

Bankruptcy Prediction of Textile and Garment Sector Companies using Altman Z-Score, Springate, and Zmijewski

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Article Information:

Received: July 10, 2026; Accepted: July 27, 2026; Published: 31 July 2026

Abstract

This study aims to analyze bankruptcy prediction using the Altman Z-Score, Springate, and Zmijewski methods, as well as to examine the differences among these three methods in textile and garment sub-sector companies listed on the Indonesia Stock Exchange during the 2020–2024 period. This research employs a quantitative approach using secondary data in the form of financial statements, which were collected through documentation techniques and selected using purposive sampling. The data analysis was conducted using the Altman Z-Score, Springate, and Zmijewski methods, along with ANOVA testing to examine differences in prediction results. The results indicate that all three methods can be used to predict corporate bankruptcy, and there are significant differences in the prediction results among the methods.

Keywords: Bankruptcy Prediction, Altman Z-Score, Springate Method, Zmijewski Method, ANOVA Analysis.

1. Introduction

A company is an organization that produces and sells goods or services to consumers with the primary goal of generating profit and ensuring operational sustainability. As it develops, a company seeks to utilize its resources effectively and efficiently to demonstrate strong performance. Good corporate performance is often reflected in the level of profit achieved. If efforts to improve effectiveness and efficiency fail, leading to a continuous decline in profits or a shift into losses, the company risks bankruptcy. Bankruptcy is a condition in which a company fails to conduct its operations successfully and is unable to generate profits.

Bankruptcy indicates a state of operational instability resulting from a company's inability to meet financial obligations, which, in turn, leads to reduced profitability (Yantari & Dewi, 2023). Under Law No. 37 of 2004, Article 1, Paragraph (1), bankruptcy (*kepailitan*) is defined as the general attachment of a bankrupt debtor's assets, the management and settlement of which are carried out by a Curator under the supervision of a Supervisory Judge, as stipulated by law. Article 2, Paragraph (1) clarifies that a debtor with two or more creditors who fails to pay in full at least one debt that has matured and is due for payment may be declared bankrupt by a

court ruling, whether upon their own petition or that of one or more creditors.

Predicting bankruptcy is crucial because it harms not only the company but also other stakeholders. Financial statements serve as a tool for predicting corporate bankruptcy. Bankruptcy prediction analysis is conducted to provide early warning signs of a company's likelihood of bankruptcy. The sooner signs of impending bankruptcy are detected, the greater the opportunity for management to implement corrective measures to improve the company's condition ([Masdiantini & Warasniasih, 2020](#)). Financial statements play a crucial role as a basis for assessing a company's performance and economic health ([Harahap, 2018](#)). Various financial ratios can be measured to predict bankruptcy. Bankruptcy can be signaled by a decline in corporate earnings, which is reflected in the company's profitability, liquidity, and solvency. Research findings regarding bankruptcy prediction using the Altman Z-Score, Springate, and Zmijewski methods include a study by [Baliang and Fauziyah \(2023\)](#), which identified differences among these three methods. Furthermore, research by [Maldani and Sari \(2024\)](#) demonstrated significant differences among the three models when tested on food and beverage companies. A study conducted by [Melissa and Banjarnahor \(2020\)](#) using the Altman Z-Score and Springate methods also revealed discrepancies in bankruptcy prediction results between the two approaches.

This study focuses on companies within the textile sub-sector listed on the Indonesia Stock Exchange. The textile industry in Indonesia has experienced complex dynamics in recent years. Although the sector contributes significantly to exports and employment, many textile companies have faced severe pressure due to globalization, high production costs, exchange rate fluctuations, and increasingly intense competition from imported products. Consequently, a considerable number of domestic textile companies have suffered drastic declines in financial performance, with some even teetering on the brink of bankruptcy. Reports indicate widespread bankruptcies within the textile sector. Deputy Minister of Manpower Immanuel Ebenezer Gerungan revealed data showing that 60 textile factories have collapsed, resulting in approximately 250,000 layoffs between 2022 and 2024 ([CNBC Indonesia, accessed April 30, 2025](#)). One example of a company that has gone bankrupt is PT Sri Rejeki Isman Tbk, known as PT Sritex. PT Sritex was declared bankrupt by the Semarang Commercial Court. This textile giant, the largest in Southeast Asia, had total debt of nearly USD 1.6 billion (equivalent to IDR 25 trillion), comprising long-term debt of USD 1.47 billion (IDR 23 trillion) and short-term debt of USD 131.42 million (IDR 2 trillion). Approximately 51.8 percent of this total debt, amounting to USD 810 million (equivalent to IDR 12.7 trillion), consisted of bank loans, with the largest share held by PT Bank Central Asia Tbk (BCA) at USD 82 million (approximately IDR 1.28 trillion) (<https://www.idxchannel.com/market-news/Utang-Sritex-SRIL-Tembus-Rp-25-Triliun-Ini-Rinciannya>, accessed April 30, 2025). An interesting aspect to examine regarding this phenomenon is the influence of internal corporate factors on bankruptcy risk, specifically profitability, leverage, and solvency. The financial distress facing companies in the textile and garment sub-sector is increasingly evident through declining profit-generation capabilities, an inability to meet short-term obligations, and high levels of corporate debt. This situation is reflected in the financial statements of several companies, which show consecutive losses, a decline in working capital, and a drop in operating cash flow during the 2020–2024 period.

A decline in a company's profits in its financial statements is an indicator of potential bankruptcy; falling profits and losses signal that bankruptcy is occurring. This study employs three financial ratio analysis methods: Altman Z-Score, Springate, and Zmijewski. However,

previous studies have yielded conflicting predictions across these methods, leaving it unclear which is most appropriate for companies in the textile and garment subsector. Furthermore, each method focuses on different financial ratios when detecting corporate financial distress. The Altman Z-Score method emphasizes liquidity, profitability, solvency, and activity ratios by comparing working capital, retained earnings, EBIT, and equity value against total assets or total liabilities. The Springate method focuses on a company's ability to generate profit and sales from its assets. In contrast, the Zmijewski method concentrates on profitability, leverage, and liquidity levels to predict the likelihood of financial distress. The differing approaches of these three methods can lead to varied bankruptcy prediction results. Therefore, further research is needed to explain in detail how these financial ratio analysis methods are applied to detect financial distress in textile and garment sub-sector companies listed on the Indonesia Stock Exchange.

This study builds upon previous research conducted by [Maldani and Sari \(2024\)](#). It aims to validate and explain the application of the Altman Z-Score, Springate, and Zmijewski models in predicting bankruptcy. The prior study predicted bankruptcy for Food and Beverage companies listed on the Indonesia Stock Exchange (IDX) between 2018 and 2022 and sought to identify the most effective bankruptcy prediction model. A purposive sampling method was used, resulting in a sample of 27 companies. The results revealed significant differences among the three models tested on the food and beverage companies. The Zmijewski model achieved the highest accuracy of 79.2%, followed by the Altman Z-Score at 60.8% and the Springate model at 55.8%. Therefore, the Zmijewski model is the most accurate for predicting bankruptcy.

2. Literature Review

The Altman Z-Score method can predict bankruptcy. Bankruptcy can be predicted by analyzing financial ratios that reflect a company's performance and stability. Various bankruptcy prediction models have been developed in the financial literature, including the Altman Z-Score model. This model is a multivariate method that combines five financial ratios to predict the probability of bankruptcy. It is effectively used for publicly traded manufacturing companies. The Altman Z-Score model is grounded in financial ratios and signaling theory, which posit that financial ratios signal a company's financial condition, including potential bankruptcy. Previous research serving as a reference for this study includes [Baliang and Fauziyah \(2023\)](#), who conducted a bankruptcy prediction analysis using the Altman Z-Score approach on textile sub-sector companies listed on the Indonesia Stock Exchange during the 2019–2021 period. The objective of that study was to analyze the potential for bankruptcy among textile sub-sector companies on the Indonesia Stock Exchange during that timeframe. The findings revealed that very low, or even negative, Altman Z-Score values for textile companies reflected dire financial conditions, indicating that the companies were effectively experiencing bankruptcy, even if they had not yet been legally declared insolvent.

The Springate method can predict bankruptcy. The prediction uses the Springate Model, an improvement on the Altman model that employs four ratios derived from linear discriminant analysis. It is suitable for Canadian companies and has been used in various studies within the manufacturing sector. Like the Altman Z-Score model, the Springate Model is based on financial ratios and signaling theory, which holds that financial ratios signal a company's financial condition, including its potential for bankruptcy. A prior study that serves as a reference for this research is [Baliang and Fauziyah \(2023\)](#) work, "Bankruptcy Prediction Analysis Using Altman, Springate, Zmijewski, Foster, and Grover Methods on Transportation

Service Issuers." This study aimed to analyze transportation service companies listed on the Indonesia Stock Exchange using the Altman Z-Score, Springate, Zmijewski, Foster, and Grover methods, and to identify those at risk of bankruptcy. The results revealed variations in the calculation outcomes across the five applied methods. Among them, the Springate method emerged as the most accurate for predicting bankruptcy. This was because the Springate method yielded the lowest standard deviation, 1.17, closest to the mean, as it places particular emphasis on current liabilities.

The Zmijewski method can predict bankruptcy. The Zmijewski model employs probit regression, using three key financial ratios and accounting for their interrelationships to estimate the likelihood of bankruptcy. Like the Altman Z-Score and Springate models, the Zmijewski model is grounded in financial ratio theory and signaling theory, which posit that financial ratios signal a company's financial health, including its potential for bankruptcy. A previous study by [Suharsono et al., \(2025\)](#), "Bankruptcy Prediction of Food and Beverage Companies Using Altman Z-Score, Springate, and Zmijewski," sought to explain and determine whether differences existed among the Altman Z-Score, Springate, and Zmijewski methods in predicting bankruptcy for food and beverage companies listed on the Indonesia Stock Exchange (IDX) between 2018 and 2022. The results indicated significant differences among the three models when tested on these food and beverage companies. The highest accuracy rates observed in this study were 79.2% for the Zmijewski model, 60.8% for the Altman Z-Score model, and 55.8% for the Springate model. Therefore, the Zmijewski model is the most accurate model for predicting bankruptcy.

There are differences between the Altman Z-Score, Springate, and Zmijewski models. Previous research serving as a basis for comparison and reference in this study is the work of [Mustika and Marginingsih \(2024\)](#), titled "Bankruptcy Prediction using Altman Z-Score and Springate Models for Airlines Listed on the IDX (2016–2023)." The study's findings reveal discrepancies in bankruptcy assessment results between the Altman Z-Score and Springate methods. PT Garuda Indonesia (Persero) Tbk showed potential for bankruptcy according to the Altman Z-Score (Modified) model, with an average Z-Score of 0.568; however, the company was assessed as healthy by the Springate model, with an average S-Score of 0.913. Meanwhile, PT Jaya Trishindo Tbk (HELI) fell into the "grey area" according to the Altman Z-Score (Modified) model, with an average Z-Score of 1.101, yet showed potential for bankruptcy according to the Springate model, with an average S-Score of 0.806.

3. Research Method

The subjects of this study are textile and garment sector companies listed on the Indonesian Stock Exchange. This study employs a quantitative, associative approach. Specifically, it examines the relationship between the results of bankruptcy prediction models (Altman Z-Score, Springate, and Zmijewski) and the companies' actual bankruptcy conditions. Bankruptcy is measured by indicators such as declining profits, poor financial ratios, and asset declining value values. The Altman Z-Score method uses indicators based on working capital to total assets, retained earnings to total assets, EBIT to total assets, and book value of equity to book value of debt. The Springate method uses indicators of working capital to total assets, operating profit to total assets, net profit to total debt, and sales to total assets. The Zmijewski method employs indicators of working capital to total assets, retained earnings to total assets, and total debt to total assets. The study population consists of 22 companies from the textile and garment sub-sector listed on the Indonesia Stock Exchange between 2020 and 2024; data regarding these

companies were obtained from www.idxchannel.com and the Indonesia Stock Exchange (www.idx.co.id). A purposive sampling method was used to select 13 companies. Data collection was conducted using the documentation method. The study uses quantitative secondary data in the form of annual time series. The ANOVA test was used to analyze the bankruptcy scores generated by the Altman Z-Score, Springate, and Zmijewski prediction models. ANOVA was deemed appropriate because the study aims to test the hypothesis of whether there are differences in bankruptcy prediction levels among these models.

4. Findings and Discussions

Table 1. Altman Z-Score

N o	Company Code	Year	X1 WC/TA	X2 RE/TA	X3 EBIT/TA	X4 BVE/BVD	Z Score	Category
1	ADMG	2020	0,270682	-0,484496	-0,000010	4,434507	4,838851	Good
		2021	0,286538	-0,480802	-0,000002	5,415461	5,984167	Good
		2022	0,213431	-0,724813	-0,000006	5,647300	4,956167	Good
		2023	0,175312	-0,905918	-0,000003	3,911839	2,295399	Distress
		2024	0,129798	-0,990522	-0,000002	3,016610	0,783311	Distress
2	ARGO	2020	-1,421833	-2,453811	-0,049930	-0,543538	-18,161802	Distress
		2021	-1,446399	-2,483005	-0,004492	-0,552161	-18,120611	Distress
		2022	-1,469664	-2,552911	-0,003616	-0,550336	-18,492156	Distress
		2023	-0,274831	-2,160555	-0,004186	0,135862	-8,718033	Distress
		2024	-0,246577	-2,112767	0,014664	0,122071	-8,266115	Distress
3	BELL	2020	0,173692	0,128651	0,015155	0,861673	2,556739	Distress
		2021	0,229169	0,139326	0,040135	0,981381	3,246246	Good
		2022	0,225855	0,140203	0,040477	0,988987	3,237817	Good
		2023	0,252064	0,148731	0,049230	1,001721	3,508427	Good
		2024	0,181876	0,145763	0,051565	0,869246	2,918427	Good
4	ERTX	2020	0,009868	0,118765	0,000003	0,352643	0,821707	Distress
		2021	0,042039	0,135188	0,000003	0,378003	1,111306	Distress
		2022	0,086445	0,170706	0,000006	0,442634	1,584058	Distress
		2023	0,121923	0,188238	0,000005	0,465640	1,896332	Distress
		2024	0,101502	0,203019	0,000003	0,490804	1,837989	Distress
5	ESTI	2020	0,070211	-1,268810	0,000000	0,303748	-3,360312	Distress
		2021	0,081139	-1,318088	0,000004	0,398573	-3,350226	Distress
		2022	0,056262	-1,401960	0,000002	0,447840	-3,733886	Distress
		2023	0,030246	-1,360232	0,000002	0,488272	-3,724758	Distress
		2024	0,077044	-1,389876	0,000002	0,549260	-3,452705	Distress
6	HDTX	2020	-0,584518	-4,951559	-0,149960	0,057791	-20,894347	Distress
		2021	-0,697961	-5,608808	-0,155246	-0,055703	-23,930183	Distress
		2022	-0,833628	-7,526631	-0,178809	-0,226457	-31,403109	Distress
		2023	-0,918286	-8,419081	-0,167712	-0,279385	-34,844627	Distress
		2024	-1,070279	-9,543878	-0,177650	-0,360779	-39,653183	Distress
7	INDR	2020	0,030991	0,289104	0,000001	0,945385	2,136890	Distress
		2021	0,088099	0,338464	0,000008	1,056055	2,785834	Good
		2022	0,116253	0,352356	0,000004	1,194916	3,160176	Good
		2023	0,004238	0,310828	-0,000003	1,362930	2,471944	Distress
		2024	0,023873	0,304042	-0,000002	1,502645	2,724354	Good
8	MYTX	2020	-0,285076	-0,750444	-0,036313	0,008750	-4,537132	Distress
		2021	-0,309397	-0,813772	-0,012151	-0,033164	-4,783545	Distress
		2022	-0,309072	-0,773380	-0,006574	-0,034851	-4,614044	Distress
		2023	-0,390255	-0,911110	-0,041552	-0,116898	-5,912745	Distress
		2024	-0,424641	-1,048361	-0,039766	-0,153985	-6,610985	Distress
9	POLU	2020	0,287982	0,039234	-0,024330	1,328948	3,234564	Sehat

N o	Company Code	Year	X1 WC/TA	X2 RE/TA	X3 EBIT/TA	X4 BVE/BVD	Z Score	Category
		2021	0,560704	-0,198994	-0,273720	2,145895	3,415254	Good
		2022	0,209390	-0,223097	-0,092508	1,603905	1,698281	Distress
		2023	0,242241	-0,324299	-0,058721	1,770807	1,984517	Distress
		2024	0,263321	-0,298213	-0,030674	1,840921	2,468877	Distress
		2020	-4,307010	-9,611560	-0,000004	-0,784522	-60,196094	Distress
10	POLY	2021	-4,169206	-9,339740	0,000001	-0,808448	-58,437946	Distress
		2022	-4,292657	-9,665401	0,000001	-0,837271	-60,333536	Distress
		2023	-4,713266	-10,487797	-0,000006	-0,831791	-65,747004	Distress
		2024	-9,230961	-20,763310	-0,000011	-0,922369	-128,750506	Distress
		2020	0,168898	-0,368457	-0,022097	0,630064	0,411424	Distress
11	SSTM	2021	0,307037	-0,256526	-0,027547	1,077253	2,108537	Distress
		2022	0,320189	-0,272458	-0,027071	1,092050	2,160950	Distress
		2023	0,172429	-0,314137	-0,029817	1,254590	1,215378	Distress
		2024	0,158027	-0,380168	-0,074570	1,236682	0,586817	Distress
		2020	0,301120	0,071332	0,029750	1,519635	3,988371	Good
12	TRIS	2021	0,341360	0,075212	0,040744	1,637989	4,461130	Good
		2022	0,345495	0,092028	0,084722	1,528659	4,723607	Good
		2023	0,360279	0,100433	0,080381	1,629172	4,923616	Good
		2024	0,343819	0,115558	0,095109	1,576593	4,909540	Good
		2020	0,179557	0,174449	-0,036296	0,858967	2,395627	Distress
13	ZONE	2021	0,216029	0,229187	0,095092	1,017220	3,860598	Good
		2022	0,268134	0,295567	0,176153	1,137457	5,087176	Good
		2023	0,248943	0,294034	0,106869	0,997938	4,345166	Good
		2024	0,233991	0,286449	0,045095	0,980438	3,789605	Good

Based on calculations using the Altman Z-Score method, the financial condition of textile and garment companies listed on the Indonesia Stock Exchange during the 2020–2024 period varied. Some companies fell into the healthy category, such as Trisula Textile Industries Tbk (TRIS) and Bellatex Industries Tbk (BELL), with relatively high Z-Scores indicating stable financial conditions and low bankruptcy risk. Other companies were in the "grey area" (vulnerable to bankruptcy), such as Eratex Djaja Tbk (ERTX) and Golden Flower Tbk (POLU). This status suggests that while these companies retain the potential to improve their financial performance, they face risks if they fail to enhance their financial management. Meanwhile, certain companies fell into the category of potential bankruptcy, such as Asia Pacific Fibers Tbk (POLY), Panasia Indo Resources Tbk (HDTX), Argo Pantes Tbk (ARGO), and Apac Citra Centertex Tbk (MYTX), demonstrating low Z-Scores throughout the study period. Overall, the research findings indicate diverse financial health across the textile and garment sector; some companies maintained financial stability, whereas others faced a significant risk of bankruptcy.

Table 2. Springate Prediction

No	Company Code	Year	A WC/TA	B NPBIT/TA	C NPBT/CL	D S/TA	S Score	Category
1	ADMG	2020	0,2707	0,0000	-1,5593	0,0001	-0,7503	Distress
		2021	0,2865	0,0000	0,0194	0,0001	0,3079	Distress
		2022	0,2134	0,0000	-1,2348	0,0001	-0,5951	Distress
		2023	0,1753	0,0000	-0,6993	0,0000	-0,2809	Distress
		2024	0,1298	0,0000	-0,3160	0,0000	-0,0749	Distress
2	ARGO	2020	-1,4218	-0,0499	-0,0539	0,0494	-1,6336	Distress
		2021	-1,4464	-0,0045	-0,0166	0,0626	-1,4895	Distress
		2022	-1,4697	-0,0036	-0,0554	0,0819	-1,5287	Distress
		2023	-0,2748	-0,0042	-0,1031	0,0945	-0,3262	Distress

No	Company Code	Year	A	B	C	D	S Score	Category
			WC/TA	NPBIT/TA	NPBT/CL	S/TA		
3	BELL	2024	-0,2466	0,0147	-0,0203	0,0919	-0,1855	Distress
		2020	0,1737	0,0152	-0,0541	0,9712	0,5782	Distress
		2021	0,2292	0,0401	0,0371	0,8164	0,7103	Distress
		2022	0,2259	0,0405	0,0379	0,8784	0,7333	Distress
		2023	0,2521	0,0492	0,0747	1,0161	0,8665	Good
		2024	0,1819	0,0516	0,0646	1,0027	0,7894	Distress
4	ERTX	2020	0,0099	0,0000	-0,0226	0,0001	-0,0047	Distress
		2021	0,0420	0,0000	0,0552	0,0001	0,0798	Distress
		2022	0,0864	0,0000	0,1318	0,0001	0,1761	Distress
		2023	0,1219	0,0000	0,0955	0,0001	0,1886	Distress
		2024	0,1015	0,0000	0,0475	0,0001	0,1359	Distress
5	ESTI	2020	0,0702	0,0000	-0,0391	0,0000	0,0465	Distress
		2021	0,0811	0,0000	0,0698	0,0000	0,1297	Distress
		2022	0,0563	0,0000	0,0113	0,0000	0,0655	Distress
		2023	0,0302	0,0000	0,0614	0,0000	0,0717	Distress
		2024	0,0770	0,0000	0,0560	0,0000	0,1163	Distress
6	HDTX	2020	-0,5845	-0,1500	-0,2360	0,0276	-1,2072	Distress
		2021	-0,6980	-0,1552	-0,1741	0,0340	-1,2968	Distress
		2022	-0,8336	-0,1788	-0,3272	0,0226	-1,6145	Distress
		2023	-0,9183	-0,1677	-0,0783	0,0001	-1,5123	Distress
		2024	-1,0703	-0,1777	-0,1293	0,0000	-1,7331	Distress
7	INDR	2020	0,0310	0,0000	0,0265	0,0001	0,0494	Distress
		2021	0,0881	0,0000	0,3158	0,0001	0,2992	Distress
		2022	0,1163	0,0000	0,1971	0,0001	0,2499	Distress
		2023	0,0042	0,0000	-0,1657	0,0001	-0,1050	Distress
		2024	0,0239	0,0000	-0,1038	0,0001	-0,0439	Distress
8	MYTX	2020	-0,2851	-0,0363	-0,0762	0,3574	-0,3124	Distress
		2021	-0,3094	-0,0122	-0,0572	0,4547	-0,2118	Distress
		2022	-0,3091	-0,0066	0,0421	0,4100	-0,1467	Distress
		2023	-0,3903	-0,0416	-0,1335	0,3237	-0,4881	Distress
		2024	-0,4246	-0,0398	0,0137	0,3824	-0,3975	Distress
9	POLU	2020	0,2880	-0,0243	-0,1059	0,6969	0,4308	Distress
		2021	0,5607	-0,2737	-2,2263	0,5156	-1,5259	Distress
		2022	0,2094	-0,0925	-0,2178	0,6045	0,0298	Distress
		2023	0,2422	-0,0587	-0,4738	0,4607	-0,0592	Distress
		2024	0,2633	-0,0307	-0,0512	0,6999	0,4232	Distress
10	POLY	2020	-4,3070	0,0000	-0,0181	0,0001	-4,4482	Distress
		2021	-4,1692	0,0000	0,0038	0,0001	-4,2917	Distress
		2022	-4,2927	0,0000	0,0115	0,0001	-4,4138	Distress
		2023	-4,7133	0,0000	-0,0205	0,0001	-4,8682	Distress
		2024	-9,2310	0,0000	-0,0457	0,0001	-9,5380	Distress
11	SSTM	2020	0,1689	-0,0221	-0,1176	0,4574	0,2115	Distress
		2021	0,3070	-0,0275	0,5116	0,4815	0,7620	Distress
		2022	0,3202	-0,0271	-0,0688	0,5587	0,4248	Distress
		2023	0,1724	-0,0298	-0,0523	0,5296	0,2634	Distress
		2024	0,1580	-0,0746	-0,1375	0,5933	0,0804	Distress
12	TRIS	2020	0,3011	0,0298	0,0328	1,0677	0,8502	Distress
		2021	0,3414	0,0407	0,0972	1,0355	0,9550	Good
		2022	0,3455	0,0847	0,2238	1,2719	1,2724	Good
		2023	0,3603	0,0804	0,2368	1,2593	1,2779	Good
		2024	0,3438	0,0951	0,2504	1,2054	1,2935	Good
13	ZONE	2020	0,1796	-0,0363	-0,2564	0,5798	0,1362	Distress

No	Company Code	Year	A	B	C	D	S Score	Category
			WC/TA	NPBIT/TA	NPBT/CL	S/TA		
		2021	0,2160	0,0951	0,2134	0,8243	0,9850	Good
		2022	0,2681	0,1762	0,4874	1,0324	1,5516	Good
		2023	0,2489	0,1069	0,2541	0,9768	1,1429	Good
		2024	0,2340	0,0451	0,0443	0,9461	0,7871	Distress

Based on calculations using the Springate Model, the financial condition of textile and garment companies listed on the Indonesia Stock Exchange during the 2020–2024 period indicates that the majority fall into the potential bankruptcy category. This is evidenced by S-Score values falling below the threshold for a healthy financial state for most of the sampled companies. Some companies demonstrated relatively better financial conditions than others. Companies such as Trisula Textile Industries Tbk (TRIS) improved their financial performance, placing them in the "healthy" category for the majority of the study period, specifically from 2021 to 2024. Additionally, Mega Perintis Tbk (ZONE) and Bellatex Industries Tbk (BELL) also exhibited healthy conditions during several years of the study, although their performance was not entirely stable year-on-year. Conversely, most other companies, such as Argo Pantes Tbk (ARGO), Panasia Indo Resources Tbk (HDTX), Asia Pacific Fibers Tbk (POLY), and Apac Citra Centertex Tbk (MYTX), recorded low S-Score values throughout the study period, placing them in the potential bankruptcy category. These results indicate that these companies are facing financial performance issues regarding profitability, liquidity, and the ability to generate sales from their assets. These findings demonstrate that a company's quality is determined not merely by the size of its assets, but also by its ability to improve financial performance over time sustainably. Thus, companies classified as "good" are those capable of continued growth and development while maintaining long-term financial stability.

Table 3. Zmijewski Prediction

No	Company Code	Year	X1	X2	X3	X Score	Category
			ROA	DR	CR		
1	ADMG	2020	-0,08	0,18	3,49	-2,94	Good
		2021	-0,02	0,16	3,46	-3,34	Good
		2022	-0,05	0,16	2,72	-3,19	Good
		2023	-0,03	0,21	2,01	-3,01	Good
		2024	-0,02	0,25	1,58	-2,79	Good
2	ARGO	2020	-0,03	2,11	0,07	7,87	Distress
		2021	0,00	2,15	0,07	7,94	Distress
		2022	0,00	2,22	0,07	8,39	Distress
		2023	0,00	0,88	0,37	0,73	Distress
		2024	0,01	0,89	0,44	0,74	Distress
3	BELL	2020	0,01	0,54	0,53	-1,28	Good
		2021	0,02	0,50	0,68	-1,54	Good
		2022	0,03	0,50	0,59	-1,55	Good
		2023	0,03	0,50	0,56	-1,59	Good
		2024	0,03	0,53	0,47	-1,40	Good
4	ERTX	2020	0,02	0,73	1,02	-0,23	Good
		2021	0,03	0,73	1,09	-0,28	Good
		2022	0,05	0,70	1,18	-0,55	Good
		2023	0,05	0,69	1,28	-0,61	Good
		2024	0,03	0,68	1,22	-0,60	Good
5	ESTI	2020	0,00	0,76	1,17	0,04	Distress
		2021	0,03	0,72	1,20	-0,37	Good

No	Company Code	Year	X1	X2	X3	X Score	Category
			ROA	DR	CR		
		2022	0,01	0,70	1,13	-0,38	Good
		2023	0,02	0,68	1,07	-0,54	Good
		2024	0,02	0,65	1,20	-0,68	Good
6	HDTX	2020	-0,12	0,95	0,08	1,64	Distress
		2021	-0,12	1,06	0,06	2,27	Distress
		2022	-0,21	1,29	0,05	4,03	Distress
		2023	-0,06	1,39	0,04	3,89	Distress
		2024	-0,13	1,56	0,02	5,19	Distress
7	INDR	2020	0,01	0,51	1,09	-1,45	Good
		2021	0,08	0,49	1,24	-1,88	Good
		2022	0,04	0,47	1,39	-1,84	Good
		2023	-0,03	0,38	1,01	-2,01	Good
		2024	-0,02	0,35	1,07	-2,24	Good
8	MYTX	2020	-0,02	0,99	0,38	1,45	Distress
		2021	-0,01	1,03	0,35	1,63	Distress
		2022	0,00	1,04	0,37	1,62	Distress
		2023	-0,03	1,13	0,33	2,27	Distress
		2024	-0,02	1,18	0,28	2,50	Distress
9	POLU	2020	-0,01	0,43	2,22	-1,80	Good
		2021	-0,14	0,32	5,54	-1,87	Good
		2022	-0,06	0,38	3,85	-1,86	Good
		2023	-0,03	0,36	2,34	-2,10	Good
		2024	-0,02	0,35	2,00	-2,22	Good
10	POLY	2020	-0,03	5,17	0,11	25,31	Distress
		2021	0,01	5,02	0,11	24,26	Distress
		2022	0,01	5,14	0,11	24,97	Distress
		2023	-0,06	5,52	0,10	27,43	Distress
		2024	-0,07	10,20	0,04	54,18	Distress
11	SSTM	2020	-0,01	0,61	1,49	-0,75	Good
		2021	-0,02	0,48	2,29	-1,49	Good
		2022	-0,02	0,47	1,43	-1,55	Good
		2023	-0,02	0,44	1,48	-1,70	Good
		2024	-0,05	0,45	1,44	-1,55	Good
12	TRIS	2020	0,02	0,40	1,89	-2,13	Good
		2021	0,03	0,38	2,05	-2,26	Good
		2022	0,06	0,40	1,99	-2,30	Good
		2023	0,05	0,38	2,10	-2,37	Good
		2024	0,06	0,39	1,99	-2,37	Good
13	ZONE	2020	-0,02	0,54	1,58	-1,14	Good
		2021	0,06	0,50	1,70	-1,75	Good
		2022	0,12	0,47	1,88	-2,17	Good
		2023	0,07	0,50	1,79	-1,78	Good
		2024	0,03	0,50	1,75	-1,56	Good

Based on calculations using the Zmijewski Model, the financial condition of textile and garment companies listed on the Indonesia Stock Exchange during the 2020–2024 period indicates that the majority fall into the "healthy" category. This is evidenced by X-scores falling below the financial distress threshold for most of the sampled companies. Several companies, such as Adimas Global Mining Tbk (ADMG), Bellatex Industries Tbk (BELL), Eratex Djaja Tbk (ERTX), Indo-Rama Synthetics Tbk (INDR), Golden Flower Tbk (POLU), Sunson Textile Manufacturer Tbk (SSTM), Trisula Textile Industries Tbk (TRIS), and Mega Perintis Tbk

(ZONE), demonstrated relatively stable financial conditions throughout the study period, thereby qualifying as healthy companies. Conversely, companies such as Argo Pantes Tbk (ARGO), Panasia Indo Resources Tbk (HDTX), Apac Citra Centertex Tbk (MYTX), and Asia Pacific Fibers Tbk (POLY) were at risk of bankruptcy during the study period. This status indicates a higher level of financial risk for these companies, primarily driven by low profitability and high debt levels. These findings demonstrate that a company's quality is determined not merely by the size of its assets but also by its ability to manage profitability, liquidity, and its debt structure effectively. Thus, a company can be considered "healthy" or well-performing if it maintains stable financial results while consistently fostering growth and development year after year.

Table 4. ANOVA

Nilai	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3625.531	2	1812.765	8.745	<.001
Within Groups	39801.967	192	207.302		
Total	43427.498	194			

Based on the ANOVA test results, an F-value of 8.745 was obtained with a significance value of 0.001. Since the significance value is less than 0.05, it can be concluded that H_0 is rejected and H_1 is accepted. Thus, there is a significant difference in the bankruptcy prediction results obtained using the Altman Z-Score, Springate, and Zmijewski methods for textile and garment subsector companies listed on the Indonesia Stock Exchange.

The Altman Z-Score method can be used to predict bankruptcy. Based on calculations using the Altman Z-Score method for textile and garment sub-sector companies listed on the Indonesia Stock Exchange (IDX) during the 2020–2024 period, the resulting Z-Scores reveal varying financial conditions, ranging from "healthy" and "prone to bankruptcy" to "potentially bankrupt." Certain companies, such as TRIS and ZONE, maintained Z-Scores within the "healthy" range throughout the study period. In contrast, companies like ARGO, POLY, MYTX, and HDTX exhibited very low Z-Scores, placing them in the "potential bankruptcy" category. These results demonstrate that the Altman Z-Score method effectively identifies a company's financial condition through specific financial ratios: Working Capital to Total Assets, Retained Earnings to Total Assets, Earnings Before Interest and Taxes to Total Assets, and Book Value of Equity to Book Value of Debt. These ratios reflect a company's ability to manage liquidity, profitability, and capital structure, thereby serving as indicators for predicting the likelihood of bankruptcy. The findings of this study align with those of [Altman \(1968\)](#), in **Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy**, which states that the Altman Z-Score model can predict potential corporate bankruptcy by combining various financial ratios. Further support for these findings comes from a study by [Mustika and Marginingsih \(2024\)](#) titled **Analisis Prediksi Kebangkrutan dengan Altman Z-Score dan Springate pada Maskapai Penerbangan Terdaftar di BEI Periode 2016-2023** (Bankruptcy Prediction Analysis using Altman Z-Score and Springate Models for Airlines Listed on the IDX, 2016–2023), which demonstrates the Altman Z-Score model's effectiveness in identifying corporate financial distress. However, there is also research yielding different results, such as the study by [Baliang and Fauziyah \(2023\)](#) comparing the accuracy of the Altman Z-Score, Springate, Grove, and Zmijewski methods (a case study of companies delisted from the Indonesia Stock Exchange), which indicates that the Altman Z-Score model exhibits low

accuracy. This is attributed to a key ratio in the Altman Z-Score formula: the market value of equity divided by total liabilities. The use of the market value of equity introduces high volatility, as it is influenced by market conditions and sentiment rather than solely by a company's fundamentals. Consequently, prediction results may lack accuracy or fail to detect a company's condition promptly, particularly for firms experiencing prolonged financial distress. Thus, the Altman Z-Score method is applicable for predicting bankruptcy among textile and garment sub-sector companies listed on the Indonesia Stock Exchange.

The Springate method can be used to predict bankruptcy. Based on an analysis using the Springate method for companies in the textile and garment sub-sector for the 2020–2024 period, the majority of companies exhibited S-Score values below the Springate model's cut-off point. This indicates that most companies in this study are at risk of bankruptcy. Several companies, such as ARGO, POLY, MYTX, HDTX, and ESTI, consistently showed low S-Score values throughout the study period. This condition suggests that these companies are experiencing significant financial pressure, thereby increasing the risk of bankruptcy. The Springate model utilizes several key financial ratios: Working Capital to Total Assets, Net Profit Before Interest and Taxes to Total Assets, Net Profit Before Taxes to Current Liabilities, and Sales to Total Assets. The combination of these ratios provides insight into a company's ability to generate profit and the efficiency of its asset utilization in operational activities. These findings align with [Springate's \(1978\) research](#), titled **Predicting the Possibility of Failure in a Canadian Firm**, which found that the Springate model could be used to predict the likelihood of corporate failure through financial ratio analysis. Another study supporting these results was conducted by [Sari and Parulian \(2023\)](#), titled **Comparative Analysis of Altman Z-Score, Springate, and Zmijewski Methods in Predicting Financial Distress among Tourism and Recreation Companies Listed on the IDX (2018–2022)**; this study demonstrated that the Springate model is capable of identifying companies experiencing financial distress. However, studies also show different results, such as [Yantari and Dewi \(2023\)](#), who found that the Springate model has lower accuracy than the Altman Z-Score model in predicting corporate bankruptcy. Thus, the Springate method can be used to predict bankruptcy among textile and garment sub-sector companies listed on the Indonesia Stock Exchange.

The Zmijewski method can be used to predict bankruptcy. Based on an analysis using the Zmijewski method for companies in the textile and garment sub-sector for the 2020–2024 period, the results indicate that some companies exhibit a healthy financial condition, while others show potential for bankruptcy. Companies such as TRIS, ZONE, INDR, and BELL show X-Score values within the healthy category. In contrast, companies such as POLY, HDTX, MYTX, and ARGO show X-Score values indicating potential bankruptcy. The Zmijewski model utilizes several key financial ratios, namely Return on Assets (ROA), Debt Ratio (DR), and Current Ratio (CR), to assess a company's financial condition. These ratios are used to measure a company's ability to generate profit, manage debt, and meet short-term obligations. The results of this study align with the research conducted by [Zmijewski \(1984\)](#), titled **Methodological Issues Related to the Estimation of Financial Distress Prediction Models**, which states that the Zmijewski model can be used to predict the likelihood of financial distress in companies. Similar research was conducted by [Herendra and Prasetyo \(2025\)](#), who found that the Zmijewski model can be used to identify companies experiencing financial difficulties. However, there are also studies reporting conflicting results, such as [Sari and Parulian \(2023\)](#), which found that the Zmijewski model's accuracy is lower than that of the Altman Z-Score model in predicting bankruptcy for manufacturing companies. Thus, the Zmijewski method can

be used to predict bankruptcy in textile and garment sub-sector companies listed on the Indonesia Stock Exchange.

Differences Exist Between the Altman Z-Score, Springate, and Zmijewski Models. Based on the ANOVA test results, an F-statistic of 8.745 was obtained with a significance value of 0.001 (less than 0.05); thus, it can be concluded that there is a significant difference between the Altman Z-Score, Springate, and Zmijewski methods in predicting corporate bankruptcy. Consequently, the research hypothesis stating that there is a difference in accuracy levels among the Altman Z-Score, Springate, and Zmijewski methods in predicting corporate bankruptcy is accepted. Furthermore, accuracy testing revealed that the Zmijewski method is the bankruptcy prediction model with the highest accuracy rate, at 87.69%. This high accuracy is attributed to the Zmijewski formula's focus on leverage ratios (Debt Ratio) and liquidity ratios (Current Ratio). During the study period (2020–2024), the majority of companies in Indonesia's textile and garment sector faced financial pressure due to heavy debt burdens incurred to cover operational costs amidst declining export volumes. Because the Zmijewski model is highly sensitive to changes in debt ratios, it can produce classification results that closely reflect companies' actual conditions. Conversely, the Altman Z-Score and Springate methods demonstrated relatively low accuracy rates in this study, 58.46% and 49.23%, respectively. The low accuracy of these two models stems from their relatively high critical thresholds (cut-offs) and their reliance on the working capital variable (Working Capital to Total Assets). Most textile companies experience slow inventory turnover, which places pressure on their working capital. This causes the Altman and Springate models to tend to classify companies as being in a state of bankruptcy (distress), even though, in reality, the companies remain legally operational and have not been delisted from the stock exchange. Consequently, both models yielded relatively high error rates within the scope of this study. Thus, this study concludes that the Zmijewski Method (X-Score) is recommended as the most valid and accurate tool for analyzing or predicting bankruptcy potential, particularly in the Indonesian textile and garment industry. The results indicate that each bankruptcy prediction method possesses a different level of sensitivity in detecting corporate financial distress. These differences stem from the varying financial ratios used in each model and the differing analytical approaches to assessing a company's financial health. Similar studies have been conducted previously. Research by [Effendi \(2018\)](#), titled "Bankruptcy Prediction using Altman Z-Score, Springate, and Zmijewski Methods for Delisted Companies on the Indonesia Stock Exchange (IDX)", demonstrated that these three methods yielded differing bankruptcy predictions for companies delisted from the IDX. Furthermore, a study by [Raviani and Ramadhan \(2025\)](#), titled "Comparative Analysis of Bankruptcy using Altman Z-Score, Springate, and Zmijewski Methods", also found discrepancies in bankruptcy prediction results among the three methods, attributed to the differing financial ratio indicators utilized in each analytical model. These findings align with prior research stating that the Altman Z-Score, Springate, and Zmijewski methods exhibit distinct model characteristics when analyzing corporate bankruptcy potential. These differences arise because each method employs a unique combination of financial ratios, such as profitability, liquidity, leverage, and activity ratios, to evaluate a company's financial health. Furthermore, variations in bankruptcy prediction results can also be influenced by a company's financial condition, which is prone to fluctuations in financial performance. Such fluctuations may stem from various external and internal factors. External factors include economic conditions, industry competition, and shifts in market demand. Meanwhile, internal factors encompass the company's ability to manage assets, its capital structure, operational efficiency,

and its capacity to generate profit. Companies that effectively manage financial resources and maintain a balance among assets, liabilities, and equity are better positioned to sustain financial health and avoid bankruptcy. Conversely, companies unable to manage their financial performance optimally are more susceptible to financial distress, which can lead to bankruptcy. Thus, bankruptcy prediction methods, such as the Altman Z-Score, Springate, and Zmijewski models, serve as vital analytical tools for companies, investors, and management to assess a company's financial health and identify potential bankruptcy risks at an early stage.

5. Conclusion

The Altman Z-score, Springate, and Zmijewski analysis methods can be used to predict bankruptcy among textile and garment companies listed on the Indonesia Stock Exchange. Companies should pay closer attention to their financial health by periodically evaluating their financial performance. Furthermore, companies need to optimally manage their capital structure, liquidity, and profitability to mitigate the risk of financial distress, which could lead to bankruptcy. Additionally, companies are expected to enhance operational efficiency and optimize asset utilization to maintain a healthy financial position.

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