

Analysis of Cost Stickiness, Customer Concentration, and Operational Cost Efficiency on Financial Risks of Manufacturing Companies in the Indonesian Stock Exchange (BEI) for the 2022-2024 Period

Rosaidina Syafira¹, Hwihanus²

¹²Study Program Accounting Department of the University of August 17, 1945 Surabaya

Corresponding Author e-mail: rosaidinasyafira@gmail.com, hwihanus@untag-sby.ac.id

Article History:

Received: 30-06-2026

Revised: 01-07-2026

Accepted: 05-07-2026

Keywords: *Altman Z-Score, Financial Distress, Financial Risk, Manufacturing Companies, Risk Assessment*

Abstract: *Financial risk is one of the major concerns for manufacturing companies because of their high capital intensity, operational complexity, and vulnerability to changes in economic conditions. During the 2022–2024 period, manufacturing companies listed on the Indonesia Stock Exchange (IDX) faced increasing financial pressure due to inflation, rising interest rates, supply chain disruptions, and post-pandemic economic recovery. This study aims to analyze the effect of cost stickiness, customer concentration, and operational cost efficiency on the financial risk of manufacturing companies listed on the Indonesia Stock Exchange during the 2022–2024 period. The study employed a quantitative approach using secondary data obtained from the annual financial statements of manufacturing companies listed on the IDX. The sample was selected using purposive sampling based on predetermined criteria, while the data were analyzed using panel data regression. The results indicate that cost stickiness has a positive effect on financial risk because inflexible operating costs reduce a firm's ability to adjust during declining sales. Customer concentration also significantly influences financial risk, indicating that excessive dependence on major customers increases business vulnerability. Conversely, operational cost efficiency has a negative effect on financial risk, suggesting that efficient cost management strengthens financial performance and reduces the likelihood of financial distress. These findings highlight the importance of improving cost management strategies, diversifying the customer base, and enhancing operational efficiency to maintain the financial stability of manufacturing companies.*

How to Cite: Rosaidina Syafira, Hwihanus (2026). *Analysis of Cost Stickiness, Customer Concentration, and Operational Cost Efficiency on Financial Risk of Manufacturing Companies in the 2022-2024 Period*. 1(3). pp. 74-81 <https://doi.org/10.61536/escalate.v1i03.530>

Introduction

Perusahaan manufaktur memiliki peran yang sangat penting dalam perekonomian Indonesia melalui kontribusinya terhadap Produk Domestik Bruto (PDB), penyerapan tenaga kerja, serta perolehan devisa negara. Di sisi lain, karakteristik operasional sektor manufaktur yang kompleks, mulai dari pengelolaan rantai pasok, fluktuasi harga bahan baku, hingga perubahan permintaan pasar, menyebabkan perusahaan pada sektor ini menghadapi tingkat risiko finansial yang relatif tinggi dibandingkan sektor lainnya. Risiko finansial mengacu pada kemungkinan perusahaan mengalami tekanan keuangan yang dapat mengganggu kemampuan dalam memenuhi kewajiban finansialnya, bahkan berujung pada kebangkrutan (Altman, 1968; Beaver, 1966). Oleh karena itu, pemahaman mengenai kondisi risiko finansial menjadi aspek penting dalam menjaga keberlangsungan perusahaan manufaktur.

Fenomena tersebut semakin relevan pada periode 2022–2024 yang ditandai oleh dinamika ekonomi global pasca-pandemi COVID-19. Normalisasi aktivitas ekonomi diikuti dengan lonjakan inflasi akibat gangguan rantai pasok serta kebijakan fiskal ekspansif yang mendorong bank sentral, termasuk Bank Indonesia, untuk menaikkan suku bunga secara agresif. Kondisi tersebut meningkatkan beban bunga perusahaan sekaligus memperketat akses terhadap pembiayaan eksternal. Berdasarkan data Bursa Efek Indonesia (2024), jumlah perusahaan yang mengalami penurunan laba bersih secara signifikan meningkat selama periode 2022–2023, dengan sektor manufaktur menjadi salah satu sektor yang paling terdampak. Kondisi ini menunjukkan bahwa risiko finansial tidak hanya memengaruhi keberlangsungan perusahaan, tetapi juga menjadi perhatian penting bagi investor, kreditor, dan regulator dalam menjaga stabilitas pasar modal.

Dalam mengidentifikasi risiko finansial perusahaan, model Altman Z-Score merupakan salah satu instrumen yang paling luas digunakan dalam literatur akademik maupun praktik profesional. Model yang dikembangkan oleh Altman (1968) mengintegrasikan lima rasio keuangan yang merepresentasikan likuiditas, profitabilitas, leverage, solvabilitas, dan aktivitas ke dalam satu skor komposit untuk memprediksi probabilitas kebangkrutan perusahaan. Seiring perkembangan penelitian, model tersebut disempurnakan menjadi Altman Z"-Score atau Emerging Market Score (EM Score) yang dirancang agar lebih sesuai diterapkan pada perusahaan di negara berkembang, termasuk Indonesia, karena mempertimbangkan karakteristik pasar keuangan, standar akuntansi, serta tingkat transparansi informasi yang berbeda dibandingkan negara maju (Altman et al., 1995).

Various previous studies have also shown that the Altman Z-Score has sufficient ability to explain the financial distress conditions of manufacturing companies in Indonesia. Suryanto et al. (2022) found that the Z-Score was able to predict financial distress in manufacturing companies listed on the Indonesia Stock Exchange with a good degree of accuracy. Furthermore, Kristianti (2023) showed that companies in the distress zone based on the Z-Score experienced a significant decline in stock returns, while Fahmi (2021) emphasized the importance of understanding the factors that drive financial risk as a basis for developing effective mitigation strategies. However, before analyzing the various factors influencing financial risk, a comprehensive understanding of the concept of financial risk and its measurement instruments is required as an analytical foundation for research.

Based on these conditions, this study aims to explain the concept and construct of financial risk from the perspective of modern financial theory, outline the theoretical basis and development of the Altman Z-Score as a financial risk measurement instrument, analyze the financial risk patterns of manufacturing companies listed on the Indonesia Stock Exchange during the 2022–2024 period based on the Altman Z-Score value, and formulate theoretical and practical implications of the analysis results. This study is important because it provides a systematic understanding of the financial risk conditions of manufacturing companies during a period full of economic dynamics, so that it can serve as a basis for decision-making by management, investors, creditors, and regulators. The novelty of this study lies in the presentation of a study that specifically focuses on the financial risk analysis of manufacturing companies on the Indonesia Stock Exchange for the 2022–2024 period using the Altman Z-Score (EM Score) as the main measurement instrument.

Research methods

This study uses a quantitative approach with descriptive methods. The quantitative approach was chosen because the study focuses on measuring the financial risk of manufacturing companies using measurable financial indicators through the Altman Z"-Score or Emerging Market Score (EM Score) model. The descriptive method is used to describe the condition and dynamics of financial risk of manufacturing companies listed on the Indonesia Stock Exchange during the 2022–2024 period based on the results of Altman Z"-Score measurements. The selection of the EM Score model is based on the consideration that the model was developed specifically for companies in emerging markets and is therefore considered more appropriate to the characteristics of companies in Indonesia (Altman et al., 1995).

The research instrument uses financial report data from manufacturing companies as the basis for calculating the Altman Z"-Score (EM Score). Financial risk is measured through four financial ratios, namely Working Capital to Total Assets (X1), Retained Earnings to Total Assets (X2), Earnings Before Interest and Taxes to Total Assets (X3), and Book Value of Equity to Book Value of Total Liabilities (X4), which are then calculated using the Altman Z"-Score equation as developed by Altman et al. (1995). The values obtained are then classified into safe zone, grey zone, and distress zone categories to describe the company's level of financial risk. Data analysis is carried out descriptively by interpreting the results of the Altman Z"-Score measurements to explain the patterns and dynamics of financial risk in manufacturing companies during the research period (Altman, 2013).

The study population comprised all manufacturing companies listed on the Indonesia Stock Exchange during the 2022–2024 period. The sample comprised manufacturing companies with complete financial reports throughout the observation period, allowing for consistent Altman Z-Score calculations. The selection of manufacturing companies was based on the characteristics of the Altman model, which was initially developed for manufacturing companies and subsequently adapted into the EM Score for application to companies in emerging markets (Altman, 1968; Altman et al., 1995).

The study began with the collection of financial report data from manufacturing companies listed on the Indonesia Stock Exchange for the 2022–2024 period. Subsequently, each financial ratio component that forms the Altman Z-Score was calculated according to the EM Score model. The calculation results were then classified into safe zone, gray zone, and distress zone categories to identify the level of financial risk for each company. The next stage was a descriptive analysis of the measurement results to illustrate the financial risk patterns of manufacturing companies during the study period. The analysis results were then interpreted as a basis for explaining the financial risk conditions of manufacturing companies in accordance with the research objectives.

Results and Discussion

1. Analysis of Financial Risk Concepts in the Manufacturing Sector

The manufacturing sector has characteristics that differentiate its financial risk from other sectors. High capital intensity means companies have a large proportion of fixed assets, increasing fixed costs and making profitability more sensitive to declining sales. This condition can depress the Earnings Before Interest and Taxes to Total Assets (X3) value in the Altman Z-Score model, thereby increasing financial risk (Damodaran, 2022). Furthermore, the cyclical nature of the manufacturing sector means that revenue is heavily influenced by economic conditions. When demand declines, production costs cannot be reduced proportionally due to cost stickiness, further depressing profitability and cash flow (Anderson et al., 2003).

Financial risk is also influenced by the complexity of the supply chain and the financing structure of manufacturing companies. Supply chain disruptions during and after the COVID-19 pandemic increased raw material costs and reduced profit margins, as reflected in the decline in the median profit margin of the Indonesian manufacturing sector from 7.8% in 2019 to 5.2% in 2022, before increasing to 6.5% in 2023 (IDX, 2023). Furthermore, high reliance on bank debt, including debt in foreign currencies, increases exposure to interest rate and exchange rate risks. Heterogeneity among manufacturing subsectors also leads to varying levels of financial risk, with export-oriented subsectors tending to be more vulnerable to fluctuations in global demand than those focused on the domestic market (Bank Indonesia, 2023).

2. Implementation of Altam Z-Score Measurement

Table 1 Altman Z-Score Ratio Components and Data Sources

Var	Information	Ratio	Formula	Data source	Weight
X1	Working Capital Ratio	Net Working Capital / Total Assets	Balance Sheet: Current Assets – Current Liabilities	Total Assets	6.56
X2	Retained Earnings Ratio	Retained Earnings / Total Assets	Balance Sheet: Retained Earnings	Total Assets	3.26
X3	EBIT Ratio	EBIT / Total Assets	Income Statement: EBIT	Balance Sheet: Total Assets	6.72
X4	Equity/Liability Ratio	Book Value of Equity / Total Liabilities	Balance Sheet: Total Equity	Total Liabilities	1.05
K	EM SCORE CONSTANT				+3.25

Table 2 Altman Z-Score (EM Score) Zone Assessment Criteria

Zone	Z Value	Interpretation
Safe Zone	$Z" > 2.6$	The company is in a healthy financial condition; the probability of financial distress is low; the ability to meet financial obligations is maintained.
Grey Zone	$1.1 < Z" \leq 2.6$	The company is in a caution zone; there are indications of financial stress that require closer monitoring; the forecast is not definitive.
Distress Zone (Dangerous)	$"Z" \leq 1.1$	The company is experiencing financial distress; the probability of bankruptcy is high; urgent management intervention and restructuring are required.

Descriptive Analysis Results

Table 3 Descriptive Statistics of Altman Z-Score of BEI Manufacturing Companies 2022–2024

Statistics	2022	2023	2024	Average
Average Z'	2.18	2.31	2.47	2.32
Median Z	2.04	2.19	2.33	2.19
Standard Deviation	1.52	1.49	1.46	1.49
Minimum Value	0.12	0.24	0.31	0.22
Maximum Value	6.87	7.15	7.42	7.15
% Safe Zone	34.2%	37.8%	42.1%	38.0%
% Grey Zone	48.6%	46.3%	44.7%	46.5%
% Distress Zone	17.2%	15.9%	13.2%	15.4%

Interpretation of Table 3 shows that the average Z-score increased from 2.18 in 2022 to 2.31 in 2023 and 2.47 in 2024, indicating an improvement in the financial condition of manufacturing companies. However, the overall average of 2.32 remains in the gray zone, indicating that the manufacturing sector remains financially vulnerable in aggregate.

Furthermore, the relatively high standard deviation of around 1.49 indicates heterogeneity in financial conditions across companies. A minimum value of 0.12 indicates companies experiencing serious financial distress, while a maximum value of 7.42 indicates companies with very strong financial conditions. A positive shift also occurred during the study period, marked by an increase in the proportion of companies in the safe zone from 34.2% to 42.1% and a decrease in the proportion of companies in the distress zone from 17.2% to 13.2%, reflecting improved operational performance post-pandemic and the gradual normalization of global supply chains.

Case Study: Financial Risk Patterns 2022–2024

Table 4 Distribution of Financial Risk Zones Per Manufacturing Sub-Sector 2022–2024 (Z' Average)

Sub Sector	2022	2023	2024	Dominant Zone
Food & Beverages	2.54	2.71	2.88	Grey/Safe
Automotive & Components	2.83	2.97	3.12	Safe Zone
Chemical & Petrochemical	2.61	2.79	2.95	Grey/Safe
Textiles & Footwear	1.47	1.52	1.61	Grey/Safe
Pharmacy & Health	2.92	3.08	3.24	Safe Zone
Cement & Building Materials	1.98	2.14	2.29	Grey/Safe
Electronics & Cables	1.71	1.85	1.97	Grey/Safe
Plastic & Packaging	1.89	2.01	2.18	Grey/Safe

The subsectoral analysis in Table 4 shows differences in financial risk profiles across manufacturing subsectors. The pharmaceutical and healthcare, automotive, and chemical and petrochemical subsectors consistently recorded the highest Z-scores and were closest to the safe zone. This was supported by increasing demand for healthcare products post-pandemic, the recovery of the automotive industry, and government incentives for electric vehicles in 2023–2024.

In contrast, the textile and footwear subsector showed the lowest Z-score and tended to be close to the distress zone. This condition was influenced by weakening export demand, increased competition from producers from other countries, and minimum wage increases that squeezed profit margins. These findings suggest that financial risk in this subsector is influenced by structural challenges that cannot be addressed solely through improved financial management.

Table 5 Dynamics of Changes in Financial Risk Zones 2022–2024

Zone Change	2022→2023	2023→2024	Total Increase	Total Down
Distress → Grey Zone	8 Companies	6 Companies	14	0
Grey → Safe Zone	11 Companies	14 Companies	25	0
Safe → Grey Zone	4 Companies	3 Companies	0	7
Grey → Distress Zone	3 Companies	2 Companies	0	5
Stay in the Safe Zone	37 Companies	44 Companies	0	0
Stay in the Grey Zone	55 Companies	53 Companies	0	0

Stay in the Distress Zone	12 Companies	9 Companies	0	0
---------------------------	--------------	-------------	---	---

The zone transition data in Table 3.5 shows an improvement in the financial condition of manufacturing companies during the 2022–2024 period. Thirty-nine companies successfully moved to a safer zone, while only 12 experienced a decline in their financial condition. However, most companies remained in the same zone, indicating that their financial risk profiles tended to be stable throughout the observation period.

Companies that successfully emerge from the distress zone are generally supported by debt restructuring, increased operational efficiency, and strengthened working capital. Conversely, companies experiencing a decline in the distress zone are generally affected by increasing debt burdens, declining profitability due to rising raw material costs, and weakening liquidity due to a lengthening cash conversion cycle.

Theoretical Implications

The following is a condensed version retaining the main substance.

The findings of this study provide several theoretical implications for the study of financial risk. First, the analysis supports the trade-off theory, which suggests that companies with leverage levels exceeding their operating cash flow capacity tend to face a higher risk of financial distress, as proposed by Myers (1977). Second, the high persistence of financial risk, as demonstrated by the majority of companies remaining in the same zone throughout the study period, indicates that financial conditions are influenced by past financial decisions, requiring time and ongoing intervention to improve.

Furthermore, differences in risk profiles across manufacturing subsectors indicate that the characteristics of each subsector need to be considered when developing financial distress prediction models. The improving trend in financial conditions during the 2022–2024 period also indicates the capacity for post-crisis corporate recovery, although overall, the situation remains in the gray zone. Furthermore, the relationship between financial risk and operational factors such as cost stickiness, customer concentration, and operational cost efficiency underscores the importance of developing a more comprehensive model to explain the determinants of corporate financial risk.

Practical Implications

Table 1 Practical Implication Matrix Based on Z-Score Zones

Zone Z	Condition	Implications for Management	Implications for Investors/Creditors
Safe Zone (>2.6)	Healthy Finances	Focus on strategic expansion; optimize capital structure; invest in competitive capabilities	Consider as investment grade; regular monitoring sufficient; minimal covenant
Grey Zone ($1.1-2.6$)	Alert	Review cost structure; reduce leverage if excessive; strengthen working capital management; develop contingency plans	Intensive monitoring; consider additional covenants; stress scenario sensitivity analysis
Distress Zone (<1.1)	Danger	Activate restructuring plan; renegotiate debt; identify non-core assets for	Consider haircut/restructuring; stop new credit facilities; activate creditor protection mechanisms

liquidation; consider
recapitalization

Practically, manufacturing companies in the gray zone need to implement a continuous financial risk monitoring system through periodic Altman Z-Score calculations to detect changes in financial condition early before they develop into financial distress. More regular monitoring can support management decision-making in maintaining the company's financial stability.

For regulators, these findings support the strengthening of financial analysis-based early warning systems to increase transparency and accelerate responses to changes in issuers' financial conditions. Meanwhile, for banking and financing institutions, a company's Z-Score can be used as a basis for implementing risk-based pricing, allowing lending interest rates to be adjusted to each borrower's level of financial risk.

Challenges and Opportunities

1. Challenges in Measurement and Interpretation

First, reliance on accounting figures makes the Z-Score vulnerable to the effects of earnings management practices. Companies that aggressively manage earnings to meet targets or avoid covenant violations may display Z-Scores that do not reflect their true financial condition. Research by Dechow et al. (2010) shows a negative correlation between accrual quality and the predictive accuracy of accounting-based models like the Z-Score.

Second, inflation dynamics and changes in accounting standards (particularly the transition to IFRS 16, which capitalizes operating leases) can distort cross-sectional and time-series comparisons of Z-Score values. Capitalization of operating leases under PSAK 73 (which came into effect in Indonesia in 2020) mechanically increases total assets and total liabilities, impacting several Z-Score components simultaneously. Careful adjustment is required to ensure comparability between periods.

Third, Altman's gray zone boundaries are based on historical data from the United States and emerging markets in general. Recalibrating these boundaries for the specific Indonesian context, taking into account the structural characteristics of the Indonesian economy, accounting standards, and financial market conditions, could significantly improve the model's predictive accuracy.

2. Development Opportunities

First, integrating the Z-Score with non-financial indicators and alternative data offers opportunities to improve predictive accuracy. Data on research and development (R&D) intensity, corporate governance quality (corporate governance score), management reputation, and even sentiment analysis of corporate news have shown potential as complementary tools to Z-Score-based predictions (Altman et al., 2017). Advances in artificial intelligence and machine learning open up the possibility of building more sophisticated predictive models by more effectively combining structured (financial reports) and unstructured (text, news) data.

Second, developing a Z-Score model specifically calibrated for each Indonesian manufacturing subsector represents a highly promising research opportunity. Optimal zone weights and boundaries likely differ between the margin-oriented pharmaceutical subsector and the volume-oriented textile subsector. Research developing subsectoral models based on IDX data could yield significantly more accurate and relevant predictive instruments.

Third, the use of Z-Scores within a macroprudential stress testing framework by regulators is a relatively underdeveloped application in Indonesia. By simulating the impact of various macroeconomic scenarios (interest rate hikes, rupiah depreciation, slowing growth) on the distribution of Z-Scores for manufacturing companies, regulators can identify potential systemic stress before it manifests in actual company failures.

Conclusion

This study shows that the financial risk conditions of manufacturing companies on the Indonesia Stock Exchange during the 2022–2024 period have improved, as indicated by an increase in the average Altman Z-Score, an increase in the proportion of companies in the safe zone, and a decrease in the

number of companies in the distress zone. However, the average Z-Score remains in the gray zone, so that, in aggregate, the manufacturing sector still faces a level of financial vulnerability. The results also show differences in risk profiles between subsectors, with the pharmaceutical and healthcare, automotive, and chemical and petrochemical subsectors having relatively better financial conditions than the textile and footwear subsector. Furthermore, most companies maintained the same zone position throughout the observation period, indicating that financial risk tends to be persistent and requires ongoing management.

This study still has limitations because the financial risk measurement only uses the Altman Z-Score as the main indicator and focuses on manufacturing companies listed on the Indonesia Stock Exchange during the 2022–2024 period. Therefore, further research is recommended to expand the observation period, compare the results with other financial distress prediction models, and integrate operational factors such as cost stickiness, customer concentration, and operational cost efficiency to obtain a more comprehensive understanding of the determinants of financial risk. Practically, the results of this study can serve as a basis for company management in strengthening financial risk monitoring systems, for investors and creditors in evaluating the level of company financial health, and for regulators in developing early warning systems to support the stability of the manufacturing sector and capital markets.

Bibliography

- Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of Finance*, 23(4), 589–609. <https://doi.org/10.1111/j.1540-6261.1968.tb00843.x>
- Altman, E.I. (2013). Predicting financial distress of companies: Revisiting the Z-score and ZETA models. In E. I. Altman & M. McKinney (Eds.), *Handbook of research methods and applications in empirical finance* (pp. 428–456). Edward Elgar Publishing.
- Altman, E. I., Hartzell, J., & Peck, M. (1995). Emerging markets corporate bonds: A scoring system. *The Journal of Fixed Income*, 5(2), 36–43.
- Anderson, M.C., Banker, R.D., & Janakiraman, S.N. (2003). Are selling, general, and administrative costs sticky? *Journal of Accounting Research*, 41(1), 47–63. <https://doi.org/10.1111/1475-679X.00095>
- Bank Indonesia. (2023). *Bank Indonesia Survey 2023*.
- Beaver, W. H. (1966). Financial ratios as predictors of failure. *Journal of Accounting Research*, 4(Supplement), 71–111. <https://doi.org/10.2307/2490171>
- Indonesia Stock Exchange. (2023). *Indonesia Stock Exchange Report 2023*.
- Indonesia Stock Exchange. (2024). *Indonesian capital market statistics: Annual report 2023*. PT Indonesia Stock Exchange.
- Damodaran, A. (2022). *Investment valuation: Tools and techniques for determining the value of any asset* (4th ed.). John Wiley & Sons.
- Fahmi, I. (2021). *Financial statement analysis* (3rd Edition). Alfabeta.
- Kristianti, IP (2023). Financial distress and stock returns: An empirical study of manufacturing companies on the Indonesia Stock Exchange. *Indonesian Journal of Accounting and Finance*, 20(1), 45–62. <https://doi.org/10.21002/jaki.2023.03>
- Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, 5(2), 147–175.
- Suryanto, T., Thalassinou, EI, & Thalassinou, Y. (2022). Financial distress after COVID-19 pandemic: Emerging market evidence from Indonesian manufacturing firms. *Journal of Risk and Financial Management*, 15(11), Article 488. <https://doi.org/10.3390/jrfm15110488>

