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Altman Z-Score Method Application in Predicting Financial Distress in Manufacturing Companies Listed in Indonesia Stock Exchange In 2016 - 2018

Zulfikar Steifani Prayoga [1], Wahyudiono [2]

Management Program, Faculty of Economics and Business, Narotama University, 60117, Indonesia
* Correspondence: Zsp01041998@gmail.com

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Abstract: Financial distress is an important indicator of a company's financial condition and requires early identification to support managerial and investment decisions. This study aims to assess the financial distress condition of manufacturing companies listed on the Indonesia Stock Exchange during 2016–2018 using the Altman Z-Score model. The analysis incorporates five financial ratios: Working Capital to Total Assets, Retained Earnings to Total Assets, Earnings Before Interest and Tax to Total Assets, Market Value of Equity to Book Value of Debt, and Sales to Total Assets. The study uses financial statement data from 30 manufacturing companies and applies descriptive analysis to calculate the Z-Score and classify each company into the Safe, Warning, or Distress Zone. The results show differences in financial conditions across the sampled companies. Based on the average Z-Score, several companies were classified in the Safe Zone, while others fell into the Warning Zone or Distress Zone. These differences indicate varying levels of financial vulnerability within the manufacturing sector during the observation period. The findings demonstrate that the Altman Z-Score can be used as an early-warning screening tool to identify differences in corporate financial conditions. The study provides a historical reference for assessing financial distress among Indonesian manufacturing companies and supports further monitoring of firms exhibiting relatively weaker financial indicators.

Keywords: Altman Z-Score; Financial Distress; Financial Ratios; Indonesia Stock Exchange; Manufacturing Companies.

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1. Introduction

Financial stability is an important consideration in assessing corporate sustainability because deterioration in financial condition may affect a firm's ability to maintain operations and meet its obligations. Financial statements provide the primary information for evaluating this condition through financial ratios that capture liquidity, profitability, leverage, activity, and the firm's financial position. Early identification of financial distress is therefore relevant for management and investors because it provides an initial indication of financial vulnerability before more severe financial problems occur.

One established approach for assessing financial distress is the Altman Z-Score model. The model combines several financial dimensions into a composite score, allowing firms to be classified according to their potential financial condition. The five ratios used in the original manufacturing model are Working Capital to Total Assets (X1), Retained Earnings to Total Assets (X2), Earnings Before Interest and Tax to Total Assets (X3), Market Value of Equity to Book Value of Debt (X4), and Sales to Total Assets (X5). Altman et al. (2017) demonstrate that Z-Score models remain useful for assessing bankruptcy and financial distress across countries, although their classification performance can vary according to country and model specification.

Recent Indonesian studies confirm the continuing use of Altman-based analysis while showing heterogeneous results across sectors and observation periods. Sianipar et al. (2023), examining automotive and component manufacturers listed on the Indonesia Stock Exchange during 2017–2021, identified firms in healthy, grey, and distressed conditions. Aplugi et al. (2024) similarly reported differences in financial-condition classifications among manufacturing companies observed during 2018–2022. Wijayanti et al. (2024) applied the model to manufacturing companies during 2017–2022 and also found variation in financial distress conditions across firms and years. These findings indicate that financial distress is not uniform even among companies operating within the same broad industrial sector.

A second group of studies focuses on the determinants and financial dimensions associated with distress. Tarihoran et al. (2024) found that profitability, leverage, and firm value were associated with financial distress among manufacturing companies listed on the Indonesia Stock Exchange, whereas liquidity did not show a significant effect in their model. This evidence reinforces the importance of examining financial condition through several complementary indicators rather than relying on a single ratio. More recent research also continues to use Altman Z-Score alongside profitability, liquidity, and leverage measures to assess corporate financial risk.

A third stream compares Altman with alternative bankruptcy-prediction models. Bondar and Mudzakar (2023) compared Altman, Springate, Zmijewski, and Grover models among companies included in the LQ45 index, demonstrating that different models may provide different classifications. Regita et al. (2024) likewise reported differences among Altman Z-Score, Springate, and Zmijewski when assessing Indonesian companies. More recently, Febriyanti et al. (2025) found significant differences among Altman, Springate, and Zmijewski results for consumer-goods manufacturing companies during 2021–2023, with Zmijewski producing the highest accuracy in their setting. These studies suggest that model selection and industry context influence the resulting assessment of financial distress.

Despite the growing application of financial-distress models, an empirical gap remains in the examination of the 30 manufacturing companies and the 2016–2018 observation period analyzed in this study. Recent Indonesian studies generally use later periods, different samples, specific manufacturing subsectors, or comparative models. For example, Sianipar et al. (2023) focused on automotive and component companies for 2017–2021, Aplugi et al. (2024) examined selected manufacturing firms for 2018–2022, and recent comparative studies extend their observations to 2021–2025. Consequently, the financial-condition profile of the companies in the present sample during 2016–2018 remains a distinct empirical setting that warrants systematic examination.

The novelty of this study lies in providing a company-level assessment of financial distress across the selected manufacturing firms using the five-component Altman Z-Score framework and presenting their financial-condition classification over the three-year observation period. Rather than treating the manufacturing sector as financially homogeneous, the study identifies differences in Z-Scores and corresponding classifications among individual firms. The analysis also provides a historical benchmark that can be compared with findings from more recent observation periods.

Accordingly, this study aims to empirically assess the financial distress condition of manufacturing companies listed on the Indonesia Stock Exchange during 2016–2018 using Working Capital to Total Assets, Retained Earnings to Total Assets, Earnings Before Interest and Tax to Total Assets, Market Value of Equity to Book Value of Debt, and Sales to Total Assets within the Altman Z-Score framework. The study specifically seeks to determine the resulting Z-Scores and classify the observed companies according to the financial-condition categories applied in the study.

2. Materials and Methods

2.1. Research Design

This study uses a descriptive quantitative approach. The analysis is based on numerical information obtained from the financial statements of manufacturing companies listed on the Indonesia Stock Exchange during 2016–2018. The purpose of the analysis is to calculate the Altman Z-Score and classify the financial condition of the observed companies.

2.2. Population and Sample

The population consists of manufacturing companies listed on the Indonesia Stock Exchange during the observation period. The study uses secondary financial data and analyzes 30 companies whose financial statements were included in the research dataset. The unit of analysis is the company-year observation for 2016, 2017, and 2018.

The 2016–2018 period was retained because the study is designed to evaluate the financial condition of the selected manufacturing companies within the original observation window. Extending the period would require a complete reconstruction of the sample, financial-statement data, market-value data, and Altman Z-Score calculations to maintain methodological consistency.

2.3. Measurement Procedure

The analysis uses five financial ratios incorporated in the Altman Z-Score model:

- X1 = Working Capital / Total Assets
- X2 = Retained Earnings / Total Assets
- X3 = Earnings Before Interest and Tax / Total Assets
- X4 = Market Value of Equity / Book Value of Debt
- X5 = Sales / Total Assets

The ratios are calculated from the reported financial information of each company for each observation year. The resulting values are then used to obtain the Altman Z-Score for each company-year observation. The annual scores are subsequently summarized using the average Z-Score reported in the results table.

2.4. Data Analysis

The calculated Z-Scores are interpreted according to the classification criteria applied in the study. The analysis emphasizes the movement and classification of each company's score over the three-year observation period. The results are presented comparatively to identify companies whose financial condition remained relatively stable and those showing greater financial distress risk.

3. Results and Discussion

3.1. Results

Tabel 1. Altman Z-Score Results

No	Companies	2016	2017	2018	Mean	Classification Risk
1	SMGR	2,06	1,78	2,42	2,087	Safe Zone
2	SMBR	1,28	1,07	1,01	1,12	Distress Zone
3	INTP	1,61	1,37	1,27	1,417	Warning Zone
4	ARNA	2,85	3,14	3,49	3,16	Safe Zone
5	AALI	1,33	1,54	2,54	1,803	Warning Zone
6	MLIA	0,92	1,57	1,68	1,39	Warning Zone
7	IKAI	1,14	1,09	2,24	1,49	Warning Zone
8	KIAS	3,47	3,15	3,03	3,217	Safe Zone
9	BUDI	1,61	1,59	1,38	1,527	Warning Zone
10	TPIA	2,39	2,38	2,1	2,29	Warning Zone
11	BRPT	2,17	2,1	1,16	1,81	Warning Zone
12	DUTI	2,42	4,76	5,83	4,337	Safe Zone
13	EKAD	4,75	4,38	4,8	4,643	Safe Zone
14	ALKA	5,84	6,65	8,71	7,067	Safe Zone
15	ALMI	1,93	1,86	1,71	1,833	Warning Zone
16	GDST	2,64	1,27	2	1,97	Warning Zone
17	BTON	3,13	2,77	2,48	2,793	Safe Zone
18	MAIN	2,41	1,89	2,22	2,173	Warning Zone
19	JPFA	2,74	1,79	2,06	2,197	Warning Zone
20	GDST	3,58	3,28	2,9	3,253	Safe Zone
21	SIPD	1,95	1,55	1,14	1,547	Warning Zone
22	INKP	1,21	1,14	0,94	1,097	Distress Zone
23	TKIM	1,52	0,87	0,81	1,067	Distress Zone
24	TKIM	3,99	3,83	3,75	3,857	Safe Zone
25	RMBA	1,96	2,05	2,82	2,277	Warning Zone
26	GGRM	3,05	2,83	2,72	2,867	Safe Zone

27	ALDO	2,52	2,21	2,49	2,407	Warning Zone
28	CTBN	1,93	2,52	2,66	2,37	Warning Zone
29	UNIC	3,46	3,24	2,94	3,213	Safe Zone
30	TIRT	1,47	1,18	1,42	1,357	Warning Zone

Table 1 presents the Altman Z-Score results for 30 manufacturing companies during 2016–2018. The scores vary substantially across firms and years, indicating differences in their financial conditions. Based on the average Z-Score, 11 companies were classified in the Safe Zone, 16 in the Warning Zone, and 3 in the Distress Zone.

The highest average Z-Score was recorded by EKAD at 4.643, followed by DUTI at 4.337 and ALKA at 7.067. Several companies also maintained relatively high scores throughout the observation period, including ARNA, KIAS, and GGRM. In contrast, SMBR recorded the lowest average Z-Score at 1.120, followed by TKIM at 1.067 and INKP at 1.097. These companies were classified in the Distress Zone based on the classification applied in the study.

The annual results also show different patterns across companies. DUTI increased from 2.42 in 2016 to 5.83 in 2018, while ARNA increased from 2.85 to 3.49. Conversely, INTP declined from 1.61 to 1.27, and BRPT decreased from 2.17 to 1.16 over the same period. Other companies showed relatively stable movements, such as GGRM, which changed from 3.05 in 2016 to 2.72 in 2018.

Overall, the results demonstrate considerable variation in the financial condition of the observed manufacturing companies. The differences in Z-Scores and their corresponding classifications indicate that financial distress risk was not uniform across firms during the 2016–2018 observation period.

3.2. Discussion

3.2.1. Interpretation of Financial Condition Based on Altman Z-Score

The classification results indicate substantial differences in the financial condition of the 30 manufacturing companies during 2016–2018. Companies classified in the Safe Zone, such as ARNA, KIAS, DUTI, EKAD, and ALKA, recorded comparatively higher average Z-Scores. This classification indicates a stronger overall position according to the financial dimensions incorporated in the Altman model. The result should be interpreted as an indication of lower financial-distress risk rather than as evidence that these companies were free from financial risk.

The Warning Zone comprises companies whose scores indicate an intermediate financial position. Companies such as INTP, AALI, MLIA, IKAI, BUDI, TPIA, BRPT, ALMI, GDST, MAIN, JPFA, SIPD, RMBA, ALDO, CTBN, and TIRT fall within this category based on the classification reported in Table 1. Their position suggests that the financial condition requires closer monitoring because changes in the underlying financial ratios could affect their classification. The presence of this zone is important because financial distress should be viewed as a continuum rather than solely as a distinction between healthy and bankrupt firms.

The Distress Zone includes SMBR, INKP, and TKIM based on the reported classification. Their relatively low average Z-Scores indicate greater financial vulnerability under the Altman framework. However, the result does not establish actual bankruptcy. Rather, it signals that the combination of financial indicators used by the model warrants greater managerial and investor attention. This interpretation is consistent with recent Indonesian studies showing that Altman Z-Score can distinguish companies according to varying levels of financial distress based on financial-statement information. Kurniadi (2021), for example, found that the five Altman ratios provided a useful basis for identifying financial distress among Indonesian manufacturing companies.

The year-to-year variation further indicates that financial condition can change within the same company. DUTI, for instance, increased from 2.42 in 2016 to 5.83 in 2018, whereas INTP declined from 1.61 to 1.27. These movements demonstrate why financial distress assessment should consider changes over time rather than relying exclusively on a single-year observation. Recent evidence from Indonesian manufacturing and other listed-company studies likewise reports different Z-Score classifications across firms and periods. Sianipar et al. (2023) identified healthy, grey-area, and distressed companies among automotive and component manufacturers during 2017–2021, while Aplugi et al. (2024) reported differences in financial conditions among Indonesian manufacturing firms using the Altman approach.

3.2.2. Comparison with Literature

The findings broadly correspond with recent research applying Altman Z-Score to Indonesian listed companies. Wicaksono et al. (2022) used the model to evaluate tobacco-producing companies and demonstrated its application as an early assessment of potential bankruptcy based on annual financial statements. Similarly, Fadilah (2022) found that companies in the property and real-estate sector could be differentiated into grey and safe zones using the modified Altman model, illustrating that classification depends on the financial characteristics of each company and the model specification applied.

The present findings also support the evidence reported by Sianipar et al. (2023), who identified seven healthy companies, three distressed companies, and two grey-area companies among automotive and component manufacturers during 2017–2021. The similarity lies in the heterogeneous classification of firms within the same broad manufacturing sector. Thus, sector membership alone does not imply a uniform financial condition.

However, recent comparative studies demonstrate that the classification may vary according to the prediction model employed. Regita et al. (2024), for example, reported significant differences between Altman Z-Score, Springate, and Zmijewski results for Indonesian retail companies. Bondar and Mudzakar (2023) likewise compared several bankruptcy-prediction models among LQ45 companies and found that most companies were classified as financially healthy, while the models provided different analytical perspectives. More recent evidence from manufacturing companies also confirms that different models can produce different classifications; Febriyanti et al. (2025) and Susanti et al. (2021) found significant differences among Altman, Springate, and Zmijewski results for consumer-goods manufacturers.

These comparisons strengthen the interpretation of the present study in two respects. First, the variation among the 30 companies demonstrates the usefulness of company-level financial screening. Second, the Altman classification should not be treated as an absolute determination of bankruptcy because its results depend on the financial ratios and model specification used. Recent research continues to apply Altman Z-Score as an early-warning instrument while comparing it with alternative prediction models (Ibrahim et al., 2026).

3.2.3. Implications of the Findings

The findings have practical implications for management and investors. Companies in the Safe Zone can use the result as an indication of comparatively stronger financial conditions while continuing to monitor changes in their financial ratios. Companies in the Warning Zone require closer periodic assessment because relatively small changes in financial performance may alter their classification. Meanwhile, companies in the Distress Zone warrant greater attention to financial restructuring and monitoring of the factors underlying their low Z-Scores.

For investors, the Z-Score can function as an initial screening instrument when evaluating financial risk. Nevertheless, investment decisions should not rely exclusively on this indicator because the model provides a composite assessment of financial condition rather than a complete evaluation of business prospects. Recent comparative evidence supports using bankruptcy-prediction models as complementary analytical tools rather than treating one classification as a definitive measure of future corporate failure.

Overall, the contribution of this study lies in documenting the differences in financial-condition classifications among the selected manufacturing companies during 2016–2018. Rather than assuming uniform financial health within the manufacturing sector, the results show that companies experienced different levels of financial vulnerability during the same observation period. The findings therefore support the use of systematic financial screening as an initial basis for identifying companies that require different levels of financial monitoring.

4. Conclusions

This study applied the Altman Z-Score model to assess the financial distress condition of manufacturing companies listed on the Indonesia Stock Exchange during 2016–2018. The analysis incorporated five financial indicators: Working Capital to Total Assets, Retained Earnings to Total Assets, Earnings Before Interest and Tax to Total Assets, Market Value of Equity to Book Value of Debt, and Sales to Total Assets. The results indicate that the sampled companies exhibited different financial conditions, as reflected in their respective Z-Scores and classifications.

The findings show that several companies remained in the Safe Zone throughout the observation period, whereas others were classified in the Warning Zone or Distress Zone based on their average Z-Scores. This variation indicates that financial condition differed substantially across companies within the manufacturing

sector. Companies in the Safe Zone generally recorded stronger composite financial indicators, while lower Z-Scores reflected comparatively greater financial vulnerability. The classification should therefore be interpreted as an early-warning assessment rather than a definitive prediction of bankruptcy.

The study contributes a company-level assessment of financial distress during 2016–2018 using the Altman Z-Score framework. The results provide a historical reference for evaluating financial-condition differences among manufacturing companies and for comparing these conditions with subsequent studies using more recent observation periods. For management and investors, the Z-Score classification can serve as an initial screening instrument for identifying companies that require closer evaluation of their financial position.

Future research may extend the observation period and compare the Altman model with other financial-distress prediction models to assess whether the resulting classifications remain consistent across different periods and sectors.

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