Journal of Information Systems Engineering and Management
2024, 9(3)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Analyzing Finansial Distress in Property and Real Estate Industry: A Comparative Study of Altman Z-Score, Springate S-Score and Grover G-Score

Namira Ufrida Rahmi[1], Erlina[2], Iskandar Muda[3], Adi Syah Putra[4]
[1,2,3]*Doctoral Study Program in Accounting, Universitas Sumatera Utara*
[4]*Faculty of Economics and Business, Universitas Sumatera Utara*
[1]*Faculty of Economics, Universitas Prima Indonesia*
namiraufridarahmi@unprimdn.ac.id

ARTICLE INFO

Received: 12 Jul 2024

Accepted: 25 Sep 2024

ABSTRACT

This study aims to determine which method is the best in detecting financial distress among the Altman z score, Springate or Grover methods. The comparison of these three methods was tested on Property and Real Estate sector companies listed on the Indonesia Stock Exchange from 2021-2024. Logistic regression was utilizied in this study, and the dependent variable is demonstrated as a binary variables. While the independent variables include the Altman Z-Score, Springate S-Score and Grover G-Score. The population in this study consisted of 81 companies and obtained a research sample of 18 property and real estate companies.. This research uses descriptive statistics, capital feasibility tests, regression model feasibility tests, coefficient of determination tests, statistical significance tests, and hypothesis tests. Based on research findings, only the Z-Score approach significantly influences the prediction of financial difficulties among the three methods. Moreover, there is no striking difference between Grover's method and Springate's method for forecasting financial problems.

Keywords: *Finansial Distress, Altman, Springate, Grover, Property and Real Estate*

JEL Code : G34,M4

Introduction

Companies must therefore be able to grow and adjust as the times change. In order to ensure that the business can continue to function for as long as possible, one of the objectives of starting a business is to make money. In actuality, some businesses are unable to compete and grow in tandem with the anticipated changes. The risk of bankruptcy motivates businesses to remain vigilant and ready for any adverse scenario that may arise in the future (Putri, et all, 2020). The art of anticipating a company's financial state is known as bankruptcy prediction (Arora & Jiyani (2022), Husein & Pambekti (2014)). When developing plans to prevent bankruptcy, management and financial statement stakeholders can greatly benefit from information concerning financial difficulties (Lestari, et all (2021), Martini, et all (2023)).

During the period 2020 to 2025, the property and real estate sector in Indonesia experienced significant financial pressure, mainly due to the impact of the COVID-19 pandemic and high dependence on external financing. In 2020, a survey showed that 89% of property and real estate companies listed on the Indonesian Stock Exchange were in financial distress. The decline in demand for residential property is reflected in a Bank Indonesia survey, which recorded a 25.60% decline in sales volume in the second quarter of 2020 compared to the previous year. A real example of this pressure is PT Alam Sutera Realty Tbk (ASRI), which recorded a net loss of IDR512 billion in the second quarter of 2020, and PT Modernland Realty Tbk (MDLN), which experienced a net loss of IDR1.76 trillion in the same year. Despite a recovery in subsequent years, with average corporate profits increasing by 22% in 2021 and 24.3% in 2022, these fluctuations indicate that the sector remains vulnerable to external pressures and requires better risk management strategies to maintain long-term financial stability.

When a company's financial assets are worth less than the book value of its legal debt, it is said to be insolvent in bankruptcy. If technical insolvency is too severe for a short time, it will result in bankruptcy, which is a permanent state

Journal of Information Systems Engineering and Management
2024, 9(3)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

that will impair the company's liquidity if it is not taken seriously (Jacob et all, 2023). From a legal standpoint, bankruptcy occurs when a legitimate business is subject to formal regulations based on current laws and regulations. In addition, a variety of factors can contribute to the occurrence of final distress; the negative aspect of poor management is that it may result in the organization experiencing this state. Numerous mistakes, including those in accounting procedures, calculation flow, and financial decision-making, can also cause financial distress. Numerous methods and techniques can be used to forecast the possibility of bankruptcy. The Altman, Springate, and Grover methods are currently the most widely used techniques for predicting economic hardship (Paramitha (2024), Hantono (2019)).

Financial analysis is therefore a way for businesses to forecast any scenario that might arise in the future. Financial predictions' outcomes greatly aid in accelerating management's reaction to issues in order to contain them before bankruptcy (Ashraf, et all (2019), Tahu (2019)). Strategies and financial turnover can be used to control financial distress by management that is proactive and responsive in identifying and examining its causes (Yendrawati & Adiwafi, 2020). Models for analyzing financial hardship keep evolving as times change. Although numerous ways connected to financial difficulties have frequently been employed as study objectives in organizations in Indonesia, studies on financial problems in property and real estate firms may be quite rare. Finding out more about evaluating and predicting financial hardship in Indonesia's telecom industry is the goal of the author of "Analysis of the Use of the Altman Z-Score Method, Springate Method, and Grover Method as Signaling Financial Distress".

One of the most popular methods for predicting bankruptcy in corporate financial research is the Altman Z-Score approach. This model incorporates a number of financial variables that accurately depict the company's financial health, including liquidity, profitability, leverage, and activity efficiency (Afifah, et all, 2024). Springate selected four of the 19 widely used financial ratios that best differentiated successful businesses from those that failed using step-wise multiple discriminate analysis (Sudjiman & Sudjiman, 2019). The Zmijewski model records one point in the distress zone, the Ohlson model reports three points, the Altman model records eight points, and the Springate model records thirty-seven points (Pratama & Mulyana, 2020).

By examining the company's financial statements, the Altman technique can assist businesses in forecasting the degree of insolvency they may face. Wahyuni & Rubiyah (2021), Altman created this technique in 1968 after a number of financial ratio selection procedures yielded five ratios that could be merged. In his study, Elewa (2022) found that Altman's approach had an 81 percent accuracy rate. Gorgon LV Springate developed the Springate model in 1978 with a sample of 40 businesses (Munjiyah & Artati, 2020). Following testing, Springate chose to use only four ratios instead of the original 19 ratios. According to this approach, a corporation will be deemed bankrupt if its score is less than 0.862 ($S < 0.0862$); if it is greater than 0.0862 ($S > 0.0862$), it will be deemed not bankrupt. The Grover model was created after the Altman Z-Score Model was revised and reassessed (Sudrajat & Wijayanti, 2019). A healthy company is defined by Komarudin and Syafnita (2019). Following Grover's introduction of the new ratio, the financial ratios X2 (retained earnings/total assets) and X4 (book value of equity/book value of liabilities) were reduced.

Methods

This investigation was conducted using a quantitative methodology. A study that primarily uses numerical data that can be precisely calculated, compared, and handled mathematically is known as quantitative research. The purpose of this study is to ascertain whether the Grover, Springate, and Altman methods may be applied as explanatory and descriptive financial signaling. challenge. Population means "the total collection of things or factors studied,". Determining the prospective growth of property and real estate listed on the Indonesia Stock Exchange between 2021 and 2024 is the goal of this study.

Nursalam (2003), which states that Sample refers to a small part of the population used and is considered to be representative of the population studied . Purposive sampling, which is a non-random sample selection method utilized in this study, signifies that the samples were chosen according to the researcher's criteria in line with the study's goals.

Finansial Distress Prediction Models

Altman Z-Score

For the purpose of identifying between non-insolvent and bankrupt companies. Altman identified five variables that can be used to forecast a company's financial future (Bunker et all, 2024). In terms of forecasting, these ratios or factors are highly accurate.

$$Z = 6{,}56X_1 + 3{,}267X_2 + 6{,}72X_3 + 1{,}05X_4$$

Journal of Information Systems Engineering and Management
2024, 9(3)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

X1 = working capital/total assets
X2 = retained earnings/total assets
X3 = earnings before interest and taxes/total assets
X4 = market values of equity/book value of total liabilities
X5 = sales/total assets

Springate S-Score

The springate model, which is designed to determine the likelihood that a business may experience financial trouble, is another model that can forecast it. Keith Springate presented this model in 1978. It functions within the framework of financial ratios and discriminant analysis (Dwiningsih & Yahya, 2023). Financial ratios that can differentiate between troubled and non-distressed enterprises are the subject of a mathematical investigation.

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

X1 = working capital/total assets
X2 = net profit before interest and taxes/total assets
X3 = net profit before taxes/current liability
X4 = sales/total assets

Grover G-Score

The Grover model was developed by Jeffry S. Grover as a way to forecast company bankruptcy (Hungan & Sawitri, 2018). When Grover aligned and reevaluated the Altman Z-Score approach in 2001, it was applied for the first time. The ratios used are :

G = 1,650X1 + 3,404X2 + 0,016X3 + 0,057

X1 = working capital/total assets
X2 = earning before interest and taxes/total assets
X3 = eaning after tax/total assets

Conceptual Framework

Three financial distress prediction models—the Altman z-score, Springate s-score, and Grovers g-score—are the foundation of the research study. Financial distress is the dependent variable, while the other four models are independent variables.

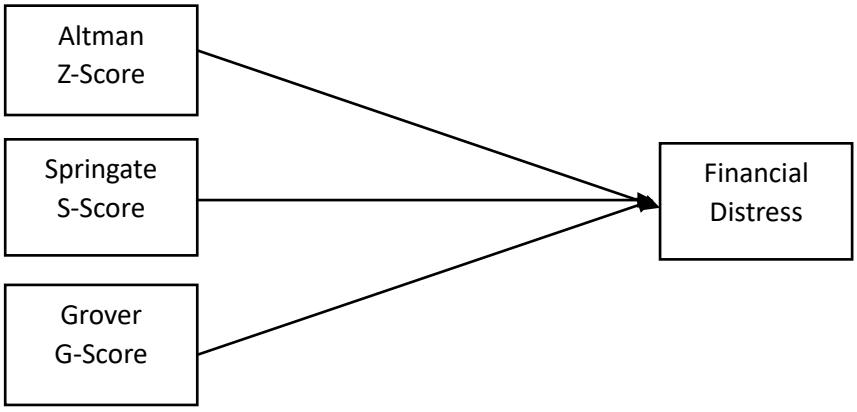

Figure 1. Conceptual Framework

Based on the development of previous theories, the research hypothesis can be formulated as follows:

Ho : Altman z-score, Springate S-score and Grover G-score can not be a method of predicting financial distress in property and real estate sector companies listed on the Indonesian Stock Exchange in 2021-2024.

H1 : Altman z-score, Springate S-score and Grover G-score can be a method of predicting financial distress in property and real estate sector companies listed on the Indonesian Stock Exchange in 2021-2024.

Journal of Information Systems Engineering and Management
2024, 9(3)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Results

Table 1. Research Results

Prediction Model	Year	Number of Companies		
		Non-Distress	Grey	Distress
Altman Z-Score	2021	9	3	6
	2022	7	3	8
	2023	5	4	9
	2024	6	2	10
Springate S-Score	2021	5	0	13
	2022	5	0	13
	2023	3	0	5
	2024	5	0	13
Grover G-Score	2021	13	0	5
	2022	14	0	4
	2023	12	0	6
	2024	13	0	5

Land acquisition, project planning, building construction, property product marketing and sales, and long-term asset management are just a few of the operational tasks that property and real estate organizations perform. Commercial assets like shophouses, shopping malls, hotels, and office buildings; industrial properties like warehouses, factories, and industrial regions; and residential properties such landed houses, apartments, and flats are among the goods sold. The business generates steady revenue from asset rents and property management services in addition to unit sales. According to calculation table 1, the outcomes of each approach vary annually. Out of all the methodologies, the Grover method has produced the lowest corporate distress forecast findings for three years in a row. However, with over ten companies over three years, the Springate Method produced the highest prediction scores for distressed enterprises. Aside from that, the Altman Method yields results that fall somewhere in the middle of the two approaches, with the number of troubled enterprises staying at or above five for three years and not going beyond ten.

Table 2. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std.Deviation
Z-Score	72	-20459.76	398.49	-442.3244	2632.04107
S-Score	72	-694.74	21.11	-13.2496	83.44632
G-Score	72	-1038.96	15.24	-21.0072	133.37539
Financial Distress	72	0	1	18	.387
Valid N (listwise)	72				

Based on the table above, the Z-Score as S- Score as X2 has a sample size of 72, minimum value -649.74, maximum value 21.11, mean value -13.2496, and standard deviation value 83.44632. G-Score as X3 has a sample size of 72, minimum value - 1038.96, maximum value 15.24, mean value -21.0072, and standard deviation value 133.37359.

Table 3. Iteration History[a,b,c]

Iteration		-2 Log likelihood	Coefficients
			Constant
Step 0	1	68.619	-1.278
	2	68.004	-1.497
	3	68.002	-1.513
	4	68.002	-1.513

Journal of Information Systems Engineering and Management
2024, 9(3)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Table 4. Iteration History[a,b,c,d]

Iteration		-2Log likelihood	Coefficients			
			Constant	Z-Score	S-Score	G-Score
Step 1	1	59.419	-1.341	.000	-.101	.061
	2	51.818	-1.560	.000	-.547	.339
	3	42.868	-1.639	-.001	-1.475	.924
	4	37.989	-1.720	-.002	-2.431	1.526
	5	31.414	-1.913	.003	-2.880	1.524
	6	26.165	-1.985	.018	-2.720	.785
	7	19.184	-2.068	.054	-2.587	-.923
	8	16.580	-2.289	.088	-3.310	-2.050
	9	16.148	-2.491	.108	-4.010	-2.491
	10	16.120	-2.560	.113	-4.341	-2.542
	11	16.120	-2.566	.114	-4.377	-2.540
	12	16.120	-2.566	.114	-4.377	-2.540

According to the preceding table, the value of -2LogLikelihood 0 is 68,002, and the value of -2LogLikelihood 1 is 16,120. This indicates that the hypothesised model matches the data because there is a decline from - 2LogLikelihood 0 to -2LogLikelihood block 1.

Table 5. Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	1.204	8	.997

According to the above table, the independent variables' Z-Score, Springate, and Grover significance values are 0.997, where this value is >0.05, indicating that the data is appropriate and well-fitting.

Table 6. Variables in the Equation

		B	S.E	Wald	df	Sig.	Exp(B)
Step 1	Z-Score	.114	.044	6.590	1	.010	1.120
	S-Score	-4.377	3.493	1.571	1	.210	.013
	G-Score	-2.540	2.623	.938	1	.333	.079
	Constant	-2.566	.786	10.663	1	.001	.077

A significance score of 0.010 is less than the alpha threshold of 0.05, which is required to compare the Z-Score of the independent factor with the dependent variable in order to determine that it has a significant impact. An independent variable that is significant at the 0.210 level, over the 0.05 cutoff, is the S-Score, sometimes referred to as Springate. There was no statistically significant relationship between the dependent variable and the S-Score. Grover's independent variable has a statistically significant value of 0.333. The dependent variable and G-Score do not significantly correlate.

As can be seen from H1, which is accepted, and H0, which is denied, the Altman Z-Score technique has a significant influence on predicting financial troubles in property and real estate sub-industry enterprises listed on the IDX in 2021–2024. Table 3.7's Altman Z-Score significance value of 0.010, which is less than the alpha value of 0.05, supports this.

Since there is no indication that the Springate S-Score approach is helpful in predicting financial issues for propoerty and real estate sub-industry companies listed on the IDX for the 2021–2024 timeframe, we reject H1 and accept H0. The cutoff value of 0.05, which serves as the threshold for hypothesis testing, is much smaller than the Springate significance value of 0.210, as shown in Table 2.

In order to determine that the G-Score Grover approach is ineffective at forecasting financial issues in companies in the property and real estate sub-industry listed on the IDX between 2021 and 2024, we must reject H1 and accept H0. This is supported by Grover's significant value of 0.333, which is higher than the alpha value in Table 2.

Journal of Information Systems Engineering and Management
2024, 9(3)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Conclusion

According to the theory, financial distress is a state in which a company's financial situation deteriorates before it experiences a decline and collapse. By recognizing the occurrence of financial trouble, it can help to prevent a company's financial problems. Financial distress can be characterized using a few models. In addition, the best way to determine which prediction model is most accurate is to look at the accuracy levels of each model individually. Comparing the number of accurate predictions with the number of samples is one way to determine the accuracy threshold. Each of the three prediction models employed in this investigation uses a single common ratio. The Return on Assets ratio is the one under consideration. Each prediction model generates a different score even if they all employ the same ratio. When compared to other financial hardship prediction models in this study, the Altman model has the best accuracy level when it comes to financial distress.

The Springate S-Score model did not appear to have any influence on financial distress prediction. Grover's G-Score approach has no discernible effect on forecasting financial issues. It's critical for businesses that keep losing money or are in financial trouble to keep concentrating on enhancing performance in order to escape this situation. Businesses that do not suffer losses or are not in a state of distress can continue to operate well and enhance their performance in order to create more sophisticated. The only methods utilized in this study to forecast financial troubles are Altman's Z-Score Method, Springate's S-Score Method, and Groover's G-Score Model. To get the best findings, future researchers are encouraged to incorporate or test more models.

The ratio of sales to total assets demonstrates how well management of the business uses all of its assets to produce revenue and make a profit. Thus, it is evident that the greater the ratio of sales to total assets, the more money the business will make and stay out of financial trouble. Conversely, if the proportion The lower the value, the lower the company's earning level. This makes it possible for the business to go through financial difficulties. Accordingly, in order to prevent financial difficulty, the business must maintain and manage its assets as best it can in order to maximize sales and profits.

References

[1] Afifah, N. T., Fatihudin, D., & Roosmawarni, A. (2024). Analysis of Financial Distress Potential Using the Altman Z-Score and Springate Methods in Predicting Company Bankruptcy. *The Journal of Financial, Accounting, and Economics*, *1*(2), 55-68.

[2] Altman, E. I., Iwanicz-Drozdowska, M., Laitinen, E. K., & Suvas, A. (2017). Financial distress prediction in an international context: A review and empirical analysis of Altman's Z-score model. *Journal of international financial management & accounting*, *28*(2), 131-171.

[3] Arora, M. N., & Jiyani, C. (2022). An Analsis of Efficacy of Financial Distress Prediction Springate and Grover Model. *GAP INTERDISCIPLINARITIES*, *4*, 74-77.

[4] Ashraf, S., GS Félix, E., & Serrasqueiro, Z. (2019). Do traditional financial distress prediction models predict the early warning signs of financial distress?. *Journal of Risk and Financial Management*, *12*(2), 55.

[5] Atang, G. D., Massie, J., & Wangke, S. (2022). The effect of financial ratios to financial distress using altman z score on hotel and tourism companies listed in indonesian stock exchange. *Jurnal EMBA: Jurnal Riset Ekonomi, Manajemen, Bisnis dan Akuntansi*, *10*(1), 1467-1475.

[6] Bunker, B., Ajit, I. A. I., Jacob, R. R. J. R. R., & Rajput, S. (2024, September). Analyzing financial distress in the automobile industry: a comparative study of Altman Z-Score, Springate S-Score, Zmijewski Z-Score, and Grover G-Score. In *AU Hybrid International Conference 2024 on" Entrepreneurship & Sustainability in the Digital Era" under the theme of" People Centric Knowledge in Intelligence World"* (Vol. 4, No. 1, pp. 390-398).

[7] Dwiningsih, S., & Yahya, M. Z. (2023). Analysis of Springate Method and the Altman Z-Score Method for Predicting the Financial Distress. *TGO Journal of Education, Science and Technology*, *1*(1), 59-68.

[8] Elewa, M. M. (2022). Using altman Z-score models for predicting financial distress for companies–the case of Egypt panel data analysis. *Alexandria Journal of Accounting Research*, *6*(1), 1-28.

[9] Hantono, H. (2019). Predicting financial distress using Altman score, Grover score, Springate score, Zmijewski score (case study on consumer goods company). *Accountability*, *8*(1), 1-16.

[10] Hungan, A. G. D., & Sawitri, N. N. (2018). Analysis of Financial Distress with Springate and Method of Grover in Coal In BEI 2012-2016. *International Business and Accounting Research Journal*, *2*(2), 52-60.

Research Article

[11] Husein, M. F., & Pambekti, G. T. (2014). Precision of the models of Altman, Springate, Zmijewski, and Grover for predicting the financial distress. *Journal of Economics, Business, and Accountancy Ventura*, *17*(3), 405-416.

[12] Jacob, B., Huazheng, H., & Congzhao, H. (2023). Financial Distress Analysis Using Altman Z-Score, Springate and Zmijewski in Retail Companies on the IDX. *Journal Markcount Finance*, *1*(1), 1-12.

[13] Komarudin, K., Syafnita, S., & Ilmiani, A. (2019). Analisis komparasi prediksi financial distress metode grover, altman, springate, zmijewski, dan ohlson pada perusahaan pertambangan di BEI. *Jurnal Ekonomi Dan Bisnis*, *22*(2), 36-43.

[14] Lestari, R. M. E., Situmorang, M., Pratama, M. I. P., & Bon, A. T. (2021). Financial distress analysis using altman (Z-score), Springate (S-score), Zmijewski (X-score), and Grover (G-score) models in the tourism, hospitality and restaurant subsectors listed on the Indonesia Stock Exchange period. In *Proceedings of the 11th Annual International Conference on Industrial Engineering and Operations Management Singapore* (Vol. 4249, p. 4259).

[15] Martini, R., Aksara, R. R., Sari, K. R., Zulkifli, Z., & Hartati, S. (2023). Comparison of financial distress predictions with Altman, Springate, Zmijewski, and Grover Models. *Golden Ratio of Finance Management*, *3*(1), 11-21.

[16] Mulyati, S., & Ilyasa, S. (2020). The comparative analysis of Altman Z-Score, Springate, Zmijewski, and internal growth rate model in predicting the financial distress (empirical study on mining companies listed on Indonesia stock exchange 2014-2017). *Kinerja*, *24*(1), 82-95.

[17] Munjiyah, M., & Artati, D. (2020). Analisis Prediksi Kebangkrutan dengan Model Altman, Springate, Ohlson dan Zmijewski Pada Perusahaan Food and Beverage di Bursa Efek Indonesia (BEI). *Jurnal Ilmiah Mahasiswa Manajemen, Bisnis Dan Akuntansi (JIMMBA)*, *2*(6), 901-909.

[18] Nimmagadda, S., Murugan, R., Dhilipan, C., Deepika, K., & Balakumar, A. (2024, July). Financial Risk Prediction in E-Commerce: Leveraging Vampire Bat Optimization and Factor Analysis for Enhanced Decision-Making. In *2024 Third International Conference on Smart Technologies and Systems for Next Generation Computing (ICSTSN)* (pp. 1-5). IEEE. https://doi.org/10.1109/ICSTSN61422.2024.10671039

[19] Paramitha, D. (2025). Financial Distress Prediction Using Springate and Altman Model: Based on Financial Indicators of Industrial Companies. *Jurnal Nusantara Aplikasi Manajemen Bisnis*, *10*(1), 167-176.

[20] Pramesti, A. W., & Yuniningsih, Y. (2023). Comparative Analysis of The Accuracy Level of The Zmijewski, Springate, and Grover Models to Predict Financial Distress. *American Journal of Humanities and Social Sciences Research (AJHSSR)*, 164-172.

[21] Pratama, H., & Mulyana, B. (2020). Prediction Of Financial Distress In The Automotive Component Industry: An Application of Altman, Springate, Ohlson And Zmijewski Models. *Dinasti International Journal Of Economics Finance & Accounting*, *1*(4).

[22] Putri, A. S., Badri, R. E., Pranyoto, E., Susanti, S., & Lestari, W. R. (2020, December). Financial Distress Prediction; Springate, Zmijewski, and GroverMethod. In *Proceeding International Conference on Information Technology and Business* (pp. 1-8).

[23] Sudjiman, L. S., & Sudjiman, P. E. (2019, December). the Accuracy of the Springate and Zmijewski in Predicting Financial Distress in Cosmetic and Household Subsector Companies. In *11th International Scholars Conference* (Vol. 7, No. 1, pp. 1343-1358).

[24] Sudrajat, M. A., & Wijayanti, E. (2019). Analisis Prediksi Kebangkrutan (Financial Distress) dengan Perbandingan Model Altman, Zmijewski dan Grover. *INVENTORY: Jurnal Akuntansi*, *3*(2), 116-130.

[25] Tahu, G. P. (2019). Predicting financial distress of construction companies in Indonesia: a comparison of Altman Z-score and Springate methods. *International Journal of Sustainability, Education, and Global Creative Economic (IJSEGCE)*, *2*(2), 7-12.

[26] Tan, E., & Wibisana, T. A. (2020). A comparative Analysis Altman (Z-Score) Revision and Springate (S-Score) Model in Predicting Financial Distress in the Manufacturing Company-Indonesia Stock Exchange. *Journal of Research in Business, Economics, and Education*, *2*(4), 831-841.

[27] Toly, A. A., Permatasari, R., & Wiranata, E. (2019). *The effect of financial ratio (altman z-score) on financial distress prediction in manufacturing sector in Indonesia 2016-2018* (Doctoral dissertation, Petra Christian University).

Research Article

[28] Wahyuni, S. F., & Rubiyah, R. (2021). Analisis Financial Distress Menggunakan Metode Altman Z-Score, Springate, Zmijeski Dan Grover Pada Perusahaan Sektor Perkebunan yang Terdaftar di Bursa Efek Indonesia. *Maneggio: Jurnal Ilmiah Magister Manajemen*, *4*(1), 62-72.

[29] Yendrawati, R., & Adiwafi, N. (2020). Comparative analysis of Z-score, Springate, and Zmijewski models in predicting financial distress conditions. *Journal of Contemporary Accounting*, 72-80.