An Analysis of Altman Z-Score, Springate, and Zmijewski Methods Used to Know the Potential of Financial Distress (Empirical Study on Manufacturing Companies in the Automotive and Component Sub-Sectors Listed on the Stock Exchange for the Year 2018-2021)

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Abstract: *This study aimed to find out and analyzed how the financial performance of the Automotive and Component Sub- Sector Manufacturing Companies using the Altman Z-Score, Springate and Zmijewski methods by analyzing and testing which method was the most stringent to determine the potential for financial distress in 2018-2021. The research type was descriptive quantitative, using secondary data. The sampling technique used was the purposive sampling technique, with a total sample of 9 companies. The research data was in the form of financial statements of automotive and component manufacturing companies that are accessed on the Indonesia Stock Exchange website for 2018-2021. The analysis used in this study was the Altman Z-Score, Springate, and Zmijewski methods. The results showed that the Altman Z-Score method in analyzing the potential for financial distress was 12 samples from the total sample calculated while the Springate method analyzed as many as 18 samples from the total sample calculated. In contrast to the Zmijewski method which only analyzed 1 sample from the total sample used. Thus, the Zmijewski method was a method that has the highest level of accuracy compared to other methods in analyzing the potential for financial distress in automotive and component manufacturing companies listed on the Indonesia Stock Exchange, which is 97.22% with an error rate of 2.78%. The Springate method has a level of accuracy of 50% with an error rate of 50%, and the Altman Z-Score's one is the lowest method with a level of accuracy of 30.56% with an error rate of 41.67%.*

Keywords: Altman Z-Score, Springate, Zmijewski, and Financial Distress

1. Introduction

In general, enterprises are formed in order to achieve both short-term and long-term goals. For the short term, the company must be able to make a profit while for the long term, the company must be able to achieve and increase the value of a company. The company uses the profits earned to develop and maintain the sustainability of the company(Was and Borolla, 2021). The profit obtained also reflects the success of management in the company in running a business (Idi and Borolla, 2021). Usually, those investors judge a company based on the company's financial performance. Similarly, automotive and component sub-sector manufacturing companies in Indonesia are trying to increase production and revenue which ends in an increase in profit every year.(Journal of Entrepreneurship, 2022)

A manufacturing company is a processing industry company that manages raw materials into finished goods. In general, the characteristic of a manufacturing company is the existence of a factory in order to carry out a production process(Kadim, 2017). One of the manufacturing company sectors listed on the Indonesia Stock Exchange is the automotive and components sub-sector. This Automotive and Components Sub-Sector Manufacturing Company is one of the industrial sector manufacturing industry companies in Indonesia that is considered more productive and able to have a widespread chain impact so as to increase added value in raw materials, increase labor, generate foreign exchange sources, and as the largest contributor to both taxes and customs. Because Indonesia itself is one of the largest sources of manufacturing industry in ASEAN by contributing through increasing exports, investment and employment. (Ministry of Industry, 2021)

From the financial statements of such companies can provide information about the performance of a company. The following is data on the financial performance of automotive and component sub-sector manufacturing companies in 2018-2021.

Table 1: List of Automotive and Component Sub-Sector Manufacturing Companies

No.	Stock Code	Company Name	Year							
			2018		2019		2020		2021	
			EBIT	Asset	EBIT	Asset	EBIT	Asset	EBIT	Asset
1	ASIA	PT. Astra Internasional Tbk	34.995	344.711	34.054	351.958	21.741	338.203	32.350	367.311
2	CAR	PT. Astra Otoparts Tbk	861.563	15.889.648	1.119.858	16.015.709	116.071	15.180.094	755.129	16.947.148
3	BOLT	PT. Garuda Metalindo Tbk	102.840.767.511	1.312.376.999.120	69.263.833.897	1.265.912.330.625	(63.652.188.438)	1.119.076.870.425	105.700.098.809	1.368.411.097.483
4	GJTL	PT. Gajah Tunggal Tbk	(85.585)	19.711.478	457.876	18.856.075	476.377	17.781.660	87.097	18.449.075
5	HAVE	PT. Indomobil Sukses Internasional Tbk	121.393	41.044.311	400.869	44.698.662	(422.943)	48.408.700	5.659	51.023.608
6	INDS	PT. Indospring Tbk	147.982.768.771	2.482.337.567.967	130.070.871.745	2.834.422.741.208	75.316.440.467	2.826.260.084.696	213.789.217.074	3.165.018.057.203
7	LPIN	PT. Multi Prima Sejahtera Tbk	35.132.528.263	301.596.448.818	31.375.178.612	324.916.202.729	8.395.696.968	337.792.393.010	25.483.321.670	310.880.071.852
8	PRAS	PT. Prima Alloy Steel Universal Tbk	8.159.520.050	165.543.021.515	(53.777.720.146)	1.657.127.269.798	703.740.254	1.668.922.580.521	530.204.978	1.637.794.655.748
9	SMSM	PT. Selamat Sempurna Tbk	831.869	2.801.203	822.042	3.106.981	684.268	3.375.526	922.168	3.868.862

Of the nine manufacturing companies in the automotive and component sub-sector, it shows that the financial performance of all manufacturing companies in the automotive and component sub-sector has not managed to maintain their performance well during 2018-2021. This is due to the decrease in the value of EBIT and assets in the company.

Problem formulation:
1) Does there be financial distress with the Altman Z score, Springate and Zwijewski methods?
2) Is there a difference in the predicted results of the Altman Z score, Springate and Zmijewski methods?

2. Literature Survey

1) **Financial Distress**

a) Understanding *Financial Distress*
Platt (in Andre,2013) defines *that financial distress* is the stage of deterioration in the financial condition experienced by a company, which occurs before bankruptcy or liquidation. This condition is generally characterized, among others, by delays in delivery, decreased product quality, and delays in paying bills from banks.

b) Factors Causing *Financial Distress*

According to Jauch and Glueck (2014) in Karina (2014) the factors causing *financial distress* are broadly divided into three, namely:

c) Common Factors
- Economic sectors, at the symptom of inflation and deflation.
- The social sector, on changes in people's lifestyles that affect the demand for products and services.
- The technology sector, at the cost borne by the company swells mainly for maintenance and implementation.
- Government sector, on the imposition of export and import tariffs changed goods, new laws for banking or labor and others.

d) External factors of the company
- In the customer sector, companies must be able to identify the nature of consumers by creating opportunities to find new consumers and avoid declining sales results.
- The supplier, company and supplier sectors must continue to work well together because the power of suppliers to raise prices and reduce the profits of their buyers depends on how far these suppliers relate to free traders.

- Competitor sector, companies do not forget about competitors, because if competitors' products are more accepted by the public, the company will not lose consumers and reduce the income received.

e) Internal factors of the company
- Too much credit is given to debtors or customers. It is ultimately not paid by the customers in time.
- Management that is not paid efficiently, management inefficiencies are reflected in management's inability to deal with situations that occur, including unsustainable sales results, problems in setting selling prices, inadequate management of debts, cost structures, investment levels in fixed assets and inventories that exceed the limit, lack of working capital, imbalances in the capital structure, and inadequate accounting systems and procedures.

2) *Financial Distress* **Prediction Method**
In this section will be described in more detail 3 (tribs) financial prediction models quite popular distress. Metode-such methods are Altman, Springate and Zmijewski.
a) Altman Z-Score

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 0.99X_5$$

Information:
Z = Bankruptcy Index
X_1= Working Capital Against Total Assets
X_2= Retained Earnings Against Total Assets
X_3= Profit Before Interest And Tax On Total Assets
X_4= Total Debt shareholders' equity
X_5= Sale of Total Assets

b) **Springate**
Gordon used a discriminant analysis with several steps to identify 4 financial ratios out of 19 existing financial ratios. Springate formulated his method as follows :
$S = 1.03A + 3.07B + 0.66C + 0.4D$
Information:
S= Bankruptcy Index
A = Working Capital Against Total Assets
B= Profit Before Interest And Tax On Total Assets
C = Profit Before Tax Against Current Liabilities
D = Sale of Total Assets

c) **Zmijewski**
According to Sondakh (2014) the study conducted by Zmijewski used a non-random sample with the population of the companies studied covering all companies listed on the American and New York Stock Exchanges during the period 1972-1978 with the total population ranging from 2028-2241 per-year.
$X = -4,3 - 4,5X_1 + 5,7X_2 - 0,004X_3$
Description:
X= Bankruptcy Index
X_1= Profit After Tax On Total Assets
X_2= Total Debt Against Total Assets
X_3= Current Assets Against Current Liabilities

3) **Hypothesis**
H_1: There is a potential for *financial distress* in the company using the Altman Z-Score Method.

H_2: There is a potential for *financial distress* in the company using the Springate Method.
H_3: There is a potential for *financial distress* in the company using the Zmijewski Method.
H_4: There is a difference in accurate prediction results between MEtode Altman (Z-Score), Springate, and Zmijewski in predicting *financial distress* in Automotive and Component Sub-Sector Manufacturing Companies listed on the IDX in 2018-2021

4) **Methods**

Sampling Methods
Samples are part of the number and characteristics possessed by the population (Sugiyono, 2017: 137). The sampling method is a *purposive* sampling method where this sampling is carried out by taking samples from the population based on certain criteria.

Table 3.1: Research Sample

No.	Company Name	Stock Code	IPO Date
1	PT. Astra Internasional Tbk	ASIA	04 April 1990
2	PT. Astra Otoparts Tbk	CAR	15 June 1998
3	PT. Garuda Metalindo Tbk	BOLT	07 July 2015
4	PT. Gajah Tunggal Tbk	GJTL	08 May 1990
5	PT. Indomobil Sukses Internasional Tbk	HAVE	15 September 1993
6	PT. Indospring Tbk	INDS	August 10, 1990
7	PT. Multi Prima Sejahtera Tbk	LPIN	05 February 1990
8	PT. Prima Alloy Steel Universal Tbk	PRAS	12 July 1990
9	PT. Selamat Sempurna Tbk	SMSM	09 September 1996

Source: www.idx.co.id

3. Results

Table 1: Summary of Altman Z-Score, Springate, and Zmijewski Method Analysis Results of Automotive and Component Sub-Sector Manufacturing Companies

Company Code	Year	Calculation Results		
		Altman Z-Score	Springate	Zmijewski
ASIA	2018	2,7689	0,8315	(1,85)
	2019	2,6694	0,8764	(1,97)
	2020	2,5372	0,7136	(2,15)
	2021	2,6478	0,8888	(2,27)
CAR	2018	1,9613	0,8191	(2,84)
	2019	2,7808	0,9507	(2,98)
	2020	2,4330	0,5252	(2,83)
	2021	2,4496	0,7496	(2,76)
BOLT	2018	1,6167	1,0126	(2,07)
	2019	1,6601	0,9451	(2,22)
	2020	0,9061	0,1261	(1,94)
	2021	1,5734	0,9172	(2,28)
GJTL	2018	1,2369	0,4387	(0,29)
	2019	1,5213	0,6146	(0,56)
	2020	1,5430	0,6172	(0,88)
	2021	1,5724	0,5603	(0,78)
HAVE	2018	0,3380	0,0516	(0,03)
	2019	0,4197	0,0931	0,18
	2020	0,2627	(0,0427)	(0,04)
	2021	0,2671	(0,0041)	(0,02)
INDS	2018	4,9956	1,3988	(3,86)
	2019	5,0064	1,2464	(3,96)
	2020	4,3397	0,9239	(3,89)

Company Code	Year	Calculation Results		
		Altman Z-Score	Springate	Zmijewski
	2021	3,6399	1,2186	(3,63)
LPIN	2018	2,0069	2,2301	(4,29)
	2019	5,3129	2,7374	(4,39)
	2020	3,9892	0,9405	(3,96)
	2021	13,0289	1,8227	(4,18)
PRAS	2018	2,7833	0,4473	(1,21)
	2019	0,0079	(0,1423)	(0,71)
	2020	0,4288	0,2469	(0,37)
	2021	0,4047	0,1936	(0,30)
SMSM	2018	11,2411	3,1500	(4,01)
	2019	11,3862	3,0514	(4,02)
	2020	9,7334	2,7178	(3,81)
	2021	8,2624	2,6372	(3,75)

Table 2: Summary of Altman Z-Score, Springate, and Zmijewski Method Prediction Results of Automotive and Component Sub-Sector Manufacturing Companies

Company Code	Year	Predicted Results		
		Altman Z-Score	Springate	Zmijewski
ASIA	2018	Grey Area	Financial Distress	Non Financial Distress
	2019	Grey Area	Non Financial Distress	Non Financial Distress
	2020	Grey Area	Financial Distress	Non Financial Distress
	2021	Grey Area	Non Financial Distress	Non Financial Distress
CAR	2018	Grey Area	Financial Distress	Non Financial Distress
	2019	Grey Area	Non Financial Distress	Non Financial Distress
	2020	Grey Area	Financial Distress	Non Financial Distress
	2021	Grey Area	Financial Distress	Non Financial Distress
BOLT	2018	Distress Area	Non Financial Distress	Non Financial Distress
	2019	Distress Area	Non Financial Distress	Non Financial Distress
	2020	Distress Area	Financial Distress	Non Financial Distress
	2021	Distress Area	Non Financial Distress	Non Financial Distress
GJTL	2018	Distress Area	Financial Distress	Non Financial Distress
	2019	Distress Area	Financial Distress	Non Financial Distress
	2020	Distress Area	Financial Distress	Non Financial Distress
	2021	Distress Area	Financial Distress	Non Financial Distress
HAVE	2018	Distress Area	Financial Distress	Non Financial Distress
	2019	Distress Area	Financial Distress	Financial Distress
	2020	Distress Area	Financial Distress	Non Financial Distress
	2021	Distress Area	Financial Distress	Non Financial Distress
INDS	2018	Non Distress Area	Non Financial Distress	Non Financial Distress
	2019	Non Distress Area	Non Financial Distress	Non Financial Distress
	2020	Non Distress Area	Non Financial Distress	Non Financial Distress
	2021	Non Distress	Non Financial	Non Financial

Company Code	Year	Predicted Results		
		Altman Z-Score	Springate	Zmijewski
		Area	Distress	Distress
LPIN	2018	Grey Area	Non Financial Distress	Non Financial Distress
	2019	Non Distress Area	Non Financial Distress	Non Financial Distress
	2020	Non Distress Area	Non Financial Distress	Non Financial Distress
	2021	Non Distress Area	Non Financial Distress	Non Financial Distress
PRAS	2018	Grey Area	Financial Distress	Non Financial Distress
	2019	Distress Area	Financial Distress	Non Financial Distress
	2020	Distress Area	Financial Distress	Non Financial Distress
	2021	Distress Area	Financial Distress	Non Financial Distress
SMSM	2018	Non Distress Area	Non Financial Distress	Non Financial Distress
	2019	Non Distress Area	Non Financial Distress	Non Financial Distress
	2020	Non Distress Area	Non Financial Distress	Non Financial Distress
	2021	Non Distress Area	Non Financial Distress	Non Financial Distress

Based on the table above, the summary results show that based on the use of the Altman Z-Score Method, as many as 15 companies experienced distress areas, while companies that experienced gray areas were 10 companies and companies that experienced *non-distress areas* as many as 11 companies from 36 company samples during 2018-2021. For the use of the Springate Method, as many as 18 companies experienced financial distress and 18 companies experienced *non-financial distress* from a total sample of 36 companies during 2018-2021. Meanwhile, the use of the Zmijewski Method was 1 company that experienced *financial distress* and 35 companies from 36 company samples during 2018-2021.

4. Conclusion

Based on the results of the data processing above regarding the analysis of the use of the Altman Z-Score, Springate, and Zmijewski methods to determine the potential for *Financial Distress* (Empirical Study on Automotive and Component Sub-Sector Manufacturing Companies Listed on the Indonesia Stock Exchange in 2018-2021) it is concluded that:

a) The Altman Z-Score method analyzes the level of compliance to determine the potential for *financial distress* as many as 15 data from a total of 36 samples of automotive and component sub-sector manufacturing companies listed on the Indonesia Stock Exchange, with the lowest score of 0.338 obtained by PT. Indomobil Sukses Internasional Tbk (IMAS) in 2018.

b) Springate's method of analyzing the degree of tightness for knowing the potential for *financial distress* as much as 18 data from a total of 36 samples of automotive and component sub-sector manufacturing companies listed on the Indonesia Stock Exchange, with the lowest score of 0.0516 obtained by PT.

Indomobil Sukses Internasional Tbk (IMAS) in 2018. Meanwhile, companies that have healthy conditions or *non-financial distress* as many as 18 samples, with the highest score obtained by PT Selamat Sempurna Tbk (SMSM) of 2.632 in 2021. The level of accuracy of the Springate method in analyzing the condition of financial *distress* is 50% and the *error* rate is 50%.

Analysis of the use of the Altman Z-Score, Springate, and Zmijewski methods to determine the potential for *Financial Distress* (Empirical Study on Automotive and Component Sub-Sector Manufacturing Companies Listed on the Indonesia Stock Exchange in 2018-2021), the researchers gave the following advice:

1) For subsequent research can increase or expand the period of research and samples.
2) The research made by researchers only used 3 analytical methods, namely Altman Z-Score, Springate, and Zmijewski. For further research, you can add methods to analyze the potential for *financial distress* such as the Grover, Ohlson, Beaver, Kida, Zavgen, Taffler, CA-Score, Fulmer, and other methods. In addition, researchers are further expected to be able to analyze *financial distress* using external factors.

References

[1] Adriansyah, M. (2020).*Analisis Perbandingan Metode Altman Z-Score, Springate Dan Zmijewski Untuk Penilaian Potensi Kebangkrutan Perusahaan Pada Perusahaan Bumn Sektor Pertanian*. Universitas Pakuan.

[2] Al-ali, M. S. Bash, A. Y., Al-Foraih, E. O., Al-Sabah, A. M., dan Al-Salem, A.S.(2018). The Adaptation of Zmijewski Model in Appraising the Financial Distress ofMobile Telecommunications Companies Listed at Boursa Kuwait. *International Academic Journal of Accounting and Financial Management,5*(4), pp. 129–136. https://www.iaiest.com.

[3] Alfiyanti, M. H., Damayanti, C. R., dan Nurlaily, F. (2020). *Analisis Financial Distress*Dengan Menggunakan Metode Altman Z-*Score*dan Springate S-*Score*(Studi pada Emiten Sektor Industri Barang Konsumsi Sub SektorFood & Beverages yang Terdaftar di Bursa Efek Indonesia Tahun 2014-2018). *Jurnal Administrasi Bisnis*, *78*(1), 76-85.

[4] Altman, E. I. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *The Journal of Finance*, *23*(4), pp. 589–609.

[5] Aminian, A., Mousazade, H. And Khoshkho, O. I. (2016).Investigate the Ability of Bankruptcy Prediction Models of Altman and Springate and Zmijewski and Grover in Tehran Stock Exchange. *Mediterranean Journal of Social Sciences*, *7*(4), pp. 208–214. 10.5901/mjss.2016.v7n4s1p208.

[6] Bambang, Wahyudiono. (2014). *Mudah Membaca Laporan Keuangan*. Jakarta: Raih Asa Sukses.

[7] Burhanuddin, R. A. (2015). *Analisis Penggunaan Metode Altman Z Score dan Metode Springate untuk Mengetahui Potensi Terjadinya Financial Distress pada Perusahaan Manufaktur Sektor Industri Dasar dan Kimia Sub Sektor Semen Periode 2009-2013*. Skripsi Universitas Hasanuddin, 1–142.

[8] Ditasari, R. A., Sasongko, N. and Triyono (2019). Comparison of Altman, Springate, Zmijewski and Grover Models in Predicting *Financial Distress* on Companies of Jakarta Islamic Index (JII) on 2013-2017.*International Summit on Science Technology and Humanity*, pp. 490–504.

[9] Effendi, R. (2018). Analisis Prediksi Kebangkrutan Dengan Metode Altman, Springate, Zmijewski, Foster, Dan Grover Pada Emiten Jasa Transportasi. *Jurnal Akuntansi, Manajemen dan Bisnis (Parsimonia)*, *4*(3), pp. 307–319. https://jurnal.machung.ac.id.

[10] Fahmi, Irham. (2014). *Analisis Laporan Keuangan.* Bandung: CV Alfabeta.

[11] Fahma, Y. T., dan Setyaningsih, N. D. (2021). Analisis *financial distress* dengan metode Altman, Zmijewski, Grover, Springate, Ohlson dan Zavgren untuk memprediksi kebangkrutan pada perusahaan ritel. Jurnal Ilmiah Bisnis dan Ekonomi Asia, *15*(2), 200-216. https://doi.org/10.32815/jibeka.v15i2.398.

[12] Fakhrani, F. D. (2018). Analisis *Financial Distress* Dengan Menggunakan Model Zmijewski Pada Perusahaan Sub Sektor Perkebunan Yang TerdaftarDiBursa Efek Indonesia Periode 2012 – 2016.*E-Proceeding of Management*, *5*(1), p. 96.

[13] Fakhruddin dan Hendy. (2008). *Istilah Pasar Modal A-Z (Ikatan Akuntan Indonesia, Ed.)*. Yogyakarta: Elex Media Komputindo.

[14] Fredy, H. (2018).The Prediction of Bankruptcy In The Pulp and Paper Industry Company Listed In Indonesia Stock Exchange On 2011-2016 Period Using Z-Score Altman, Springate And Grover Model.*South East Asia Journal Of Contemporary Business, Economics and Law*, *15*(5), pp. 52–62.

[15] Hadiriyani, V. (2020). Analisis Perbandingan Metode Altman,Springate, can Zmijewski Untuk Memprediksi *FinancialDistress* Pada Perusahaan Kosmetik Yang TerdaftarDiBEI.*Jurnal Ilmiah Akuntansi*.

[16] Hanafi, M. M., dan Halim, A. (2018). *Analisis Laporan Keuangan*. Yogyakarta: Upp Stim YKPN.

[17] Hani, S. (2015). *Teknik Analisa Laporan Keuangan*. (A. Juliandi, Edisi: Pertama). UMSU Press.

[18] Hantono (2019). Memprediksi *Financial Distress* dengan Menggunakan Model Altman Score, Grover Score, Zmijewski Score (Studi Kasus Pada Perusahaan Perbankan).*Jurnal Riset Akuntansi Going Concern*, *14*(1), pp. 168–180.

[19] Harahap, Sofyan Syafri. 2015. *Analisis Kritis atas Laporan Keuangan*. Jakarta: PT. Raja Grafindo Persada.

[20] Hermanto, B. dan M.A.(2015). *Analisa Laporan Keuangan.* Lentera Ilmu Cendekia.

[21] Hirawati, H. (2017). AnalisisPrediksi *Financial Distress* Berdasarkan Model Altman Dan Grover Pada Perusahaan Manufacktur Yang Terdaftar Di Bursa Efek Indonesia.*Jurnal Riset Ekonomi Manajemen (Rekomen)*.Untidar. Doi: 10.31002/rn.v2i1.966.

[22] Idi, C. M., dan Borolla, J. D. (2021). Analisis *Financial Distress* Menggunakan Metode Altman Z–Score pada PT. Golden Plantation Tbk. Periode 2014-2018. *PUBLIC POLICY (Jurnal Aplikasi Kebijakan Publik & Bisnis)*, *2*(1), 102–121.https://doi.org/10.51135/publicpolicy.v2.i1.p102-121.

[23] Ikatan Akuntan Indonesia (2018).*Standar Akuntansi Keuangan (PSAK) No 1: Penyajian Laporan Keuangan*. Jakarta: IAI.

[24] Indonesia Stock Exchange, (2022). *Laporan Keuangan dan Tahunan*. https://www.idx.co.id

[25] Januri, Sari, E. N., dan Diyanti, A. (2017). The Analysis of the Bankruptcy Potential Comparative by Altman Z-Score, Springate and Zmijewski Methods at Cement Companies Listed in Indonesia Stock Exchange. *IOSR Journal of Business and Management,19*(10), 80–87. Diakses dari https://doi.org/10.9790/487X-1910068087.

[26] Jurnal Entrepreneur. (2022). *Cara Mudah Investor Melihat dan Menilai PerusahaanMelalui Laporan Keuangan*. Diakses dari https://www.jurnal.id/id/blog/laporan-keuangan-untuk-investor-untuk-pahami-keuangan-perusahaan.

[27] Kadim, A. (2017). *Penerapan Manajemen Produksi dan Operasi Di Industri Manufaktur*. Jakarta: Mitra Wacana Media (p. 280).

[28] Kasmir. (2016). *Pengantar Manajemen Keuangan*. Jakarta: Prenada Media Group.

[29] Kemenperin, (2022). *Unggul di ASEAN, Indonesia Fokus Tingkatkan Nilai Tambah Manufaktur*. https://www.kemenperin.go.id.

[30] Kholifah, N., Djumali, D., & Hartono, S. (2020). Mengukur *financial distress* dengan metode GROVER, Altman Z-score, Springate dan Zmijewski pada PTSolusi Bangun Indonesia Tbk. *JURNAL ILMIAH EDUNOMIKA*, *4*(02). https://doi.org/10.29040/jie.v4i02.1214.

[31] Krusita, N. W. Y. And Wiagustini, N. L. P. (2019). Prediksi *Financial Distress* Menggunakan Model Zmijewski dan Model Grover Pada Perusahaan Migas Di BEI.*E-Jurnal Manajemen*, *8*(5), pp. 2891–2917.

[32] Mardaconsita and Soelton, M. (2019). Analysis of Accuracy Level of Altman Z-Score Model and Springate Model in Measuring the Potential of *Financial Distress* in Plantations Industries. *International Journal of Economics and Financial Research,5*(2), pp. 16–25. Diakses dari doi: 10.32861/ijefr.52.16.25.

[33] Melissa, P., dan Banjarnahor, H. (2020). Analisis Prediksi Kebangkrutan Menggunakan Model Altman Z-Score, Springate dan Zmijewski Yang Terdaftar di Bursa Efek Indonesia. *Jurnal EMBA: Jurnal Riset Ekonomi, Manajemen, Bisnis Dan Akuntansi*, *8*(1), 903–912.

[34] Mulyani, L., Sulindawati, N. L. G. E. And Wahyuni, M. A. (2018). Analisis Perbandingan Ketepatan Prediksi *Financial Distress* Perusahaan Menggunakan Metode Altman, Springate, Zmijewski, dan Grover (Studi Pada Perusahaan Retail Yang Terdaftar Di Bursa Efek Indonesia Periode 2015-2017). *Jurnal Ilmiah Mahasiswa Akuntansi*, *9*(2), pp. 139–150.

[35] Nurhayati. (2016). *Analisis Fundamental Perusahaan Terhadap Return Saham yang Terdaftar di Bursa Efek Indonesia*. Skripsi Universitas Medan Area.

[36] Octavianus, R. J. N. And Karina, Y. (2016). Analisis Potensi Kebangkrutan Kafe dan Resto Di Kota Malang Dengan Menggunakan Metode Zmijewski. *Jurnal EkonomiModernisasi*, *12*(1), p. 35. doi: 10.21067/jem.v12i1.1180.

[37] Parquinda, L., dan Azizah, D. F. (2019). Analisis Penggunaan Model Grover (*G-Score*), Fulmer (H-*Score*), Springate (S-*Score*), Zmijewski (X-*Score*), dan Altman (Z-*Score*) Sebagai Prediktor Kebangkrutan (Studi pada Perusahaan Tekstil dan Garmen yang Listing di Bursa Efek Indonesia (BEI) Periode 2015. *Jurnal Administrasi Bisnis*, *72*(1), 110-118.

[38] Permana, R. K., Ahmar, N. And Djadang, S. (2017). Prediksi *Financial Distress* Pada Perusahaan Manufaktur Di Bursa Efek Indonesia.*Esensi: Jurnal Bisnis dan Manajemen*, *7*(2), pp. 149–166.Diakses dari doi: 10.15408/ess.v7i2.4797.

[39] Piscestalia, N. And Patuh Priyadi, M. (2019). Analisis Perbandingan Model Prediksi *Financial Distress* Dengan Model Springate, Ohlson, Zmijewski, dan Grover.*Jurnal Ilmu dan Riset Akuntansi*, *8*(6).

[40] Platt, H., dan M. B. Platt. 2002. Predicting *Financial Distress*. *Journal of Financial Service Professionals*.

[41] Prasetiyani, E., dan Sofyan, Moh. (2020). Bankruptcy Analysis Using Altman Z-Score Model and Springate Model In Retail Trading Company Listed In Indonesia Stock Exchange. *Ilomata International Journal of Tax and Accounting*, *1*(3), 139–144.https://doi.org/10.52728/ijtc.v1i3.98.

[42] Prastowo, Dwi. 2015. *Analisis Laporan Keuangan Konsep dan Aplikasi*. Edisi Ketiga. Yogyakarta. Upp Stim YKPN.

[43] Pratama, Putra. (2021). *Analisis Financial Distress dengan Menggunakan Model Altman (Z-Score), Springate (S-Score), Zmijewski (X-Score), dan Grover (G-Score) Pada Subsektor Pariwisata, Perhotelan dan Restoran yang Terdaftar di Bursa Efek Indonesia Tahun 2015-2019*. Universitas Pakuan.

[44] Prihanthini, Ni Made Evi Dwi dan Maria M Ratna Sari. 2013. Prediksi Kebangkrutan Grover, Altman, Z-Score, Springate, dan Zmijewski Pada Perusahaan *Food and Beverage* Di Bursa Efek Indonesia. *E-Jurnal Akuntansi Universitas Udayana*,5.2, (2013):417-435. ISSN:2302-8556. Fakultas Ekonomi dan Bisnis: Universitas Udayana.

[45] Qamruzzaman, M. And Jianguo, W. (2016). Analysis Of *Financial Distress o*nMicro Finance Institutions (Mfis) In Bangladesh: A Case Study Of Grameen Bank.*Commonwealth Journal Of Commerce & Management Research*, *3*(12), pp. 1–15.

[46] Rudianto. (2013). *Pengantar Akuntansi*. Jakarta: Erlangga.

[47] Setiawati, M. H. (2017). Analisis Metode Altman Z-Score, Springate, dan Zmijewski Untuk Memprediksi *Financial Distress* Pada Perusahaan Food and Beverage Yang Terdaftar di Bursa Efek Indonesia (BEI) Periode 2011-2015. *Administrasi Bisnis*, 2015, 1–15.

[48] Sondakh, A.C., dkk. (2014). Analisis Potensi Kebangkrutan dengan Menggunakan Metode Altman Z-score, Springate, dan Zmijewski Pada Industri Perdagangan Ritel Yang Terdaftar Di BEI Periode 2009-2013. *Jurnal EMBA*. Vol.2 No.4, 364-373.

[49] Sugiyono. (2017). *Metode Penelitian Bisnis*. Edisi ketiga. Bandung: CV Alfabeta.

[50] Supriati, D., Bawono, I. R. And Anam, K. C. (2019). Analisis Perbandingan Model Springate, Zmijewski, Dan Altman Dalam Memprediksi *Financial Distress*

Pada Perusahaan Manufaktur Yang Terdaftar Di Bursa Efek Indonesia. *Journal of business administration*, *3*(2), pp. 258–270. http://ejurnal.umri.ac.id/index.php/jae/article/download/200/125/.

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