RESEARCH ARTICLE

Assessing financial distress in State-Owned Enterprises: A comparative analysis using Altman Z-Score and Springer S-Score

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ABSTRACT

This study aims to evaluate the financial condition of State-Owned Enterprises (BUMN) listed on the official website of the Ministry of BUMN during the 2016–2023 period. BUMN represent government investments that manage essential societal needs. According to Law No. 19 of 2003, BUMN are defined as business entities whose capital is wholly or partially owned by the state through direct contributions from separated state assets. The primary goals of BUMN are to support national economic growth and contribute to state revenue. The research utilizes the Altman Z-Score and Springer S-Score methods to analyze financial distress. The findings reveal that the Altman Z-Score predicts 21 BUMN to be financially stable, 8 BUMN to be financially distressed, and 9 BUMN to be in a "grey area." Meanwhile, the Springer S-Score method predicts 12 BUMN as financially stable. However, several BUMN, including PPLN, KAEF, KRAS, TINS, JSMR, WSKT, PTHK, POST, and KAII, are identified as experiencing financial distress. These results highlight the importance of monitoring financial performance to ensure the sustainability of BUMN.
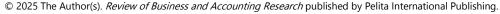
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1. Introduction

The increasing phenomenon of financial distress experienced by State-Owned Enterprises (BUMN) remains a compelling topic for analysis. BUMN play a crucial role in driving Indonesia's economic system. According to the Indonesian Ministry of Finance (2019), a State-Owned Enterprise (BUMN) is a business entity in which all or most of its capital is owned by the state through direct investments derived from separated state assets. BUMN function as economic actors within the national economy alongside private enterprises and cooperatives. When a company's capital is predominantly state-owned, the government benefits from the investment and holds significant influence in decision-making at the General Meeting of Shareholders (GMS).

In Indonesia's economic system, BUMN contribute to producing goods and services needed to achieve national prosperity. Additionally, they serve as a significant source of state revenue through various taxes, dividends, and privatization proceeds (Annisa Nurfitriana, 2019:2).

When a company faces significant financial difficulties and is unable to meet its obligations, this condition is referred to as financial distress. If left unaddressed, financial distress can lead to bankruptcy. In general, financial distress poses a major threat to business continuity and requires strong mitigation strategies to prevent further deterioration. In the context of BUMN, analytical methods such as the Altman Z-Score and Springer S-Score can provide a clear assessment of the financial distress risk these enterprises may face.

As entities with a primary role in promoting economic equity and public welfare, BUMN are also expected to pioneer business sectors that private enterprises may find less attractive. Their critical role necessitates that BUMN operate efficiently to guarantee the fulfillment of public needs while maintaining self-sufficiency, growth, and contributions to national income. However, balancing profitability with public service obligations is challenging. If internal management fails to properly manage finances, inefficiencies may arise, ultimately leading to financial distress.

Financial distress can affect companies of all sizes across various industries. The financial difficulties threatening BUMN operations are particularly concerning, as these companies rely on government funding. Ideally, BUMN should be financially healthy and self-sustaining, with the potential to support national finances, as seen in other countries. This phenomenon represents a research gap that needs to be analyzed. Financial distress typically arises when a company fails to meet its payment obligations or faces a high risk of bankruptcy. The objective of this study is to provide recommendations to the government in formulating policies to address financial distress within BUMN.

Several factors can contribute to financial distress, including rising operational costs, excessive expansion, technological lag, competitive pressures, economic conditions, weak corporate management, and declining industrial trade activities. Indonesia's economic landscape is constantly shifting, impacting the performance of both small and large enterprises. Additionally, global economic trends indicate a slowdown, which further influences domestic economic conditions. Indonesia's economic growth continues to experience significant deceleration (Directorate of Financial Statistics, 2023).

Financial distress can be measured using various assessment methods. This study employs the Altman Z-Score and the Springer S-Score methods. The Altman Z-Score is an analytical model designed to predict corporate bankruptcy with a relatively high

degree of accuracy, making it a reliable tool for assessing financial risk. The Altman model has undergone several developments, resulting in three variations: the original model, a revised model, and a modified model. This study utilizes the modified version of the Altman model. Meanwhile, the Springer S-Score applies the Multiple Discriminant Analysis (MDA) model to identify four key financial ratios out of 19 commonly referenced in financial literature, distinguishing between companies at risk of bankruptcy and those in stable condition.

The objective of this study is to analyze the financial distress prospects of State-Owned Enterprises (BUMN) from 2016 to 2023 using two different assessment methods. First, the study applies the Altman Z-Score method to evaluate the financial health and bankruptcy risk of BUMN during this period. Second, it utilizes the Springer S-Score method to further assess financial distress by identifying key financial ratios that distinguish between companies at risk of bankruptcy and those in stable condition. Through these analyses, the study aims to provide insights into the financial stability of BUMN and offer recommendations for mitigating potential financial distress.

2. Literature review

2.1. Financial distress

Financial distress refers to a prolonged decline in a company's financial condition over several consecutive years, leading to difficulties in meeting its obligations to creditors. Companies do not typically experience bankruptcy suddenly; rather, it is a gradual process that can be identified through early warning signs. Therefore, financial distress incidents that lead to a company's downfall are never without precedent. Managers and investors must assess various indicators to determine whether a company is experiencing financial distress.

Nakamura (2021) highlights that financial distress and bankruptcy are distinct conditions, although they are often perceived as the same. Financial distress occurs when a company is unable to meet its short-term obligations. Fahma and Setyaningsih (2021:201) state that short-term financial distress is temporary and does not necessarily impact a company's continuity. However, long-term financial distress can disrupt business operations, leading to insolvency and, in the worst case, liquidation. Sugeng (2017) further explains that financial distress results from excessive debt, leading to financial burdens and potential losses for the company.

2.2. Altman Z-score

Kristanti (2019:45) explains that the Altman Z-Score model was first introduced by Edward I. Altman in 1968 following his research on financial ratios. After evaluating 22

financial ratios, he identified five key ratios that could be combined to distinguish between bankrupt and non-bankrupt companies. Altman conducted multiple studies using different companies as subjects and found that profitability played a significant role in predicting bankruptcy.

Barbara and Diesy (2019) describe the Altman Z-Score model as an indicator used to measure a company's potential for bankruptcy. Numerous studies have been conducted to assess the usefulness of financial ratio analysis in predicting business failures. One of the most well-known studies in this field employs Multiple Discriminant Analysis (MDA), commonly referred to as the Altman Z-Score model. Altman developed this model using discriminant analysis to address the limitations of traditional ratio analysis, which evaluates each ratio separately.

According to Prasandri (2018), the Altman Z-Score is a discriminant analysis tool used to predict business or corporate bankruptcy by calculating a Z-Score based on various weighted financial ratios. A higher Z-Score indicates a financially healthy company, while a lower Z-Score suggests a company is at risk of bankruptcy. The model provides a formula for assessing when a company may face bankruptcy. Over time, Altman refined his model with ZETA analysis, incorporating adjustments related to company size, financial profile, accounting standards, financial practices, and business expansion in the retail sector.

The Altman Z-Score model classifies companies into three categories. Companies with a Z-Score greater than 2.60 are considered financially healthy and not at risk of financial distress. Companies with a Z-Score between 1.10 and 2.60 fall into the "grey area," meaning they face financial difficulties but have an equal probability of survival or bankruptcy, depending on management decisions. Companies with a Z-Score below 1.10 are categorized as facing severe financial distress with a high risk of bankruptcy (Fitriyanti & Rohmah, 2021:5).

2.3. Springer S-score

Peter and Yoseph (2011:6) explain that, following the principles of the Altman Z-Score, the Springer S-Score model uses a step-wise Multiple Discriminant Analysis (MDA). Initially, this method employed 19 financial ratios commonly referenced in research. However, after further validation, only four key financial ratios were selected to differentiate between financially healthy (non-distressed) companies and those at risk of bankruptcy (distressed). The four ratios used in this model are working capital to total assets, earnings before interest and taxes to total assets, earnings before taxes to current liabilities, and sales to total assets.

The Springer S-Score model sets a threshold score of 0.862. Companies with an S-Score greater than 0.862 are classified as financially stable, while those with an S-Score below 0.862 are considered at high risk of bankruptcy (Fitriyanti & Rohmah, 2021:5).

3. Research methodology

This study falls within the scope of Financial Management and analyzes financial distress using the Altman Z-Score and Springer S-Score methods. The research focuses on State-Owned Enterprises (SOEs) listed on the Ministry of SOEs website from 2016 to 2023. The study employs a quantitative research approach, which involves the use of numerical data that can be directly measured and represented in numerical form to determine the quantity of a particular phenomenon (Malik, 2017:52). The results of the quantitative analysis are then described in a narrative form, predicting financial distress based on the Altman Z-Score and Springer S-Score methods.

This research utilizes secondary data, which includes information obtained from books, journals, records, articles, and previous research from existing sources (Malik, 2017:52). The collected data consists of financial reports of SOEs for the period from 2016 to 2023, along with other relevant data required for calculating the research variables (State-Owned Enterprises, 2023).

The population refers to the entire set of objects or elements that share specific characteristics within a study (Nuha, 2017:67). The population in this study comprises all SOEs listed on the Ministry of SOEs website, totaling 44 companies (State-Owned Enterprises, 2023). The sampling method used in this research is purposive sampling, which is based on specific considerations and exclusive criteria (Pahleviannur et al., 2022:68). This technique is applied to ensure that the selected sample meets the predefined criteria.

As a result, 23 companies were excluded for not meeting the established criteria, leaving 21 companies as the final sample for this study. The list of selected SOEs analyzed in this research (State-Owned Enterprises, 2023).

4. Results and discussion

4.1. Results of Altman (Z-Score) method

To calculate the Altman (Z-Score) method, four financial performance ratios are used. The first performance ratio (X1) is the Working Capital to Total Asset (WCTA), which indicates the proportion of Working Capital to Total Assets. The second performance ratio (X2) is the Retained Earnings / Total Asset (RETA) ratio, which shows the comparison between Retained Earnings and Total Assets. The third performance ratio (X3) is the Earnings Before Interest and Taxes / Total Asset (EBITA) ratio, which measures the

proportion of Earnings Before Interest and Taxes relative to Total Assets. The fourth performance ratio (X4) is the Book Value of Equity / Book Value of Total Debt (BVEBVTL) ratio, which represents the proportion of Market Equity Value to the Book Value of Debt.

This section will first describe the trends in each ratio for the companies analyzed, followed by a discussion of the Z-Score calculations for each company.

4.1.1. Working capital to total asset (WCTA)

The Working Capital / Total Asset ratio is used for State-Owned Enterprises (SOEs) listed on the Ministry of SOEs website to assess a company's ability to generate net working capital from total assets (to measure company liquidity). A higher ratio indicates a better financial position for the company.

Table 2. Results of working capital to total asset (WCTA)

Code	2016	2017	2018	2019	2020	2021	2022	2023	Change
PPLN	-0,02	-0,03	-0,03	0,00	-0,03	-0,04	-0,02	-0,01	-60,77
INAF	0,11	0,02	0,03	0,28	0,17	0,18	-0,14	-1,36	1,16
KAEF	0,26	0,26	0,14	0,00	-0,04	0,01	0,01	-0,20	-23,66
KRAS	-0,06	-0,08	-0,23	-0,55	0,00	-0,14	-0,42	-0,52	1,01
ANTM	0,21	0,11	0,05	0,08	0,05	0,16	0,17	0,27	28,04
TINS	0,23	0,30	0,16	0,02	0,60	0,12	0,24	0,12	-47,56
WIKA	0,22	0,20	0,26	0,19	0,06	0,00	0,05	-0,12	-48,18
JSMR	-0,11	-0,08	-0,24	-0,30	-0,04	-0,02	0,00	-0,11	-8,29
PTPP	0,28	0,22	0,21	0,19	0,07	0,06	0,10	0,08	-72,56
WSKT	0,14	0,00	0,08	0,03	-0,20	0,15	0,13	0,00	-99,12
ADHI	0,19	0,25	0,21	0,16	0,08	0,01	0,12	0,09	-53,23
PTHK	0,13	0,02	-0,03	0,00	-0,16	0,01	0,13	0,16	-25,24
BBNI	0,03	0,03	0,03	0,03	0,02	0,02	0,02	0,02	-30,82
BBRI	0,02	0,02	0,01	0,02	0,02	0,02	0,03	0,03	34,22
BMRI	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	0,00	-0,01	-147,82
BBTN	0,00	0,00	0,00	0,00	0,00	-0,02	0,00	0,00	4,34
POST	0,05	0,01	0,01	0,03	0,03	0,08	0,14	0,11	-121,44
KAII	0,03	0,17	0,04	-0,03	0,00	0,00	0,08	-0,06	-291,41
GIAA	-0,11	-0,25	-0,48	-0,48	-0,35	-0,76	-0,14	-0,08	-171,38
TLKM	0,04	0,01	-0,01	-0,08	-0,09	-0,03	-0,06	-0,06	-225,56
DNRK	-0,03	-0,03	-0,02	-0,03	-0,05	0,09	0,09	0,09	-384,59

Source: Secondary data (processed), 2024.

Based on Table 2, it can be identified that from 2016 to 2023, 16 out of 22 State-Owned Enterprises experienced a decline in performance based on the Net Working Capital to Total Assets ratio. The companies that showed a decline in WCTA ratio performance include PPLN, KAEF, TINS, WIKA, JSMR, PTPP, WSKT, ADHI, PTHK, BBNI, BMRI, POST, KAII, GIAA, TLKM, and DNRK. The largest decline occurred in DNRK, with a decrease of -384.59%.

Meanwhile, based on Table 2, five out of 21 State-Owned Enterprises showed an improvement in performance based on the Net Working Capital to Total Assets ratio from 2016 to 2023. The companies that showed improved performance were INAF,

KRAS, ANTM, BBRI, and BBTN. The company with the highest performance improvement in Net Working Capital to Total Assets was PPLN, with an increase of 100.01% from 2016 to 2023.

4.1.2. Result of retained earning to total assets (RETA)

The Retained Earnings / Total Asset ratio is used for State-Owned Enterprises listed on the Ministry of SOEs website to assess a company's ability to generate retained earnings from its total assets (measuring profitability). Retained earnings represent profits that are not distributed to shareholders.

From Table 3, it is identified that between 2016 and 2023, only 12 out of 21 State-Owned Enterprises experienced a decline in performance based on the Retained Earnings to Total Assets ratio. The companies with declining RETA ratios include KAEF, KRAS, ANTM, TINS, WSKT, PTHK, BBNI, BBRI, POST, KAII, GIAA, and DNRK. The largest decline occurred in KAEF, with a decrease of -976.07%.

Table 3. Result of retained earning to total assets (RETA)

Code	2016	2017	2018	2019	2020	2021	2022	2023	Change
PPLN	0,06	0,05	0,05	0,04	0,05	0,05	0,06	0,06	4,62
INAF	0,13	0,09	-0,06	-0,06	-0,09	-0,09	-0,48	-1,86	1,49
KAEF	0,02	0,04	0,04	0,00	0,00	0,02	-0,05	-0,14	-976,07
KRAS	0,00	0,00	-0,49	-0,71	-0,67	-0,58	-0,69	-0,82	-816,20
ANTM	-0,06	-0,06	0,24	0,25	0,24	0,20	0,18	0,32	-604,66
TINS	0,07	0,08	0,04	-0,03	-0,06	0,02	0,01	-0,11	-250,06
WIKA	0,04	0,04	0,04	0,04	0,04	0,06	0,06	0,06	57,33
JSMR	0,05	0,04	0,04	0,05	0,05	0,05	0,04	0,09	71,42
PTPP	0,03	0,03	0,03	1,57	0,31	0,48	0,47	0,85	2,51
WSKT	0,45	0,06	0,07	0,07	0,06	0,07	1,01	0,14	-68,02
ADHI	0,11	0,15	0,17	0,15	0,04	0,08	1,78	5,96	54,27
PTHK	0,01	0,02	0,03	0,02	-0,02	-0,04	-0,04	-0,02	-293,81
BBNI	0,08	0,08	0,08	0,09	0,07	0,08	0,09	0,10	-20,72
BBRI	0,12	0,12	0,12	0,13	0,10	0,11	0,11	0,11	-11,91
BMRI	0,09	0,09	0,10	0,10	0,07	0,08	0,08	0,09	0,11
BBTN	0,00	0,00	0,01	1,17	0,00	0,01	0,01	0,01	1,56
POST	0,07	0,05	0,01	0,01	0,04	0,06	0,06	0,06	-25,57
KAII	0,04	0,08	0,01	0,17	0,11	0,09	0,00	0,00	-97,47
GIAA	-0,06	-0,12	-0,16	-0,15	-0,30	-1,03	-0,59	0,51	-763,28
TLKM	0,34	0,35	0,37	0,00	0,32	0,32	0,35	0,36	5,27
DNRK	0,02	-0,02	-0,26	-0,33	-0,30	0,00	-0,01	0,01	-66,32

Source: Secondary data (processed), 2024.

Meanwhile, based on Table 3, nine out of 21 State-Owned Enterprises showed an improvement in performance based on the Retained Earnings to Total Assets ratio between 2016 and 2023. The companies with improved performance were PPLN, INAF, WIKA, JSMR, PTPP, ADHI, BMRI, BBTN, and TLKM. The company with the highest improvement in the Retained Earnings to Total Assets ratio was PTPP, with an increase of 2,511.96% from 2016 to 2023.

4.1.3. Earnings before interest and taxes to total assets (EBITA)

The Earnings Before Interest and Taxes / Total Asset ratio is used for State-Owned Enterprises listed on the Ministry of SOEs website to assess a company's ability to generate earnings from its operations before paying interest and taxes.

Table 4. EBITA Ratio Calculation Results

Code	2016	2017	2018	2019	2020	2021	2022	2023	Change
PPLN	0,01	0,01	0,01	0,02	0,01	0,01	0,01	0,02	82,07
INAF	-0,01	-0,04	-0,02	0,01	0,01	0,00	-0,36	-0,88	-65,78
KAEF	0,08	0,33	0,07	0,00	0,00	0,02	0,00	-0,12	-248,25
KRAS	-0,05	-0,02	-0,05	-0,16	0,00	0,02	0,07	-0,04	-174,27
ANTM	0,01	0,02	0,06	0,02	0,05	0,09	0,16	0,09	1.037,97
TINS	0,04	0,06	0,00	0,00	-0,02	0,12	0,11	-0,03	-20,04
WIKA	0,04	0,03	0,04	0,04	0,46	0,28	0,23	0,12	197,72
JSMR	0,05	0,04	0,04	0,03	0,01	0,02	0,04	0,06	23,63
PTPP	0,04	0,04	0,04	0,02	0,63	0,68	0,66	0,26	607,51
WSKT	0,04	0,05	0,04	0,01	0,09	0,01	0,01	0,04	12,25
ADHI	30,57	33,79	21,58	18,80	1,04	2,49	4,58	2.895,36	9.370,16
PTHK	0,16	0,02	0,04	0,02	-0,02	-0,02	-0,01	0,01	-92,04
BBNI	0,02	0,02	0,02	0,02	0,01	0,01	0,02	0,02	-0,84
BBRI	0,03	2,03	0,03	0,20	0,02	0,02	3,03	2,04	5.931,95
BMRI	0,02	0,02	0,03	0,03	0,02	0,01	0,03	0,03	92,69
BBTN	0,02	0,01	0,01	0,00	0,01	0,01	0,01	0,01	-36,12
POST	0,08	0,05	0,01	0,01	0,04	0,06	0,06	0,05	-33,72
KAII	0,05	0,06	0,05	0,06	-0,04	-0,01	0,03	0,03	-48,61
GIAA	0,00	-0,04	-0,07	0,00	-0,24	-0,63	0,63	0,03	6,41
TLKM	0,21	0,21	0,18	0,17	0,16	0,16	0,13	0,14	4,37
DNRK	0,04	-0,04	-0,22	0,02	0,05	0,80	0,02	0,02	-44,41

Source: Secondary data (processed), 2024.

From Table 4, it is identified that between 2016 and 2023, 10 out of 21 State-Owned Enterprises experienced a decline in performance based on the Earnings Before Interest and Taxes to Total Assets ratio. The companies with declining EBITA ratios include INAF, KAEF, KRAS, TINS, PTHK, BBNI, BBTN, POST, KAII, and DNRK. The largest decline occurred in KAEF, with a decrease of -248.25%.

Meanwhile, based on Table 4, 11 out of 21 State-Owned Enterprises showed an improvement in performance based on the Earnings Before Interest and Taxes to Total Assets ratio between 2016 and 2023. The companies with improved EBITA ratios include PPLN, ANTM, WIKA, JSMR, PTPP, WSKT, ADHI, BBRI, BMRI, GIAA, and TLKM. The company with the highest improvement was ADHI, with an increase of 9,370.16%.

4.1.4. Book value of equity to book value of total debt (BVETD)

The Book Value of Equity / Book Value of Total Debt ratio is used for State-Owned Enterprises listed on the Ministry of SOEs website to assess a company's ability to meet its obligations based on its own market equity value (common stock).

From Table 4.5, it is identified that between 2016 and 2023, 16 out of 21 State-Owned Enterprises experienced a decline in performance based on the ratio of Book Value of Equity to Book Value of Debt. The companies with declining BVEBVTD ratios include PPLN, INAF, KAEF, KRAS, TINS, WIKA, JSMR, PTPP, WSKT, ADHI, BBNI, BMRI, BBTN, KAII, GIAA, and TLKM. The largest decline occurred in GIAA, with a decrease of -118.45%.

Table 5. BVEBVTD ratio calculation results

Code	2016	2017	2018	2019	2020	2021	2022	2023	Change
PPLN	2,2306	1,8675	1,5358	1,4174	1,4478	1,5541	1,5331	1,5505	-30,48
INAF	0,7144	0,5245	0,5251	0,5744	0,3554	0,3381	0,0596	-0,5144	-27,99
KAEF	0,9702	0,8188	0,5772	0,6776	0,6795	0,6868	0,8478	0,5711	-0,41
KRAS	0,8772	0,8192	0,2982	0,1181	0,1477	0,1842	0,2117	0,2119	-75,84
ANTM	1,5907	1,6045	1,3419	1,5034	1,5785	1,7251	2,389	2,6671	67,66
TINS	1,4515	1,0424	0,6777	0,3481	0,5158	0,7525	1,1687	0,9442	-35,15
WIKA	0,6721	0,4712	0,4097	0,4479	0,3237	0,3356	0,3038	0,1696	-74,76
JSMR	0,4396	0,3017	1,3246	1,3031	0,3123	0,3366	0,3911	0,4304	-2,09
PTPP	0,5273	0,5171	0,4502	0,4141	0,3521	0,3474	0,3463	0,3659	-99,94
WSKT	0,3755	0,3028	0,3024	0,3115	0,1279	0,1754	0,1696	0,1381	-63,22
ADHI	3,0573	3,3786	2,1584	1,8799	1,0431	2,4871	0,4584	0,2895	-90,53
PTHK	0,4582	0,2127	0,2871	0,4874	0,4015	0,7016	1,1851	2,1957	379,21
BBNI	0,1811	0,1727	0,1644	0,1815	0,1512	0,1509	0,1575	0,1661	-8,28
BBRI	0,1721	0,1751	0,1666	0,1764	0,1703	0,2104	0,1942	0,1919	11,15
BMRI	0,1861	0,1914	0,1963	0,2037	0,1724	0,1674	0,1633	0,1731	-6,98
BBTN	0,1046	0,0967	0,0903	0,0884	0,0621	0,0653	0,0737	0,0799	-23,61
POST	0,3989	0,7261	0,8369	0,7554	1,0378	1,3657	1,6591	1,4727	269,19
KAII	0,9951	0,6409	0,8842	0,7891	0,4711	0,5948	0,6842	0,6123	-38,46
GIAA	0,8675	1,0371	0,1819	0,1929	-0,1526	-0,4593	-0,1975	-0,1601	-118,45
TLKM	1,4249	1,2984	1,3195	1,1278	0,9591	1,1033	1,1852	1,1998	-15,79
DNRK	0,6128	0,5136	0,6943	0,4459	0,4111	0,3687	2,1031	2,0071	227,52

Source: Secondary data (processed), 2024.

Meanwhile, based on Table 5, only 5 out of 21 State-Owned Enterprises (SOEs) experienced performance improvement according to the ratio comparison between Book Value of Equity and Book Value of Debt from 2016 to 2023. The companies that showed an increase in performance were ANTM, PTHK, BBRI, POST, and DNR. The company with the highest performance improvement in terms of the ratio of Book Value of Equity to Book Value of Debt was PTHK, achieving a 379.21% increase from 2016 to 2023.

After obtaining the values of the four ratios, the next step is to calculate the Z-Score. In this method, Altman uses four types of ratios: (a) Net Working Capital/Total Assets Ratio; (b) Retained Earnings/Total Assets Ratio; (c) Earnings Before Interest and Taxes/Total Assets Ratio; and (d) Book Value of Equity/Book Value of Debt Ratio

These four ratios are incorporated into the formula to calculate Altman's Method according to Edward I. Altman, which was revised in 1968 (Kristanti, 2019).

$$Z = 6.56\ X1 + 3.26\ X2 + 6.72\ X3 + 1.05\ X4$$

The obtained Z-Score from the Altman model is then compared to the classification criteria cut-off points to predict whether a company is non-distressed, distressed, or in the grey area. The classification of a company as non-distressed or distressed is based on the Z-

Score value of the Altman model (Cipta, 2021), namely: (a) If the Z-Score is less than 1.1, the company is predicted to be distressed (potential bankruptcy); (b) If the Z-Score is greater than 2.60, the company is predicted to be non-distressed (financially healthy); and (c) If the Z-Score is between 1.1 and 2.60, the company is classified as being in the grey area (between distress and non-distress). ND (non-distress) indicates that the company has no financial distress potential, G (grey) signifies that the company is in the grey area, and D (distress) means the company has a high probability of financial difficulties and bankruptcy. Table 4.6 reports the financial distress potential calculations using the Altman (Z-Score) method based on financial statement data from 2016 to 2023.

Based on the average values in Table 4.6, the calculation results using the Altman (Z-Score) method indicate that 8 SOEs are predicted to experience distress (bankruptcy) in the future, 9 SOEs fall into the grey area (uncertain whether they are healthy or heading towards bankruptcy), and the remaining 4 SOEs are predicted to be non-distressed (not at risk of bankruptcy).

The companies predicted to be distressed according to the Altman (Z-Score) method are PT Indofarma (INAF), PT Krakatau Steel (KRAS), PT Jasa Marga (JSMR), PT Bank Negara Indonesia (BBNI), PT Bank Rakyat Indonesia (BBRI), PT Bank Mandiri (BMRI), PT Bank Tabungan Negara (BBTN), and PT Garuda Indonesia (GIAA). Meanwhile, the companies predicted to be in the grey area are PT Kimia Farma (KAEF), PT Timah (TINS), PT Wijaya Karya (WIKA), PT Waskita Karya (WSKT), PT Hutama Karya (PTHK), PT Pos Indonesia (POST), PT Kereta Api Indonesia (KAII), PT Telekomunikasi Indonesia (TLKM), and PT Danareksa (DNRK). The companies classified as non-distressed (healthy) are PT Perusahaan Listrik Negara (PPLN), PT Aneka Tambang (ANTM), PT Pembangunan Perumahan (PTPP), and PT Adhi Karya (ADHI).

If we analyze the distressed companies based on the four ratios used in Z-Score calculations, as outlined in Tables 4.2 to 4.6, the details are as follows:
1. INAF (Indo Farma) experienced the highest financial performance decline in Ratio X3 (Earnings Before Interest and Taxes/Total Assets) at -65.78%.
2. KRAS (PT Krakatau Steel) experienced the highest financial performance decline in Ratio X2 (Retained Earnings/Total Assets) at -816.21%.
3. WIKA (PT Wijaya Karya) recorded the highest financial performance improvement in Ratio X3 (Earnings Before Interest and Taxes/Total Assets) at 197.72%.
4. JSMR (PT Jasa Marga) experienced the highest financial performance decline in Ratio X1 (Net Working Capital/Total Assets) at -8.29%.
5. BBNI (PT Bank Negara Indonesia) experienced the highest financial performance decline in Ratio X1 (Net Working Capital/Total Assets) at -30.82%.
6. BBRI (PT Bank Rakyat Indonesia) experienced the highest financial performance decline in Ratio X2 (Retained Earnings/Total Assets) at -11.91%.
7. BMRI (PT Bank Mandiri) experienced the highest financial performance decline in Ratio X1 (Net Working Capital/Total Assets) at -147.82%.
8. BBTN (PT Bank Tabungan Negara) experienced the highest financial performance decline in Ratio X4 (Book Value of Equity/Book Value of Debt) at -23.61%.
9. GIAA (PT Garuda Indonesia) experienced the highest financial performance decline in Ratio X1 (Net Working Capital/Total Assets) at -171.38%.

On the other hand, companies predicted to be non-distressed (healthy) include PPLN, ANTM, PTPP, and ADHI. If we analyze these companies based on the four ratios used in Z-Score calculations, the details are as follows:

1. PPLN (PT Perusahaan Listrik Negara) recorded the highest financial performance improvement in Ratio X3 (Earnings Before Interest and Taxes/Total Assets) at 82.07%.
2. ANTM (PT Aneka Tambang) recorded the highest financial performance improvement in Ratio X3 (Earnings Before Interest and Taxes/Total Assets) at 1,037.97%.
3. PTPP (PT Pembangunan Perumahan) recorded the highest financial performance improvement in Ratio X2 (Retained Earnings/Total Assets) at 2,511.96%.
4. ADHI (PT Adhi Karya) recorded the highest financial performance improvement in Ratio X2 (Retained Earnings/Total Assets) at 54.27%.

Meanwhile, based on Table 5, only 5 out of 21 State-Owned Enterprises (SOEs) experienced performance improvement according to the ratio comparison between Book Value of Equity and Book Value of Debt from 2016 to 2023. The companies that showed an increase in performance were ANTM, PTHK, BBRI, POST, and DNR. The company with the highest performance improvement in terms of the ratio of Book Value of Equity to Book Value of Debt was PTHK, achieving a 379.21% increase from 2016 to 2023.

After obtaining the values of the four ratios, the next step is to calculate the Z-Score. In this method, Altman uses four types of ratios:

1. Net Working Capital/Total Assets Ratio
2. Retained Earnings/Total Assets Ratio
3. Earnings Before Interest and Taxes/Total Assets Ratio
4. Book Value of Equity/Book Value of Debt Ratio

These four ratios are incorporated into the formula to calculate Altman's Method according to Edward I. Altman, which was revised in 1968 (Kristanti, 2019):

$$Z = 6.56\ X1 + 3.26\ X2 + 6.72\ X3 + 1.05\ X4$$

The obtained Z-Score from the Altman model is then compared to the classification criteria cut-off points to predict whether a company is non-distressed, distressed, or in the grey area. The classification of a company as non-distressed or distressed is based on the Z-Score value of the Altman model (Cipta, 2021), namely: (a) If the Z-Score is less than 1.1, the company is predicted to be distressed (potential bankruptcy); (b) If the Z-Score is greater than 2.60, the company is predicted to be non-distressed (financially healthy); and (c) If the Z-Score is between 1.1 and 2.60, the company is classified as being in the grey area (between distress and non-distress).

ND (non-distress) indicates that the company has no financial distress potential, G (grey) signifies that the company is in the grey area, and D (distress) means the company has a high probability of financial difficulties and bankruptcy.

Table 6 reports the financial distress potential calculations using the Altman (Z-Score) method based on financial statement data from 2016 to 2023. Based on the average values in Table 4.6, the calculation results using the Altman (Z-Score) method indicate that 8 SOEs are predicted to experience distress (bankruptcy) in the future, 9 SOEs fall into the grey area (uncertain whether they are healthy or heading towards bankruptcy), and the remaining 4 SOEs are predicted to be non-distressed (not at risk of bankruptcy).

The companies predicted to be distressed according to the Altman (Z-Score) method are PT Indofarma (INAF), PT Krakatau Steel (KRAS), PT Jasa Marga (JSMR), PT Bank Negara Indonesia (BBNI), PT Bank Rakyat Indonesia (BBRI), PT Bank Mandiri (BMRI), PT Bank Tabungan Negara (BBTN), and PT Garuda Indonesia (GIAA). Meanwhile, the companies predicted to be in the grey area are PT Kimia Farma (KAEF), PT Timah (TINS), PT Wijaya Karya (WIKA), PT Waskita Karya (WSKT), PT Hutama Karya (PTHK), PT Pos Indonesia (POST), PT Kereta Api Indonesia (KAII), PT Telekomunikasi Indonesia (TLKM), and PT Danareksa (DNRK). The companies classified as non-distressed (healthy) are PT Perusahaan Listrik Negara (PPLN), PT Aneka Tambang (ANTM), PT Pembangunan Perumahan (PTPP), and PT Adhi Karya (ADHI).

Table 6: Calculation Results of Altman (Z-Score) Method

Code	2016	2017	2018	2019	2020	2021	2022	2023	Change	Status Prediksi
PPLN	2,49	1,96	1,68	1,72	1,50	1,65	1,83	2,01	1,85	ND
INAF	1,80	0,75	0,42	2,30	1,28	1,27	-4,85	-21,43	-2,31	D
KAEF	3,35	4,14	2,12	0,71	0,49	1,01	0,78	-2,01	-1,82	G
KRAS	0,21	0,19	-3,13	-6,86	-2,01	-2,50	-4,34	-6,11	-1,35	D
ANTM	2,89	2,34	2,97	3,05	3,11	4,11	5,24	6,22	3,74	ND
TINS	3,55	3,74	1,86	0,38	4,11	2,44	3,53	1,19	2,59	G
WIKA	2,56	2,14	2,53	2,18	3,91	2,48	2,40	0,40	2,32	G
JSMR	0,26	0,23	0,23	-0,44	0,28	0,54	0,84	0,39	0,29	D
PTPP	2,73	2,39	2,19	6,95	6,07	6,91	6,97	5,43	4,95	ND
WSKT	2,99	0,83	1,38	0,84	-0,34	1,46	4,38	0,87	1,55	G
ADHI	22,53	25,12	16,74	14,40	7,84	17,22	10,01	22,26	17,01	ND
PTHK	2,44	0,62	0,45	0,75	-0,83	0,57	1,96	3,39	1,26	G
BBNI	0,80	0,78	0,79	0,82	0,59	0,65	0,74	0,78	0,74	D
BBRI	0,93	0,92	0,87	0,82	0,79	0,89	0,95	0,98	0,89	D
BMRI	0,53	0,61	0,67	0,71	0,57	0,55	0,59	0,66	0,61	D
BBTN	0,25	0,23	0,23	0,96	0,15	0,01	0,20	0,21	0,27	D
POST	1,50	1,30	1,07	1,09	1,68	2,56	3,20	2,78	1,89	G
KAII	1,73	2,46	1,57	1,59	0,57	0,88	1,42	0,44	1,33	G
GIAA	0,05	-1,21	-3,93	-2,43	-5,05	-13,06	1,18	-2,10	-3,31	D
TLKM	4,33	4,02	3,67	1,84	2,51	3,08	2,91	3,02	3,17	G
DNRK	0,75	0,05	-1,78	-0,65	-0,55	6,37	2,95	2,89	1,25	G

Note: ND = Non-Distress (Healthy), D = Distress (Bankrupt/Unhealthy), G = Grey Area (Between Distress and Non-Distress)
Source: Secondary data (processed), 2024.

If we analyze the distressed companies based on the four ratios used in Z-Score calculations, as outlined in Tables 4.2 to 4.6, the details are as follows:
1. INAF (Indo Farma) experienced the highest financial performance decline in Ratio X3 (Earnings Before Interest and Taxes/Total Assets) at -65.78%.
2. KRAS (PT Krakatau Steel) experienced the highest financial performance decline in Ratio X2 (Retained Earnings/Total Assets) at -816.21%.
3. WIKA (PT Wijaya Karya) recorded the highest financial performance improvement in Ratio X3 (Earnings Before Interest and Taxes/Total Assets) at 197.72%.
4. JSMR (PT Jasa Marga) experienced the highest financial performance decline in Ratio X1 (Net Working Capital/Total Assets) at -8.29%.

5. BBNI (PT Bank Negara Indonesia) experienced the highest financial performance decline in Ratio X1 (Net Working Capital/Total Assets) at -30.82%.
6. BBRI (PT Bank Rakyat Indonesia) experienced the highest financial performance decline in Ratio X2 (Retained Earnings/Total Assets) at -11.91%.
7. BMRI (PT Bank Mandiri) experienced the highest financial performance decline in Ratio X1 (Net Working Capital/Total Assets) at -147.82%.
8. BBTN (PT Bank Tabungan Negara) experienced the highest financial performance decline in Ratio X4 (Book Value of Equity/Book Value of Debt) at -23.61%.
9. GIAA (PT Garuda Indonesia) experienced the highest financial performance decline in Ratio X1 (Net Working Capital/Total Assets) at -171.38%.

On the other hand, companies predicted to be non-distressed (healthy) include PPLN, ANTM, PTPP, and ADHI. If we analyze these companies based on the four ratios used in Z-Score calculations, the details are as follows:

1. PPLN (PT Perusahaan Listrik Negara) recorded the highest financial performance improvement in Ratio X3 (Earnings Before Interest and Taxes/Total Assets) at 82.07%.
2. ANTM (PT Aneka Tambang) recorded the highest financial performance improvement in Ratio X3 (Earnings Before Interest and Taxes/Total Assets) at 1,037.97%.
3. PTPP (PT Pembangunan Perumahan) recorded the highest financial performance improvement in Ratio X2 (Retained Earnings/Total Assets) at 2,511.96%.
4. ADHI (PT Adhi Karya) recorded the highest financial performance improvement in Ratio X2 (Retained Earnings/Total Assets) at 54.27%.

4.2. Results of Springer (S-Score) method

To calculate the Springer (S-Score) method, four financial performance ratios are used. The first performance ratio (A) is the Working Capital / Total Asset (WCTA) ratio, which shows the comparison between Working Capital and Total Assets. The second performance ratio (B) is the Earning Before Interest and Taxes / Total Asset (EBITA), which indicates the comparison between Earnings Before Interest and Taxes and Total Assets. The third performance ratio (C) is the Earning Before Taxes / Current Liabilities ratio, which shows the comparison between Earnings Before Taxes and Current Liabilities. The fourth performance ratio (D) is the Sales / Total Asset ratio, which demonstrates the comparison between Sales and Total Assets.

In this section, the descriptive trends of each ratio's development for each researched company will first be explained, followed by a discussion on the S-Score calculation results for each company.

4.2.1. Results of Working Capital to Total Asset (WCTA)

Based on Table 7, it can be identified that during the 2016–2023 period, 16 out of 21 State-Owned Enterprises (SOEs) experienced a decline in financial performance related to Ratio A, which is the comparison between Working Capital and Total Assets. The companies that experienced a decline in Ratio A are PPLN, KAEF, TINS, WIKA, JSMR, PTPP, WSKT, ADHI, PTHK, BBNI, BMRI, POST, KAII, GIAA, TLKM, and DNRK. The largest decline occurred in DNRK, amounting to -384.59%.

Meanwhile, according to Table 7, five out of 21 SOEs showed improved performance in Ratio A during the 2016–2023 period. These companies are INAF, KRAS, ANTM, BBRI, and BBTN. The highest increase in performance in the comparison of Net Working Capital to Total Assets was achieved by PPLN from 2016 to 2023, with an increase of 100.01%.

Table 7. Calculation Results of Ratio A

Code	2016	2017	2018	2019	2020	2021	2022	2023	Change
PPLN	-0,02	-0,03	-0,03	0,00	-0,03	-0,04	-0,02	-0,01	-60,77
INAF	0,11	0,02	0,03	0,28	0,17	0,18	-0,14	-1,36	1,16
KAEF	0,26	0,26	0,14	0,00	-0,04	0,01	0,01	-0,20	-23,66
KRAS	-0,06	-0,08	-0,23	-0,55	0,00	-0,14	-0,42	-0,52	1,01
ANTM	0,21	0,11	0,05	0,08	288,15	0,16	0,17	0,27	28,04
TINS	0,23	0,30	0,16	0,02	0,60	0,12	0,24	0,12	-47,56
WIKA	0,22	0,20	0,26	0,19	0,06	0,00	0,05	-0,12	-48,18
JSMR	-0,11	-0,08	-0,24	-0,30	-0,04	-0,02	0,00	-0,11	-8,29
PTPP	0,28	715,30	0,21	0,19	0,07	0,06	0,10	0,08	-72,56
WSKT	0,14	0,00	0,08	0,03	-0,20	0,15	0,13	0,00	-99,12
ADHI	0,19	0,25	0,21	0,16	0,08	0,01	0,12	0,09	-53,23
PTHK	0,13	0,02	-0,03	0,00	-0,16	0,01	0,13	0,16	-25,24
BBNI	0,03	0,03	0,03	0,03	0,02	0,02	0,02	0,02	-30,83
BBRI	0,02	0,02	0,01	0,02	0,02	0,02	0,03	0,03	34,22
BMRI	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	0,00	-0,01	-147,82
BBTN	0,00	0,00	0,00	0,00	0,00	-0,02	0,00	0,00	4,34
POST	0,05	0,01	0,01	0,03	0,03	0,08	0,14	0,11	-121,44
KAII	0,03	0,17	0,04	-0,03	0,00	0,00	0,08	-0,06	-291,41
GIAA	-0,11	-0,25	-0,48	-0,48	-0,35	-0,76	-0,14	-0,08	-171,38
TLKM	0,04	0,01	-0,01	-0,08	-0,09	-0,03	-0,06	-0,06	-225,56
DNRK	-0,03	-0,03	-0,02	-0,03	-0,05	0,09	0,09	0,09	-384,59

Source: Secondary data (processed), 2024.

Table 8. Calculation Results of Earnings Before Interest and Tax to Total Assets (EBITTA)

Code	2016	2017	2018	2019	2020	2021	2022	2023	Change
PPLN	0,0106	0,0064	0,0133	0,0164	0,0077	0,0143	0,0131	0,0193	82,07
INAF	-0,0136	-0,0371	-0,0175	0,0071	0,0105	0,0043	-0,3581	-0,8811	-65,78
KAEF	0,0831	0,3258	0,0666	0,0021	0,0041	0,0221	-0,0008	-0,1232	-248,25
KRAS	-0,0486	-0,0189	-0,0483	-0,1614	0,0018	0,0162	0,0671	-0,0361	-174,27
ANTM	0,0079	0,0151	0,0625	0,0227	0,0517	0,0924	0,155	0,0899	1.037,97
TINS	0,0434	0,0603	0,0005	-0,0044	-0,0185	0,1176	0,1076	-0,0347	-20,04
WIKA	0,0395	0,0321	0,0398	0,0449	4,5555	2,8343	2,3455	0,1176	197,72
JSMR	0,0495	0,0411	0,0389	0,0311	0,0066	0,0204	0,0408	0,0612	23,63
PTPP	0,0373	0,0428	0,0381	0,0209	6,2771	6,7843	6,5995	2,6396	6.976,67
WSKT	0,0351	0,0471	0,0445	0,0108	0,0895	0,0104	0,0126	0,0394	12,25
ADHI	3,0573	3,3786	2,1584	1,8799	1,0431	2,4871	0,4584	0,2895	-90,53
PTHK	0,1583	0,0244	0,0371	0,0236	-0,0167	-0,0165	-0,0081	0,0126	-92,04
BBNI	0,0237	0,0241	0,0245	0,0229	0,0057	0,0131	0,0221	0,0235	-0,84
BBRI	0,0338	2,0328	0,0321	0,2006	0,0186	0,0244	3,0346	2,0388	5.931,95
BMRI	0,0178	0,0241	0,0282	0,0276	0,0158	0,0111	0,0282	0,0343	92,69
BBTN	0,0155	0,0147	0,0117	0,0013	0,0062	0,0081	0,0096	0,0099	-36,12
POST	0,0774	0,0507	0,0131	0,0093	0,0411	0,0626	0,0555	0,0513	-33,72
KAII	0,0537	0,0629	0,0499	0,0567	-0,0417	-0,0087	0,0308	0,0276	-48,61
GIAA	0,0047	-0,0421	-0,0689	0,0002	-0,2402	-0,6301	0,6311	0,0348	6,41
TLKM	0,2126	0,2149	0,1765	0,1713	0,1571	0,1575	0,1321	0,1421	4,37
DNRK	0,0394	-0,0374	-0,2242	0,0161	0,0473	0,8003	0,0233	0,0219	-44,41

Source: Secondary data (processed), 2024.

4.2.2. Results of Earnings Before Interest and Tax to Total Assets (EBITTA)

The Earning Before Interest and Taxes / Total Asset ratio is used for SOEs listed on the Ministry of SOEs' website to demonstrate a company's ability to generate profits from its business activities before paying interest and taxes.

Based on Table 8, it can be identified that during the 2016–2023 period, 10 out of 21 SOEs experienced a decline in financial performance related to Ratio B, which is the comparison between Earnings Before Interest and Taxes and Total Assets. These companies are INAF, KAEF, KRAS, TINS, PTHK, BBNI, BBTN, POST, KAII, and DNRK. The largest decline occurred in KAEF, reaching -248.25%.

Meanwhile, based on Table 8, only 11 out of 21 SOEs showed improved performance in Ratio B during the 2016–2023 period. These companies are PPLN, ANTM, WIKA, JSMR, PTPP, WSKT, ADHI, BBRI, BMRI, GIAA, and TLKM. The highest performance improvement was observed in ADHI, reaching 9,370.16%.

4.2.3. Results of Earning before tax to current liabilities

The Earning Before Taxes / Current Liabilities ratio is used for SOEs listed on the Ministry of SOEs' website to demonstrate a company's ability to generate profits from its business activities, measuring Earnings Before Taxes against Current Liabilities.

Based on Table 9, it can be identified that during the 2016–2023 period, only seven out of 21 SOEs experienced a decline in financial performance related to Ratio C, which is the comparison between Earnings Before Taxes and Current Liabilities. These companies are WIKA, ADHI, PTHK, BBTN, KAII, TLKM, and DNRK. The largest decline occurred in PTHK, amounting to -99.99%.

Table 9. Earning before tax to current liabilities

Code	2016	2017	2018	2019	2020	2021	2022	2023	Change
PPLN	0,1116	0,0614	0,1261	0,1654	0,0821	0,1584	0,1484	0,2261	102,59
INAF	-0,0268	-0,0636	-0,0305	0,0221	0,0216	0,0083	-0,5357	-0,5438	1.929,10
KAEF	0,2258	0,9276	0,1591	0,0051	0,0108	0,0656	-0,0021	-0,2303	201,86
KRAS	-0,1565	-0,0572	-0,0971	-0,2127	0,0077	0,0412	0,0884	-0,0475	69,64
ANTM	0,0545	0,0818	0,3619	0,1297	0,2172	0,4637	0,8732	0,4494	724,58
TINS	0,1355	0,2104	0,0012	-0,0007	-0,0459	0,3041	0,5522	-0,1121	182,73
WIKA	0,5038	0,5729	0,5261	0,4381	0,2427	0,2565	0,2861	0,3414	-32,23
JSMR	0,1422	0,1301	0,1032	0,0745	0,0466	0,1724	0,3068	0,3473	144,23
PTPP	0,0734	0,0865	0,0753	0,0406	12,3972	12,5069	14,1669	5,5276	7.430,79
WSKT	0,0689	0,0883	0,0974	0,0295	0,1858	0,0397	0,0587	0,1653	139,91
ADHI	4,7173	5,4288	3,4302	2,8027	1,4679	3,1879	0,7445	0,4693	90,05
PTHK	0,4026	0,0826	0,1415	0,1005	-0,0465	-0,0825	-0,0627	0,0982	-75,61
BBNI	3,2815	3,8083	4,4877	3,6261	0,9294	2,2461	4,2795	4,4602	35,91
BBRI	5,9809	6,5028	3,5861	4,6398	4,3995	4,2904	9,0123	7,4803	25,06
BMRI	1,2558	2,1648	2,4439	3,5449	2,3837	3,7337	4,7852	5,0483	301,99
BBTN	8,7049	7,8429	5,7293	0,6524	3,1239	0,3262	6,1581	6,7648	-22,28
POST	0,1341	0,1047	0,0306	0,0236	0,1195	0,2185	0,2939	0,1797	34,01
KAII	0,2389	0,3228	0,2687	0,3143	-0,2392	-0,0571	0,2219	0,1254	-47,51
GIAA	0,0113	-0,0823	-0,0935	0,0003	-0,6036	-0,7853	2,3409	0,2013	1.681,41
TLKM	0,9604	0,9401	0,7869	0,6494	0,5612	0,6318	0,5162	0,5701	-40,63
DNRK	1,1332	-1,2802	-9,2912	0,5475	0,9265	3,5431	0,1302	0,1179	-89,59

Meanwhile, based on Table 9, 14 out of 21 SOEs experienced an increase in financial performance in Ratio C during the 2016–2023 period. These companies are PPLN, INAF, KAEF, KRAS, ANTM, TINS, JSMR, PTPP, WSKT, BBNI, BBRI, BMRI, POST, and GIAA. The highest increase was recorded by PTPP, at 7,430.79%.

4.2.4. Results of sales to total asset

The Sales / Total Asset ratio is used for SOEs listed on the Ministry of SOEs' website to demonstrate a company's ability to generate profits from its business activities, measuring Sales against Total Assets.

Based on Table 10, it can be identified that during the 2016–2023 period, 17 out of 21 SOEs experienced a decline in financial performance related to Ratio D, which is the comparison between Sales and Total Assets. These companies are INAF, KAEF, TINS, WIKA, JSMR, PTPP, WSKT, ADHI, PTHK, BBNI, BBRI, BMRI, BBTN, POST, KAII, GIAA, and TLKM. The largest decline occurred in PPLN, amounting to -99.83%.

Table 10. Calculation Results of Sales to Total Asset

Code	2016	2017	2018	2019	2020	2021	2022	2023	Change
PPLN	0,1715	0,1912	0,1828	0,1802	0,2173	0,2282	0,2692	0,2917	66,59
INAF	66,3524	1,0663	1,1044	0,9821	1,0013	1,4424	0,6617	0,6891	-98,96
KAEF	1,2599	0,8426	0,6579	0,5122	0,5697	0,7239	0,4663	0,5666	-55,02
KRAS	0,3415	0,3521	0,4863	0,4321	0,3882	0,5609	0,7078	0,5103	49,42
ANTM	0,3037	0,4215	0,7841	1,0835	0,8626	1,1679	1,3654	0,9579	215,41
TINS	0,7297	0,7761	0,7259	0,9481	1,0481	0,9942	0,9569	0,6529	-91,38
WIKA	503,877	572,991	526,054	438,135	242,792	256,547	286,145	341,466	-32,23
JSMR	1,6508	1,1265	1,1871	0,2642	0,1316	0,1498	0,1819	0,1648	-99,91
PTPP	0,5272	0,5146	0,4781	0,4167	0,2964	0,3016	0,3284	0,3266	-38,05
WSKT	0,3872	0,4618	0,3922	0,2561	0,1606	0,1179	0,1557	0,1145	-70,42
ADHI	0,5521	0,5349	0,5202	0,4192	0,2842	0,2889	0,3388	0,1569	-84,31
PTHK	0,3715	0,3713	0,4144	0,2879	0,1896	0,1541	0,1548	0,1586	-57,31
BBNI	0,0725	0,0679	0,0669	0,0692	0,0631	0,0518	0,0531	0,0565	-22,06
BBRI	0,0935	0,0912	0,0861	0,0859	0,0843	0,0855	0,0814	0,0911	-2,56
BMRI	0,0738	0,0706	0,0673	0,0694	0,0621	0,0566	0,0564	0,0609	-17,47
BBTN	0,0801	0,0768	0,0745	0,0824	0,0695	0,0693	0,0644	0,0644	-19,61
POST	0,7702	0,5501	0,5522	0,5262	0,5976	0,4561	0,4146	0,4011	-47,92
KAII	0,5754	0,5706	0,6888	0,5014	0,3397	0,2854	0,3573	0,4314	-25,02
GIAA	1,0338	1,1101	1,0421	1,0262	0,1383	0,1858	0,3368	0,4365	-57,77
TLKM	0,6476	0,6461	0,6342	0,6128	0,5526	0,5166	0,5352	0,5198	-8,27
DNRK	0,0567	0,0595	0,0663	0,1635	0,0718	0,2805	0,1792	0,1955	244,79

Meanwhile, based on Table 4.10, only four out of 21 SOEs experienced an improvement in financial performance in Ratio D during the 2016–2023 period. These companies are PPLN, KRAS, ANTM, and DNRK. The highest increase occurred in DNRK, reaching 244.79%.

After obtaining the values for each of the four ratios, the S-Score value is calculated using the following formula by Peter and Yoseph (Fitriyanti and Rohmah, 2021:5):

$$S = 1.03A + 3.07B + 0.66C + 0.4D$$

The obtained S-Score values are then compared with the classification criteria to determine whether a company is financially healthy or at risk of bankruptcy. The classification criteria for the Springer S-Score method are:
1. Companies with an S-Score > 0.862 are classified as financially healthy.
2. Companies with an S-Score < 0.862 are classified as potentially bankrupt.

Table 11. Calculation Results of the Springer Method

Code	2016	2017	2018	2019	2020	2021	2022	2023	Change	Status Prediction
PPLN	0,1578	0,1016	0,1665	0,2275	0,1309	0,2011	0,23	0,3181	0,19	B
INAF	26,5918	0,3796	0,3965	0,7178	0,6261	0,7831	-1,3373	-4,1875	2,99	TB
KAEF	1,1782	2,2149	0,7211	0,212	0,2071	0,4134	0,1905	-0,5102	0,57	B
KRAS	-0,1756	-0,0353	-0,2543	-1,0281	0,1683	0,1611	0,1153	0,5009	-0,06	B
ANTM	0,3971	0,3874	0,8012	0,6697	0,699	1,2186	1,7735	1,2319	0,89	TB
TINS	0,7494	0,9461	0,4538	0,3951	0,9456	1,0813	1,3208	0,2035	0,76	B
WIKA	0,6086	0,5658	0,6538	0,5723	18,7765	12,3181	10,5794	0,512	5,57	TB
JSMR	0,7971	0,5844	0,4793	-0,0588	0,0621	0,2197	0,4032	0,365	0,35	B
PTPP	0,6597	0,6214	0,5726	0,453	27,6469	29,2694	29,8414	11,9607	12,62	TB
WSKT	0,4492	0,3891	0,442	0,1887	0,2593	0,2645	0,2686	0,2749	0,31	B
ADHI	10,2299	11,2739	7,4738	6,5079	3,7621	8,1037	2,0241	1,386	6,34	TB
PTHK	1,035	0,3032	0,3393	0,2565	-0,1736	-0,0321	0,134	0,3355	0,27	B
BBNI	2,2978	2,6412	3,0914	2,5169	0,6814	1,5656	2,9344	3,0595	2,34	TB
BBRI	4,1082	4,4465	2,5121	3,2065	3,0179	2,9643	6,1133	5,1188	3,93	TB
BMRI	0,9012	1,5221	1,717	2,4468	1,6408	2,5498	3,2624	3,4559	2,18	TB
BBTN	5,745	5,176	3,781	430,677	2,061	0,2466	4,064	4,464	57,02	TB
POST	0,6844	0,4535	0,2904	0,285	0,4736	0,599	0,6708	0,5473	0,51	B
KAII	0,5852	0,8089	0,6498	0,5544	-0,1523	0,0518	0,4616	0,278	0,44	B
GIAA	0,3258	0,0048	-0,3475	-0,0794	-1,4394	-3,1616	2,472	0,3363	1,02	TB
TLKM	1,5911	1,5499	1,3002	1,1223	0,9793	1,0781	0,9028	0,9632	1,18	TB
DNRK	0,8575	0,7263	5,4468	0,3905	0,7105	5,0036	0,3254	0,3203	1,72	TB

Note: B = Bankrupt, TB = Not Bankrupt or Healthy

Based on the average S-Score calculations in Table 11, nine SOEs are predicted to face bankruptcy in the future, while the remaining 12 SOEs are predicted to remain financially stable. The companies predicted to go bankrupt using the Springer S-Score method are PPLN, KAEF, KRAS, TINS, JSMR, WSKT, PTHK, POST, and KAII.

Conversely, the companies classified as Not Bankrupt (TB) include INAF, ANTM, WIKA, PTPP, ADHI, BBNI, BBRI, BMRI, BBTN, GIAA, TLKM, and DNRK.

5. Conclusion

Based on the comparison and discussion conducted regarding the Altman Z-Score and Springer methods in predicting the bankruptcy of State-Owned Enterprises (BUMN) listed on the Ministry of SOEs website for the 2016–2023 period, it is concluded that the Altman Z-Score method predicts that twenty-one (21) out of thirty-four (34) State-Owned Enterprises (BUMN) are not expected to experience bankruptcy from 2016 to 2023. Meanwhile, eight (8) State-Owned Enterprises (BUMN) are predicted to face

bankruptcy, and nine (9) are categorized as being in the "grey area" during the same period.

On the other hand, the Springer method predicts that twelve (12) State-Owned Enterprises (BUMN) will not experience bankruptcy between 2016 and 2023. However, companies such as PT. Perusahaan Listrik Negara, PT. Krakatau Steel, PT. Timah, PT. Waskita Karya, PT. Pos Indonesia, and PT. Kereta Api Indonesia are predicted to be in a bankrupt condition.

Researchers are expected to carefully consider financial ratios when managing finances using the Altman Z-Score and Springer S-Score methods, as these methods serve as considerations in assessing the financial condition of companies that may face bankruptcy in the future. For future researchers, it is recommended to extend the research period or incorporate additional financial distress prediction methods, as this study only employs two methods: the Altman Z-Score and the Springer S-Score.

Conflict of interest

The authors declare that there are no conflicts of interest regarding this publication.

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