, Grover, and Zmijewski models in predicting financial distress within agricultural sector companies listed on the IDX. Moreover, Utami & Mahastanti (2022) reported the Grover model's heightened accuracy compared to the Altman, Springate, and Zmijewski models in forecasting financial distress among property and real estate sector companies listed on the IDX. These disparate findings underscore the contextual nuances and sector-specific intricacies influencing the predictive performance of these models across various industries and research methodologies.
 This research deviates from prior studies by focusing on a specific group of companies: those categorized under the 5 or 8 problem criteria of the IDX Watchlist Board—a sector unexplored in previous research. The problem formulation for this study is outlined as follows:

1. Are there discernible differences in the accuracy of predicting financial distress among the Altman Z-Score, Grover, Zmijewski, and Springate models?
2. Does the Altman model exhibit superior accuracy compared to the Grover, Zmijewski, and Springate models in predicting financial distress?
3. Does the Grover model demonstrate superior accuracy compared to the Altman, Zmijewski, and Springate models in predicting financial distress?

4. Does the Zmijewski model showcase superior accuracy compared to the Altman, Grover, and Springate models in predicting financial distress?
5. Does the Springate model manifest superior accuracy compared to the Altman, Grover, and Zmijewski models in predicting financial distress?

These formulated problem statements aim to elucidate the comparative predictive capabilities of these models specifically within the context of companies falling under the 5 or 8 problem criteria identified by the IDX Special Monitoring Board.
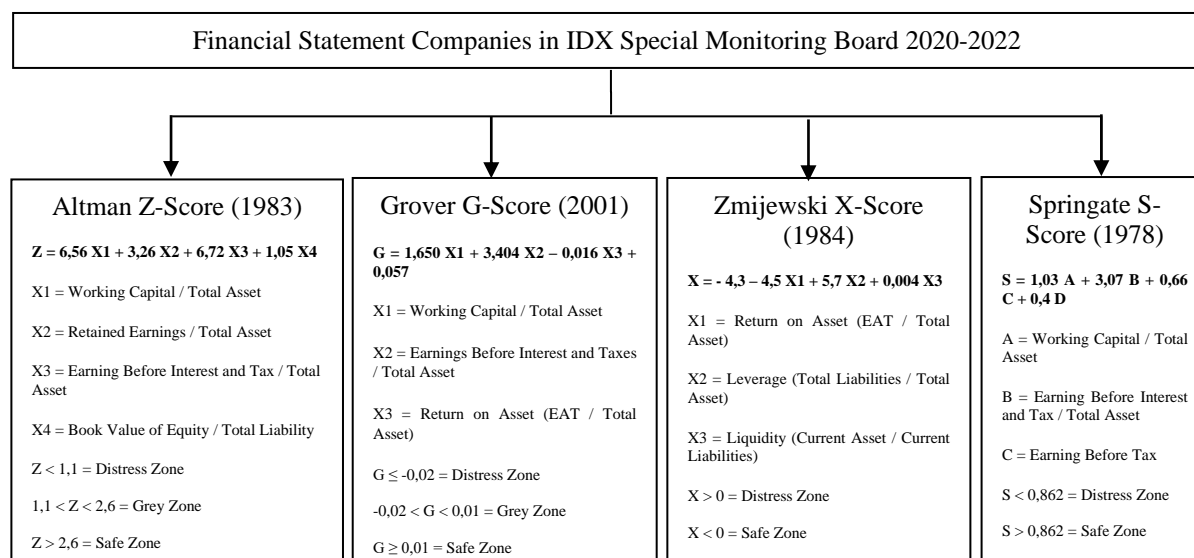
METHOD

The sample in this study were 43 companies from the population of 55 companies that have problem criteria 5 or 8 on the IDX Watchlist Board on October 30, 2023. Sample selection based on purposive sampling, with the following sample criteria: First, companies on the IDX Watchlist Board fall under the criteria (5) having negative equity in the latest financial report and criterion (8) The Listed Company is facing an application of Suspension of Debt Payment Obligations, bankruptcy, or homologation cancellation. Second, The company has been listed on the IDX in 2020. Third, the company has complete financial statements in the period 2020-2022.

This research is descriptive research with quantitative data types and data collection using secondary data. The data used are annual financial reports for 3 years from 43 samples, so the total data to be processed is 129 data. From the financial statements, the calculation of the financial distress prediction value for each model will be performed using financial ratios in the formula of model. The actual financial condition of the company is analyzed based on profit, dividends, and debt to equity ratio (DER) of each company. Categorized into the "Distress Zone" if there are negative profits for three consecutive years or more, reduced or no dividend payments at all, and an increase in the debt to equity ratio (DER) (Salim & Ismudjoko, 2021).

Analyzing the level of accuracy is measure by following formula:
- Accuracy Rate   = (Sample with Correct Prediction / Total Sample) x 100%
- Error Rate   = (Sample with Inccorect Prediction / Total Sample) x 100%

Samples with correct predictions if there is a similarity between the results of the prediction model analysis and the actual financial condition of the company. Meanwhile, if there is a difference, it is categorized as incorrect prediction (Salim & Ismudjoko, 2021). In this study, the number "0" will be given if the prediction is correct, and the number "1" if the prediction is incorrect. After that, carry out a different test on the accuracy level of the Altman model, Grover model, Zmijewski model, and Springate model with the Kruskal Wallis One Way Anova test using SPSS 24.
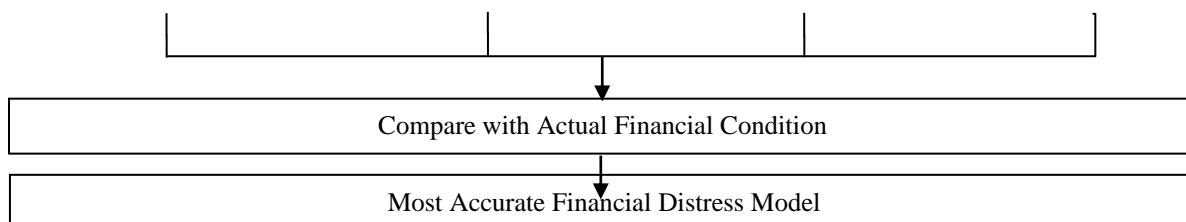
Financial Statement Companies in IDX Special Monitoring Board 2020-2022

Altman Z-Score (1983)	Grover G-Score (2001)	Zmijewski X-Score (1984)	Springate S-Score (1978)
$Z = 6{,}56\ X1 + 3{,}26\ X2 + 6{,}72\ X3 + 1{,}05\ X4$	$G = 1{,}650\ X1 + 3{,}404\ X2 - 0{,}016\ X3 + 0{,}057$	$X = -4{,}3 - 4{,}5\ X1 + 5{,}7\ X2 + 0{,}004\ X3$	$S = 1{,}03\ A + 3{,}07\ B + 0{,}66\ C + 0{,}4\ D$
X1 = Working Capital / Total Asset	X1 = Working Capital / Total Asset	X1 = Return on Asset (EAT / Total Asset)	A = Working Capital / Total Asset
X2 = Retained Earnings / Total Asset	X2 = Earnings Before Interest and Taxes / Total Asset	X2 = Leverage (Total Liabilities / Total Asset)	B = Earning Before Interest and Tax / Total Asset
X3 = Earning Before Interest and Tax / Total Asset	X3 = Return on Asset (EAT / Total Asset)	X3 = Liquidity (Current Asset / Current Liabilities)	C = Earning Before Tax
X4 = Book Value of Equity / Total Liability			D = Earning Before Tax
Z < 1,1 = Distress Zone	G ≤ -0,02 = Distress Zone	X > 0 = Distress Zone	S < 0,862 = Distress Zone
1,1 < Z < 2,6 = Grey Zone	-0,02 < G < 0,01 = Grey Zone	X < 0 = Safe Zone	S > 0,862 = Safe Zone
Z > 2,6 = Safe Zone	G ≥ 0,01 = Safe Zone		

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Compare with Actual Financial Condition

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Most Accurate Financial Distress Model

Figure 1. Conceptual Framework

RESULTS AND DISCUSSION

The company is declared in the distress zone or safe zone on the actual financial condition of the company and based on the calculation results of the four financial distress prediction models. Furthermore, a comparison is carried out between the two analyses to obtain results, whether the predictions of the model are correct or incorrect. In determining the actual financial condition of the company, it will be using indicators of negative profits, a decrease or default in dividend payments, and an increase in DER. This study uses negative profits for 3 years or more as the main indicator to declare a company in financial distress.

Table 1. Results of Financial Distress Prediction Model Analysis and Company Actual Financial Condition Analysis

Code	Altman		Grover		Zmijewski		Springate		Actual Financial Condition
	Average Z-Score		Mean G-Score		Mean X-Score		Mean S-Score		
ABBA	- 3,526	D	0,023	S	2,154	D	0,173	D	D
ARGO	- 21,475	D	- 2,455	D	8,415	D	- 1,581	D	D
ARTI	- 16,733	D	- 1,879	D	4,657	D	- 1,503	D	D
BIKA	0,623	D	0,366	S	1,965	D	0,266	D	S
BOSS	- 1,336	D	- 0,072	D	2,171	D	- 0,274	D	S
BTEL	- 9.227,953	D	- 217,617	D	8.082,942	D	- 136,500	D	D
BUVA	- 8,740	D	- 2,058	D	2,088	D	- 1,709	D	D
CANI	- 23,125	D	- 4,274	D	10,332	D	- 2,806	D	D
CENT	- 0,949	D	- 0,201	D	0,642	D	- 0,535	D	D
CLAY	- 3,893	D	- 0,547	D	1,418	D	- 0,889	D	D
CMPP	- 10,173	D	- 2,962	D	8,469	D	- 2,317	D	D
CNKO	- 19,216	D	- 1,668	D	8,543	D	- 0,651	D	D
CNTX	- 6,303	D	- 1,613	D	3,614	D	- 0,847	D	D
DEAL	- 4,611	D	- 0,690	D	2,493	D	- 0,557	D	D
DIGI	- 4,065	D	- 0,648	D	2,055	D	- 1,914	D	D
ENVY	- 19,718	D	- 1,947	D	8,341	D	- 3,257	D	D
ETWA	- 5,390	D	- 0,597	D	3,482	D	- 0,582	D	S
GIAA	- 6,022	D	- 1,094	D	4,141	D	- 0,551	D	S
GLOB	- 665,203	D	- 83,149	D	483,798	D	- 50,161	D	D
GMFI	- 7,774	D	- 1,215	D	4,426	D	- 1,057	D	S
HDTX	- 25,453	D	- 1,658	D	2,653	D	- 1,376	D	D
HKMU	- 1,103	D	0,019	S	1,290	D	- 0,376	D	D
IBFN	- 10,276	D	- 1,191	D	7,481	D	- 2,071	D	D
INAF	- 0,338	D	- 0,077	D	0,788	D	0,152	D	S
INTA	- 8,592	D	- 1,227	D	6,043	D	- 0,894	D	D
JKSW	0,273	D	0,223	S	18,509	D	0,080	D	S

KARW	-	18,247	D	-	4,315	D	12,359	D	-	2,584	D	S
KBLV	-	7,091	D	-	1,870	D	2,479	D	-	1,434	D	D
KOIN	-	0,054	D	-	0,007	D	1,027	D	0,935	S	D
MDRN	-	27,791	D	-	0,970	D	10,376	D	-	0,239	D	S
MKNT	3,299	S	1,118	S	1,765	D	2,586	S	D
MYTX	-	4,657	D	-	0,500	D	1,627	D	-	0,222	D	D
OCAP	-	116,179	D	-	4,283	D	164,029	D	-	4,110	D	D
POSA	-	9,129	D	-	1,506	D	2,155	D	-	1,137	D	D
SAFE	-	12,737	D	-	0,688	D	2,670	D	-	0,088	D	S
SRIL	-	5,457	D	-	1,485	D	5,294	D	-	1,790	D	S
TELE	-	186,518	D	-	24,499	D	142,562	D	-	11,684	D	D
TIRT	-	15,392	D	-	2,473	D	14,024	D	-	2,463	D	D
TRIO	-	362,015	D	-	22,847	D	231,404	D	-	12,472	D	S
UNSP	-	17,722	D	-	2,359	D	6,720	D	-	1,221	D	S
VIVA	-	5,311	D	-	0,898	D	2,417	D	-	0,586	D	D
WICO	-	4,019	D	-	0,448	D	1,303	D	1,037	S	D
WSBP	-	9,238	D	-	1,536	D	4,034	D	-	1,186	D	S
Total	**D**	**42**	**D**	**38**	**D**	**43**	**D**	**40**	**D = 29**
	S	**1**	**S**	**5**	**S**	**0**	**S**	**3**	**S = 14**
			N = 43						
			D = Distress (Distress Zone)						
			S = Safe (Safe Zone)						

Companies that are in the Grey Zone are counted into the distress zone (Fauzi et al., 2021). From the table above, it showed that the Altman model can predict financial distress 42 times, the Grover model 38 times, the zmijewski model 43 times, and the springate model 40 times. While in the actual financial condition of the company, it is found that there are 29 companies that are declared financial distress.

Table 2. Normality Test Result

	Model	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Financial Distress	Altman Z-Score	.416	43	.000	.603	43	.000
	Grover G-Score	.416	43	.000	.603	43	.000
	Zmijewski X-Score	.428	43	.000	.591	43	.000
	Springate S-Score	.393	43	.000	.621	43	.000
a. Lilliefors Significance Correction							

Source: SPSS 24 Output Result (2023)

Based on Table 2, the results of the normality test show that the significance of each model is less than 0.05, so it can be concluded that the data is not normally distributed. Based on these results, the requirement to do Kruskal-Wallis One Way Anova test is fulfilled.

Table 3. Kruskal-Wallis One Way Anova Result

Test Statistics[a,b]	
	Financial Distress
Chi-Square	.480
df	3
Asymp. Sig.	.923
a. Kruskal Wallis Test	

b. Grouping Variable: Model

<div align="center">Source: SPSS 24 Output Result (2023)</div>

Kruskal-Wallis One Way Anova test with the Asymp. Sig is more than 0.05 as shown in Table 3, it is concluded that there is no significant difference in the accuracy results between the Altman, Grover, Zmijewski, and Springate prediction models in predicting financial distress in companies on the IDX Special Monitoring Board category 5 and/or category 8.

<div align="center">Table 4. Prediction Models Result</div>

Code	Altman	Grover	Zmijewski	Springate	Code	Altman	Grover	Zmijewski	Springate
ABBA	0	1	0	0	IBFN	0	0	0	0
ARGO	0	0	0	0	INAF	1	1	1	1
ARTI	0	0	0	0	INTA	0	0	0	0
BIKA	1	0	1	1	JKSW	1	0	1	1
BOSS	1	1	1	1	KARW	1	1	1	1
BTEL	0	0	0	0	KBLV	0	0	0	0
BUVA	0	0	0	0	KOIN	0	0	0	1
CANI	0	0	0	0	MDRN	1	1	1	1
CENT	0	0	0	0	MKNT	1	1	0	1
CLAY	0	0	0	0	MYTX	0	0	0	0
CMPP	0	0	0	0	OCAP	0	0	0	0
CNKO	0	0	0	0	POSA	0	0	0	0
CNTX	0	0	0	0	SAFE	1	1	1	1
DEAL	0	0	0	0	SRIL	1	1	1	1
DIGI	0	0	0	0	TELE	0	0	0	0
ENVY	0	0	0	0	TIRT	0	0	0	0
ETWA	1	1	1	1	TRIO	1	1	1	1
GIAA	1	1	1	1	UNSP	1	1	1	1
GLOB	0	0	0	0	VIVA	0	0	0	0
GMFI	1	1	1	1	WICO	0	0	0	1
HDTX	0	0	0	0	WSBP	1	1	1	1
HKMU	0	1	0	0	**0 = Correct ; 1 = Incorrect**				

Based on the comparison between the prediction results of each model and the actual financial condition of the company, the results show that the Altman Z-Score model and the Grover G-Score model predicted correctly 28 times and predicted incorrectly 15 times. Meanwhile, the Zmijewski X-Score model predicts correctly 29 times and predicts wrongly 14 times. Furthermore, the Springate S-Score model predicted correctly 26 times, and predicted 17 times incorrectly.

<div align="center">Table 5. Accuracy Analysis Result</div>

Prediction Model	N	Correct Prediction	Incorrect Prediction	Accuracy Rate	Error Rate
Altman Z-Score	43	28	15	65%	35%

Grover G-Score	43	28	15	65%	35%
Zmijewski X-Score	43	29	14	67%	33%
Springate S-Score	43	26	17	60%	40%

In the analysis of financial distress predictions for companies in IDX Watchlist Board category 5 and/or 8 in the 2020-2022 period, it is known that the Altman model and Grover model have an accuracy rate of 65% and an error rate of 35%, the Zmijewski model has an accuracy rate of 67% and an error rate of 33%, the Springate model has an accuracy rate of 60% and an error rate of 40%. From these percentages, it is known that the highest level of accuracy is the Zmijewski model, then at the second level is the Altman model and the Grover model, and the lowest accuracy is the Springate model.

Table 6. Summary of Hypothesis Result

No	Hypothesis	Result	Conclusion
1.	There are differences in accuracy results in predicting financial distress between the Altman Z-Score, Grover, Zmijewski, and Springate models in predicting financial distress	Asymp.sig Kruskal-Wallis test: 0.923	Rejected
2.	The Altman model is the most accurate model compared to the Grover, Zmijewski, and Springate models	Accuracy: 65% Error: 35%	Rejected
3.	The Grover model is the most accurate model compared to the Altman, Zmijewski, and Springate models	Accuracy: 65% Error: 35%	Rejected
4.	The Zmijewski model is the most accurate model compared to the Altman, Grover, and Springate models	Accuracy: 67% Error: 33%	Accepted
5.	The Springate model the most accurate model compared to the Altman, Grover, and Zmijewski models	Accuracy: 60% Error: 40%	Rejected

Salamah (2023) states that in assessing the company's performance is said to be good, influenced by the financial management applied. The calculation of financial ratios can evaluate the company's financial condition and monitor company performance (Atul et al., 2022). It can be concluded that by analyzing the company's financial statements, information will be obtained about how the company manages its company and knows whether the company is in good condition or experiencing difficulties in managing its finances. Financial distress prediction is done using financial ratios. There are several financial distress prediction models, in this study there are Altman, Grover, Zmijewski, and Springate models. Each of these financial distress prediction models has a different formula.

In analyzing the financial distress prediction of companies in the IDX Watchlist Board in problem criteria 5 or 8, this study found that despite the differences in the formulas and ratios used by the Altman, Grover, Zmijewski, and Springate models, the accuracy level of the 4 models was not significantly different when compared using the Kruskal-Wallis One Way Anova test. These results are the same results in research conducted by Yesildas (2019) on the prediction of financial distress in manufacturing companies listed on the Instanbul Stock Market (BIST) for the 2017-2019 period.

In addition, based on the analysis of the accuracy level of the financial distress prediction model by comparing the number of correct predictions with the number of samples, the Altman Model and Grover model have an accuracy level of 65%, the Zmijewski model has an accuracy level of 67%, and the Springate model is 60%. It can be stated that the Zmijewski model is the most accurate model compared to the Altman, Grover, and Springate models. These results are in line with research conducted by Indrawan & Gusmarani (2023) and Rosa & Putra (2023).

CONCLUSION

The Kruskal-Wallis One Way Anova statistical test, found that the accuracy of the Altman, Grover, Zmijewski, and Grover models had no significant difference. Thus, examining companies that are indicated to have financial distress, makes the accuracy results of the prediction model can accurately predict the company. However, from the analysis of the level of accuracy based on the number of correct or incorrect predictions, Zmijewski is the most accurate model, followed by Altman, Grover, and the lowest is Springate

Future researchers can adjust the selected model to the sector or group of companies studied. If analyzing companies in the special monitoring board, it can use the Zmijewski prediction model. In calculating the level of accuracy, it is expected to use financial distress indicators that are in line with the phenomenon of the company problem under study.

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