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Financial Red Flags: Early Detection of Financial Distress in Indonesian Manufacturing Companies Using the Altman Z-Score Model

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Abstrak

The manufacturing sector plays an important role in Indonesia's economy but has recently been under pressure due to global disruptions and market instability. This study aims to detect early signs of financial distress in Indonesian manufacturing companies using the Altman Z-Score model. A descriptive quantitative method was applied to 10 manufacturing companies listed on the Indonesia Stock Exchange (IDX) during the 2020–2024 period. Data were obtained from annual financial reports, and the Z-Score was calculated using a modified formula tailored for emerging markets. The results show that 9 out of 10 companies (90%) consistently remained in the Safe zone (Z > 2.99), indicating strong financial performance. One company, PT Indofood CBP Sukses Makmur Tbk (ICBP), experienced financial distress in 2021 with a Z-Score of -298.6167 but showed significant recovery in the following years. These findings indicate that the Altman Z-Score is an effective and reliable tool for detecting financial risks and potential bankruptcy in Indonesia's manufacturing sector.

Keywords: Financial_distress; Altman Z-Score; manufacturing; Indonesia_Stock_Exchange

1. Introduction

The manufacturing sector is a fundamental pillar of the Indonesian economy, whose contribution to Gross Domestic Product (GDP) as well as its ability to absorb labor makes it an important barometer of national economic stability [1]. However, in recent years, the sector has faced complex multidimensional challenges. Post-pandemic global supply chain turmoil, raw commodity price volatility, high inflation, and global market uncertainty have created significant pressure on the operational and financial performance of manufacturing companies [2]. In this volatile business environment, companies' financial resilience is at stake, increasing their vulnerability to financial distress, a state in which a company is experiencing serious financial difficulties that could potentially lead to a failure to meet its short-term obligations [3].

Financial distress does not occur instantly, but through a process of deterioration that can actually be identified through early warning signals or financial 'red flags' in the financial statements [4]. Late detection of these signals can be fatal, not only for the survival of the company itself but also for its stakeholders, such as investors who experience capital losses, creditors who face bad debts, and social impacts in the form of wider layoffs. Therefore, the ability to detect symptoms of financial distress as early as possible is a strategic imperative to mitigate risks and prevent greater losses [5].

In this context, classic bankruptcy prediction models such as the Altman Z-Score, introduced by Edward Altman in 1968, have once again shown their relevance. This model has been tested over decades as an effective and efficient tool to scan a company's financial health by analyzing a set of key financial ratios [6]. The main advantage of the Z-Score model lies in its ability to provide a clear quantitative indicator of a score that can classify companies into

'Safe', 'Gray', or 'distress' zones [7]. Although more complex predictive models have emerged, its ease of application, straightforward interpretation, and easily accessible financial ratio base make the Altman Z-Score a powerful tool for early warning system screening purposes, especially in emerging markets such as Indonesia [8].

However, the application of this model in the specific context of Indonesian manufacturing companies in the contemporary post-crisis period still needs to be explored more deeply [9]. To what extent is this model able to capture financial 'red flags' in manufacturing companies on the Indonesia Stock Exchange? How accurate are the signals provided in reflecting company vulnerability? These questions underlie the urgency of this research. By analyzing the financial statements of manufacturing companies in recent years, this study aims to systematically test and apply the Altman Z-Score model to map the level of financial vulnerability and identify companies that have shown warning signs [10].

As such, this study not only aims to confirm the effectiveness of the classic model in the current context, but also aims to present a financial red flag map that can serve as a practical guide for investors, creditors, and company management in monitoring financial health and taking necessary preventive actions. Ultimately, accurate early detection is expected to contribute to more informed decision-making and a more resilient and stable Indonesian manufacturing sector.

2. Methodology

This study uses a quantitative approach with a descriptive method that aims to describe the condition of financial distress in manufacturing companies in Indonesia [11]. The research population includes all manufacturing companies listed on the Indonesia Stock Exchange (IDX) during the 2020-2024 period. The sample selection was carried out using purposive sampling technique, namely by selecting companies that meet the criteria for completeness of financial reports and have consistent stock trading activity during the study period.

Based on these criteria, 10 companies were obtained as research samples, namely :

No	Company Name	Stock Code	Manufacturing Sector
1.	Indofood CBP Sukses Makmur Tbk	ICBP	Food & Beverage
2.	Indofood Sukses Makmur Tbk	INDF	Food & Beverage
3.	Mayora Indah Tbk	MYOR	Food & Beverage
4.	Semen Indonesia (Persero) Tbk	SMGR	Cement
5.	Indocement Tunggal Prakasa Tbk	INTP	Cement
6.	Holcim Indonesia Tbk	SMCB	Cement
7.	Unilever Indonesia Tbk	UNVR	Cosmetics & Houseware
8.	Astra International Tbk	ASII	Automoe & Componentstiv
9.	Charoen Pokphand Indonesia Tbk	CPIN	Animal Feed
10.	Japfa Comfeed Indonesia Tbk	JPFA	Animal Feed

Table 1. Sample

The data used in this study are secondary data obtained through the documentation of the company's annual financial statements, which are accessed from the official website of the Indonesia Stock Exchange (www.idx.co.id). The main variable in this study is financial distress status, which is measured using the Altman Z-Score model that has been modified for emerging markets [12]. The formula used in the calculation is:

$$Z = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4,$$

with:

X_1 = Working Capital / Total Assets

X_2 = Retained Earnings / Total Assets

X_3 = EBIT / Total Assets

X_4 = Book Value of Equity / Total Liabilities

The stages of data analysis are carried out sequentially, starting with the calculation of the financial ratios of each company, followed by the calculation of the Z-Score value based on the formula above [13]. The Z-Score results are then classified into three categories:

Safe Zone if $Z > 2.6$

Gray Zone if $1.1 < Z < 2.6$

Distress Zone if $Z < 1.1$

These classifications were analyzed descriptively to map the potential financial red flags faced by each company during the study period.

3. Result and Discussion

3.1. Result

Emiten	Periode	X1	X2	X3	X4
ICBP	2024	-86,322	309,110	0,213	1,136
	2023	-87,429	286,006	0,211	1,086
	2022	-86,751	253,957	0,189	0,994
	2021	-159,828	229,382	0,172	0,871
	2020	-88,456	217,639	0,166	0,959
INDF	2024	0,212	0,275	0,199	1,175
	2023	0,162	0,263	0,193	1,167
	2022	0,134	0,228	0,188	1,078
	2021	0,077	0,206	0,181	0,943
	2020	0,064	0,190	0,164	0,942
MYOR	2024	0,411	0,551	0,279	1,355
	2023	0,449	0,612	0,352	1,779
	2022	0,410	0,547	0,307	1,779
	2021	0,371	0,001	0,348	1,327
	2020	0,473	0,001	0,369	1,325
SMGR	2024	0,043	0,452	0,103	1,814
	2023	0,045	0,425	0,124	1,505
	2022	0,070	0,410	0,129	1,420
	2021	0,019	0,402	0,143	1,155
	2020	0,052	0,407	0,149	0,879

	2024	0,106	0,687	0,199	2,663
	2023	0,063	0,647	0,197	2,416
INTP	2022	0,214	0,707	0,200	3,187
	2021	0,256	0,684	0,196	3,739
	2020	0,292	0,637	0,185	4,291
	2024	0,049	0,175	0,121	1,588
	2023	0,086	0,144	0,125	1,289
SMCB	2022	0,018	0,150	0,130	1,289
	2021	0,062	0,088	0,133	1,085
	2020	0,004	0,065	0,144	0,574
	2024	-0,408	0,123	1,042	0,636
	2023	-0,302	0,193	1,152	0,162
UNVR	2022	-0,266	1,790	1,041	0,279
	2021	-0,252	0,217	1,029	0,290
	2020	-0,221	0,342	1,094	0,317
	2024	0,092	0,427	0,156	1,348
	2023	0,092	0,438	0,165	1,284
ASII	2022	0,147	0,438	0,170	1,437
	2021	0,154	0,445	0,139	1,421
	2020	0,138	0,440	0,114	1,369
	2024	0,298	0,704	0,244	2,423
	2023	0,176	0,656	0,202	1,939
CPIN	2022	0,363	1,200	0,373	1,947
	2021	0,399	1,267	0,412	2,443
	2020	0,262	0,265	0,265	2,990
	2024	0,227	0,374	0,324	0,916
	2023	0,192	0,309	0,220	0,710
JPFA	2022	0,232	0,302	0,235	0,717
	2021	0,248	0,318	0,281	0,846
	2020	0,221	0,286	0,286	0,785

Table 2. Financial Ratios (X1-X4) for Z-Score Calculation

Based on Table 2, it can be seen that most companies show fairly stable financial ratios from year to year, with positive values on all variables. However, there are some anomalies, such as the extreme negative X1 (Working Capital/Total Assets) values of ICBP and UNVR, indicating potential problems in short-term liquidity. For example, ICBP over the period 2020-2024 recorded consistently negative X1 values, with the lowest value in 2021 of -159.828, which is very unusual. This is an early indication of potentially significant liquidity stress. Similarly, UNVR recorded consecutive negative X1 values, from -0.221 (2020) to -0.408 (2024), despite other variables performing well.

Other companies such as MYOR, CPIN, and ASII recorded strong and consistent financial performance, as evident from the positive and increasing values of X2 (Retained Earnings/Total Assets) and X3 (EBIT/Total Assets), reflecting accumulated profits and high operational efficiency.

After calculating the values of these variables, the Z-Score value is calculated using the modified Altman formula for developing countries:

$$Z=3.25+6.56X_1+3.26X_2+6.72X_3+1.05X_4$$

Emiten	Periode	Nilai Z-Score	Zona
ICBP	2024	444,0536	Safe
	2023	361,3976	Safe
	2022	261,1267	Safe
	2021	-298,6167	Distress
	2020	131,3553	Safe
INDF	2024	4,8560	Safe
	2023	4,4412	Safe
	2022	4,0195	Safe
	2021	3,3841	Safe
	2020	3,1305	Safe
MYOR	2024	7,7915	Safe
	2023	9,1776	Safe
	2022	8,4055	Safe
	2021	6,1682	Safe
	2020	6,9790	Safe
SMGR	2024	4,3489	Safe
	2023	4,0960	Safe
	2022	4,1526	Safe
	2021	3,6120	Safe
	2020	3,5932	Safe
INTP	2024	7,0657	Safe
	2023	6,3813	Safe
	2022	8,3963	Safe
	2021	9,1520	Safe
	2020	9,7343	Safe
SMCB	2024	3,3763	Safe
	2023	3,2264	Safe
	2022	2,8332	Safe
	2021	2,7257	Safe
	2020	1,8072	grey
UNVR	2024	5,3935	Safe
	2023	6,5571	Safe
	2022	11,3764	Safe
	2021	6,2759	Safe
	2020	7,3509	Safe
ASII	2024	4,4589	Safe
	2023	4,4885	Safe
	2022	5,0393	Safe

	2021	4,8849	Safe
	2020	4,5399	Safe
	2024	8,4307	Safe
	2023	6,6840	Safe
CPIN	2022	10,8462	Safe
	2021	12,0867	Safe
	2020	7,5045	Safe
	2024	5,8449	Safe
	2023	4,4895	Safe
JPFA	2022	4,8407	Safe
	2021	5,4393	Safe
	2020	5,1314	Safe

Table 3. Z-Score Values and Financial Zone Classification

The Z-Score zone classification follows the following categories [14]:

- Safe Zone : $Z > 2.6$
- Gray Zone : $1.1 < Z < 2.6$
- Financial Distress Zone: $Z < 1.1$

The calculation results show that of the 10 companies analyzed, almost all were within the safe zone during the observation period [15]. However, there are two significant exceptions that need to be noted:

1. ICBP in 2021 recorded a negative Z-Score value of -298.62, which is very far from the lower limit of the distress zone. This is an outlier and highly unusual, strongly suspected to be caused by the extreme negative value of X1 (high current liabilities to current assets).
2. SMCB in 2020 is in the gray zone with a Z-Score of 1.8072, which indicates uncertainty in its financial performance in that year.

In contrast, companies like CPIN, MYOR, and INTP show very solid financial performance, with Z-Score values well above the safe limit. For example, CPIN in 2022 and 2021 recorded Z-Score values of 10.8462 and 12.0867, reflecting very healthy financial performance and good long-term business continuity potential.

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3.2. Discussion

The results of this study indicate that most large manufacturing companies in Indonesia have a healthy financial condition during the 2020-2024 period, as indicated by the Z-Score value which is in the safe zone. This finding is in line with the characteristics of the sample companies, the majority of which are blue-chip companies with large market capitalization and conservative financial management.

However, the presence of a significant anomaly in ICBP is a major concern. The drastically negative Z-Score in 2021 indicates a serious problem in the company's working capital structure, even though other components such as EBIT and Retained Earnings are quite strong. This shows that poor liquidity ratios can greatly affect the final Z-Score result. It also indicates that even if a company's profitability looks stable, distress risk can still arise from an imbalance in current assets and short-term liabilities. In other words, solvency does not always reflect liquidity.

Meanwhile, the high Z-Score values of companies like CPIN and MYOR reflect very healthy financial structures. These companies show stability and positive growth, with large contributions from variables X2 (Retained Earnings) and X3 (EBIT), which reflect the ability to generate profits and maintain profitability over time. This reinforces the validity of the Altman model in detecting companies with superior performance and avoiding distress.

It is interesting to note that SMCB, the only company that had entered the gray zone, managed to improve to the safe zone in the following years. This indicates improvements in capital structure and positive operational efficiency. This also serves as an example that Z-Score is not only an early risk detection tool, but can also be used to monitor the effectiveness of a company's recovery strategy from uncertain financial conditions.

These results are consistent with previous findings in the literature that the Z-Score model remains relevant and effective for emerging markets such as Indonesia, although there are some challenges in the interpretation of outliers that need to be further explored [16].

From the sectoral side, there is no indication that certain sectors are more prone to distress. This suggests that differences in financial performance are more influenced by internal conditions of the company rather than sectoral factors. This means that the company's financial management is a key factor in determining financial risk, not just the industry sector in which the company operates.

4. Conclusion

The results show that most large manufacturing companies in Indonesia are in a healthy financial condition during the period 2020-2024, with Z-Score values in the safe zone. However, there is an exception in ICBP which recorded an extreme negative Z-Score value in 2021 due to a very low liquidity ratio, despite its good profitability performance. This suggests that short-term liquidity issues can have a major impact on bankruptcy risk. In contrast, companies such as CPIN and MYOR show very strong financial conditions, characterized by consistently high Z-Score values. These findings prove that the Altman model is effective for measuring financial health in emerging markets such as Indonesia. In addition, the difference in financial condition is more due to internal factors of the company, rather than its industry sector.

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