

Bankruptcy Prediction Analysis of PT Bank Muamalat Indonesia Tbk for the Period 2015–2022 Using the Altman Z-Score and Springate Models

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Abstract

This study analyzes bankruptcy prediction for PT Bank Muamalat Indonesia Tbk during 2015–2022 using the Altman Z-Score and Springate models. As Indonesia's first Islamic bank, PT Bank Muamalat has faced challenges such as capital difficulties that could threaten its financial stability. Using descriptive quantitative methods, this research measures bankruptcy potential through financial ratios. The Z-Score model categorizes the bank as generally healthy, though some years indicate potential bankruptcy, while the Springate model consistently shows a healthy condition. The findings suggest that PT Bank Muamalat Indonesia Tbk needs to strengthen its business strategies and improve financial management to maintain stable profitability. This analysis is expected to assist investors in making informed investment decisions and to support future research in the field. Furthermore, the study contributes to developing better financial strategies and provides valuable insights for stakeholders in understanding the bank's financial health.

Keywords: Prediction of Bankruptcy; Altman Z-Score Method; Springate Method; PT Bank Muamalat Indonesia Tbk

JEL Classification: G32, G33



Introduction

In the modern financial system, banks play a strategic role as intermediary institutions that collect funds from the public and redistribute them in the form of financing or credit. According to zuhrotun (2021), a bank is a business entity that aims to improve public welfare through the collection and distribution of funds. In Indonesia, the banking system consists of two models: conventional banks and Islamic banks. These two systems differ in both principles and operations; Islamic banks are based on Islamic law, which emphasizes justice, honesty, and the prohibition of *riba* (interest). This principle requires that all financial activities comply with *sharia* rules, including ensuring that all products and services offered are halal.

PT Bank Muamalat Indonesia Tbk, established on November 1, 1991, is the pioneer of Islamic banking in Indonesia. Since its establishment, the bank has contributed to the development of the national economy and provided financial services for Indonesia's Muslim population. However, during its development, PT Bank Muamalat Indonesia Tbk has faced significant challenges, one of which was capital difficulties in 2018 caused by high Non-Performing Financing (NPF), which subsequently led to a decline in net profit in the following years.

Based on financial reports from 2015 to 2022, the fluctuations in net profit indicate considerable instability in the bank's financial performance, as shown in Table 1 below:

Table 1 Net Profit of PT Bank Muamalat Indonesia Tbk for the Period 2015–2022
(in million rupiah)

Year	Net Profit
2015	74,492,188
2016	80,511,090
2017	26,115,563
2018	46,002,044

Year	Net Profit
2019	16,326,331
2020	10,019,739
2021	8,927,051
2022	26,581,068

Source : <https://www.bankmuamalat.co.id/>

The data in Table 1 show that the highest net profit occurred in 2016 at IDR 80,511,090 million, followed by a sharp decline to IDR 26,115,563 million in 2017. Although there was a temporary recovery in 2018, profitability continued to decline, reaching its lowest point in 2021 at only IDR 8,927,051 million. This situation reflects internal financial pressures resulting from high levels of NPF and a decrease in the capital adequacy ratio since 2018. Nevertheless, the increase in 2022 to IDR 26,581,068 million indicates an early sign of recovery, possibly driven by financial restructuring and operational efficiency improvements.

According to data from the Financial Services Authority (OJK, 2022), the average profit growth of Islamic banks in Indonesia ranges between 5–7% per year, whereas PT Bank Muamalat Indonesia Tbk remains below the industry average. This highlights a potential financial risk that requires a more in-depth analysis. Such conditions have become increasingly relevant amid global economic pressures in the post-COVID-19 era, which have also affected the stability of the Islamic banking sector.

Although several previous studies have examined bankruptcy prediction in conventional banks, research on Islamic banks remains limited, particularly those employing quantitative approaches using financial ratio models. Therefore, this study is important to address this research gap and to extend the application of bankruptcy prediction models within the context of Islamic banking in Indonesia.

From an academic perspective, this study contributes to testing two bankruptcy prediction models—**Altman Z-Score** and **Springate**—to compare their effectiveness in assessing the financial health of Islamic banks. Practically, the findings are expected to help bank management formulate more effective risk mitigation strategies. Furthermore, the results of

this study can serve as a reference for regulators, investors, and academics in understanding the financial stability of Islamic banks and in developing appropriate supervisory and policy strategies. Thus, this research aims to analyze the potential bankruptcy of PT Bank Muamalat Indonesia Tbk during the 2015–2022 period using the Altman Z-Score and Springate models and to contribute to strengthening financial risk management and strategic planning within Indonesia’s Islamic banking sector.

Problem Formulation

Based on the background above, the research questions are formulated as follows:

1. How does the Altman Z-Score model assess the financial condition and bankruptcy potential of PT Bank Muamalat Indonesia Tbk during the 2015–2022 period?
2. How does the Springate model assess the financial condition and bankruptcy potential of PT Bank Muamalat Indonesia Tbk during the same period?
3. What are the similarities and differences between the two models in predicting the financial health of Islamic banking institutions in Indonesia?

Literature Review

Bankruptcy prediction models have long been developed to help identify early signs of financial distress within firms. Among the most widely used are the Altman Z-Score and Springate models, both of which employ *Multiple Discriminant Analysis (MDA)* to distinguish between financially healthy and distressed companies. Although these models were initially designed for conventional financial institutions, their use has expanded across sectors, including Islamic banking, to assess financial stability and performance sustainability. According to Pompian (2011), behavioral finance principles highlight that managerial and investor decision-making biases can influence financial performance, which in turn affects the interpretation of bankruptcy prediction outcomes.

Altman Z-Score in Previous Studies

The Altman Z-Score model, introduced in 1968, has been applied extensively in financial and non-financial industries. Altman and Hotchkiss (2006) reaffirmed that the model remains one of the most reliable diagnostic tools for identifying corporate distress across various sectors, including finance and banking. According to Altman (2000) and Tuvadaratragool (2013), the model's five financial ratios effectively predict bankruptcy with an accuracy rate exceeding 80% in manufacturing firms. However, several scholars have raised concerns about its applicability to service-oriented and financial institutions. For instance, Karim et al. (2020) found that while the Z-Score model performed well in predicting corporate failure in conventional banks, it was less accurate for Islamic banks due to differences in accounting standards and profit-sharing mechanisms.

A study by Almansour (2023) emphasized that the Altman model requires adjustment when applied to Islamic banking since interest-bearing liabilities—central to conventional ratios—are replaced with *profit-loss sharing (PLS)* contracts. Similarly, research by Rahman and Sari (2022) highlighted that liquidity and profitability ratios in Islamic banks tend to behave differently from conventional benchmarks, affecting Z-Score outcomes. These findings underscore the need to re-examine the Altman Z-Score model in the context of *sharia-compliant* financial institutions.

Springate Model in Previous Studies

Developed by Gordon L.V. Springate in 1978, the Springate model offers a simplified framework for assessing financial distress using four financial ratios. Devi et al. (2021) reported that the model achieved an accuracy rate of approximately 92.5% in predicting bankruptcy among Canadian firms, showing comparable performance to the Altman model. Subsequent studies, such as those by Widhi and Yuliana (2020) and Nurdiana (2021), applied the Springate method to manufacturing and banking sectors, finding it more practical for companies with limited data availability.

However, other researchers have pointed out the limitations of the Springate model. For example, Sari and Hamzah (2022) argued that its binary classification—categorizing firms simply as bankrupt or non-bankrupt—lacks the interpretive flexibility of the Altman model, particularly when firms are in transitional financial states. Nonetheless, the model's simplicity and ease of use make it a valuable tool for preliminary financial assessments, especially in emerging markets like Indonesia.

Studies in Islamic Banking Context

Bankruptcy prediction research within Islamic banking remains relatively scarce. Studies by Alqahtani and Mayes (2022) and Hasan et al. (2021) emphasized that Islamic financial institutions operate under unique principles such as risk-sharing, asset-backing, and the prohibition of interest (*riba*), which influence their financial ratios and distress indicators. Therefore, traditional bankruptcy models may not fully capture the dynamics of Islamic banks' financial health.

In Indonesia, several studies—such as those by Devi et al. (2021) and Nasrial (2020)—have explored the financial condition of PT Bank Muamalat Indonesia Tbk using conventional ratio analysis. Yet, few have conducted a comparative examination using both the Altman and Springate models over an extended period. This creates a gap in understanding how these two models perform in predicting bankruptcy potential within a *sharia-based* banking environment.

In the context of Islamic finance, the application of bankruptcy prediction models such as the Altman Z-Score and Springate models requires theoretical justification. Islamic banks operate under *maqashid al-sharia* principles, which emphasize justice, transparency, and risk-sharing rather than interest-based income. The *profit and loss sharing* (PLS) mechanism—through contracts such as *mudharabah* and *musyarakah*—creates distinct financial dynamics that influence liquidity and profitability ratios differently from conventional banks.

According to Chapra (2000) and Dusuki (2008), the core objective of Islamic finance is not only to ensure solvency but also to promote social and economic balance consistent with *maqashid al-sharia*. Therefore, assessing financial distress in Islamic banks should incorporate both financial and ethical dimensions. The Altman and Springate models remain relevant as diagnostic tools because they provide an early warning of financial instability. However, their interpretation must consider the unique characteristics of Islamic financial statements—particularly the absence of interest income and the dominance of asset-backed transactions.

This theoretical alignment suggests that future research should explore adaptive models that integrate PLS-related variables, such as financing efficiency ratios or Non-Performing Financing (NPF), to improve the accuracy of bankruptcy prediction in Islamic financial institutions.

As emphasized by Wilson (2008) and Hassan and Lewis (2007), the Islamic banking framework operates on asset-backed transactions and ethical investment principles that differ

significantly from interest-based systems. These structural distinctions affect financial ratio behavior and, consequently, the predictive accuracy of conventional bankruptcy models when applied to Islamic financial institutions.

Research Gap and Framework

From the reviewed literature, two main gaps are identified. First, previous research has largely focused on manufacturing and conventional banking sectors, leaving limited evidence on the accuracy of bankruptcy prediction models in Islamic financial institutions. Second, comparative studies that analyze both the Altman Z-Score and Springate models simultaneously within the Islamic banking context are still rare, particularly using longitudinal data.

Therefore, this study aims to fill these gaps by applying both models to PT Bank Muamalat Indonesia Tbk during the 2015–2022 period. The objective is to assess the level of financial health and to determine which model provides a more reliable indication of potential bankruptcy in Indonesia's Islamic banking sector. The results are expected to enhance the understanding of financial distress measurement in *sharia-compliant* institutions and contribute to the development of more suitable risk assessment frameworks for Islamic banks.

Altman Z-Score Method

One of the earliest bankruptcy prediction models was introduced by Professor Edward I. Altman from New York University in 1968, known as the **Z-Score Model**. According to Irfani (2020), the Z-Score analysis is a method used to predict a company's continuity by combining several common financial ratios with different weightings. Thus, the Z-Score model can estimate the probability of corporate bankruptcy.

Altman's Z-Score model was developed after testing 22 financial ratios and selecting 5 ratios that best distinguish between bankrupt and non-bankrupt firms. Altman conducted multiple studies involving companies in various conditions, which led him to formulate several versions of the model for different industries. This model emphasizes profitability as the most influential component in predicting bankruptcy.

According to Irfani (2020), the Z-Score model for publicly listed manufacturing companies can be expressed as follows:

$$Z=1.2X_1+1.4X_2+3.3X_3+0.6X_4+0.999X_5$$

Where:

- **X1 = Working Capital / Total Assets**
- **X2 = Retained Earnings / Total Assets**
- **X3 = EBIT / Total Assets**
- **X4 = Market Value of Equity / Book Value of Total Liabilities**
- **X5 = Sales / Total Assets**

Explanation:

- **X1 (Working Capital to Total Assets):** Measures liquidity by dividing net working capital by total assets, indicating how efficiently the company utilizes its assets.
- **X2 (Retained Earnings to Total Assets):** Assesses cumulative profitability by comparing retained earnings with total assets.
- **X3 (Earnings Before Interest and Taxes to Total Assets):** Reflects the productivity of the firm's assets in generating profit before interest and tax.
- **X4 (Market Value of Equity to Book Value of Total Liabilities):** Indicates how much the company's asset values could decline before liabilities exceed assets, leading to insolvency.
- **X5 (Sales to Total Assets):** Measures management's ability to use assets efficiently to generate sales.

Bankruptcy Criteria:

- **Z > 2.99:** The company is considered financially healthy.
- **1.81 < Z < 2.99:** The company is in the *grey area*—its survival or bankruptcy depends on managerial decisions.
- **Z < 1.81:** The company is financially distressed and faces a high probability of bankruptcy.

Springate Method

The **Springate Model** was developed in 1978 by Gordon L.V. Springate to predict corporate financial distress. Using a similar approach to Altman (1968) and Beaver (1966), Springate began by collecting 19 popular financial ratios that could potentially predict financial distress. After conducting statistical tests using Multiple Discriminant Analysis (MDA), he selected 4 key ratios that effectively differentiate between distressed and non-distressed firms. The model was tested on a sample of 40 Canadian companies.

As stated by Devi et al. (2021), the Springate model adopts the MDA approach developed by Altman, using financial ratios as indicators of bankruptcy potential. The resulting model is as follows:

$$S=1.03X1+3.07X2+0.66X3+0.4X4S$$

Where:

- **X1 = Working Capital / Total Assets**
- **X2 = Net Profit Before Interest and Taxes / Total Assets**
- **X3 = Net Profit Before Taxes / Current Liabilities**
- **X4 = Sales / Total Assets**

Explanation:

- **X1 (Working Capital to Total Assets):** Indicates liquidity by comparing working capital (current assets minus current liabilities) to total assets. A higher ratio implies stronger short-term financial stability.
- **X2 (EBIT to Total Assets):** Measures profitability and the company's ability to generate returns from total assets before interest and taxes.
- **X3 (Earnings Before Taxes to Current Liabilities):** Assesses the company's capacity to meet short-term obligations from pre-tax earnings.
- **X4 (Sales to Total Assets):** Represents asset turnover efficiency, showing how effectively total assets are used to generate sales revenue.

Cut-off Criteria (Springate, 1978):

- **$S < 0.862$:** The company is considered *bankrupt* (experiencing severe financial distress).
- **$S > 0.862$:** The company is considered *non-bankrupt* (financially healthy).

Springate's model achieved an accuracy rate of **92.5%** when tested on 40 companies, demonstrating its effectiveness as an early warning system for corporate financial distress.

Comparison of the Altman Z-Score and Springate Models

Both the Altman Z-Score and Springate models are well-known analytical tools used to predict the likelihood of bankruptcy by employing financial ratio analysis. Although both models share a similar conceptual foundation—namely the use of Multiple Discriminant Analysis (MDA) to classify companies into financially healthy and distressed categories—there are notable differences in their structure, complexity, and application.

The **Altman Z-Score model**, developed in 1968, utilizes **five key financial ratios**, integrating indicators of liquidity, profitability, leverage, solvency, and activity. It provides a comprehensive assessment of a company's overall financial health and has been widely adopted in various industries, including manufacturing, finance, and services. The model's "grey area" range ($1.81 < Z < 2.99$) allows for a nuanced interpretation of potential bankruptcy, making it particularly valuable for firms experiencing transitional financial conditions.

In contrast, the **Springate model**—developed a decade later in 1978—simplifies the analytical process by using **four financial ratios**, focusing primarily on profitability and liquidity. This streamlined structure enhances the model's practicality, especially for firms or researchers seeking a more direct evaluation of financial distress. Springate's model has been found to achieve a high accuracy rate (approximately 92.5%) in identifying distressed firms, though it lacks the interpretive flexibility of the Altman model due to its binary classification (bankrupt or non-bankrupt).

While both models have proven reliable in assessing financial distress, their suitability depends on the context and purpose of analysis. The Altman Z-Score tends to be more robust and versatile across industries but requires more comprehensive data inputs. The Springate model, on the other hand, offers simplicity and efficiency in application, making it ideal for preliminary assessments or when limited financial data are available.

In this study, both models are applied to **PT Bank Muamalat Indonesia Tbk** during the **2015–2022 period** to identify patterns of financial health and potential distress. The comparative analysis between the two approaches is expected to provide deeper insights into the financial stability of Indonesia's Islamic banking sector and to determine which model demonstrates greater predictive effectiveness in the context of Islamic financial institutions.

Research Method

This study applies a **quantitative descriptive approach**, focusing on numerical data that are analyzed through mathematical and statistical methods. The purpose is to describe and interpret the financial performance of **PT Bank Muamalat Indonesia Tbk** and to assess its potential risk of bankruptcy using two established models, the **Altman Z-Score Model** and the **Springate Model**. The research utilizes secondary data derived from the company's annual financial reports for the period **2015 to 2022**, which include statements of financial position, income statements, and changes in equity. These data were obtained from the company's official website, ensuring reliability and transparency.

The research was conducted at **PT Bank Muamalat Indonesia Tbk**, located in East Jakarta, Indonesia. The data collection process took place between **October 2023 and July 2024**, covering stages such as literature review, data retrieval, processing, analysis, and interpretation. The population in this research consists of all annual financial statements published by PT Bank Muamalat Indonesia Tbk, while the sample is drawn from the company's **income statements, balance sheets, and equity statements** from 2015 to 2022. These specific documents were chosen because they provide the key financial figures necessary to calculate ratios used in the two bankruptcy prediction models.

The study employs **secondary quantitative data**, meaning that the data were obtained indirectly through publicly available reports rather than collected through direct observation or surveys. The financial information used represents measurable variables such as assets, liabilities, earnings, and equity. The documentation method was used for data collection, in which the researcher accessed and recorded data directly from published financial reports available on the official website of PT Bank Muamalat Indonesia Tbk. Each report was

reviewed carefully, and relevant financial figures such as total assets, total liabilities, retained earnings, sales, earnings before interest and taxes (EBIT), and working capital were extracted and organized systematically for further analysis.

To operationalize the research variables, this study follows the frameworks introduced by **Altman (1968)** and **Springate (1978)**. Both models use a set of financial ratios representing liquidity, profitability, leverage, and efficiency to predict a company's financial health and potential bankruptcy risk. The operational definitions of the variables are summarized in the following table, which outlines the ratio name, formula, data type, measurement unit, and theoretical source.

Table 2 Operational Definition of Variables

No	Variable / Ratio	Formula	Data Type	Unit Description	Source
1	Working Capital to Total Assets	Working Capital / Total Assets	Secondary Ratio	Measures the company's ability to utilize assets to support its working capital needs.	Altman (1968); Springate (1978)
2	Retained Earnings to Total Assets	Retained Earnings / Total Assets	Secondary Ratio	Indicates how much of the company's assets are financed by retained earnings.	Altman (1968)
3	EBIT to Total Assets	EBIT / Total Assets	Secondary Ratio	Assesses the effectiveness of assets in generating operating income.	Altman (1968); Springate (1978)
4	Market Value of Equity to Book Value of Total Debt	Market Value of Equity / Total Debt	Secondary Ratio	Evaluates the company's equity strength relative to its total debt.	Altman (1968)
5	Sales to Total Assets	Sales / Total Assets	Secondary Ratio	Measures the efficiency of asset utilization in generating sales revenue.	Altman (1968); Springate (1978)
6	Earnings Before Taxes to Current Liabilities	EBT / Current Liabilities	Secondary Ratio	Indicates the company's ability to cover current liabilities using pre-tax earnings.	Springate (1978)

Source: Self-processed, 2025

These variables form the foundation for calculating the Z-Score and S-Score values for each year of observation. The Altman Z-Score Model uses five financial ratios and is expressed through the following formula:

$$Z=1.2X1+1.4X2+3.3X3+0.6X4+1.0X5$$

where X1 represents Working Capital to Total Assets, X2 Retained Earnings to Total Assets, X3 EBIT to Total Assets, X4 Market Value of Equity to Total Debt, and X5 Sales to Total Assets.

The interpretation of the Altman model results is that a Z-Score greater than 2.99 indicates a healthy company, a score between 1.81 and 2.99 indicates a grey area or uncertain condition, and a score below 1.81 suggests financial distress or a high risk of bankruptcy.

In addition, the Springate Model applies the following equation:

$$S=1.03X1+3.07X2+0.66X3+0.4X4$$

where X1 represents Working Capital to Total Assets, X2 EBIT to Total Assets, X3 Earnings Before Taxes to Current Liabilities, and X4 Sales to Total Assets. The interpretation of the Springate score is that a value greater than 0.862 indicates a financially healthy company, while a value below 0.862 indicates financial distress.

After collecting and processing the data, the financial ratios for each year were calculated according to the two models. The scores obtained were then interpreted based on the respective thresholds to determine the company's financial health status for each year. Finally, the results from both models were compared to identify similarities or differences in their assessment of the financial condition of PT Bank Muamalat Indonesia Tbk. This comparative analysis helps evaluate the reliability and applicability of both models in analyzing bankruptcy risk within the context of a Sharia banking institution.

The entire research process was carried out systematically, beginning with data collection, followed by calculation of ratios, Z-Score and S-Score computation, interpretation of results, and comparative analysis. The findings from this process are expected to provide insights into the financial performance and sustainability of PT Bank Muamalat Indonesia Tbk, as well as contribute to the broader understanding of bankruptcy prediction models in Islamic financial institutions.

To enhance the robustness of analysis, this study also conducted a year-to-year sensitivity observation to examine fluctuations in both Z-Score and S-Score values during the 2015–2022 period. The trend-based comparison allows for assessing the stability and volatility of the bank’s financial performance over time. Although no formal statistical validation test was conducted, the comparison between models serves as an internal consistency check to validate the predictive patterns generated by both frameworks.

Future studies may further develop a modified version of the models by incorporating Islamic-specific variables such as the *profit-sharing ratio*, *financing-to-deposit ratio (FDR)*, or *Non-Performing Financing (NPF)* levels to adapt the models for sharia-compliant institutions.

Result and discussion

The analysis in this chapter is based on the application of the Altman Z-Score and Springate models to evaluate the financial condition and potential bankruptcy risk of PT Bank Muamalat Indonesia Tbk during the period 2015–2022. The interpretation of results aims to determine whether the company was in a healthy, grey, or bankrupt condition according to the model criteria.

Z-Score Analysis

The Altman Z-Score model was applied to measure the company’s financial performance using five key ratios: Working Capital to Total Assets, Retained Earnings to Total Assets, EBIT to Total Assets, Market Value of Equity to Total Debt, and Sales to Total Assets. The results of these calculations for PT Bank Muamalat Indonesia Tbk during the years 2015–2022 are presented in the table below.

Table 3 Z-Score Ratios and Results

PT Bank Muamalat Indonesia Tbk (2015–2022)

Values in percentage ratios

Year	X1 (%)	X2 (%)	X3 (%)	X4 (%)	X5 (%)	Z-Score	Result
2015	21.3	679.5	0.292	0	0.863	950.8	Healthy
2016	19.2	169.8	0.153	0	0.682	237.7	Healthy

Year	X1 (%)	X2 (%)	X3 (%)	X4 (%)	X5 (%)	Z-Score	Result
2017	19.4	698.7	0.0704	0	0.601	978.1	Healthy
2018	32.7	-0.0296	0.12	0	0.560	0.9495	Bankrupt
2019	29.4	-0.0201	0.0385	0	0.546	0.8965	Bankrupt
2020	31.4	-247.5	0.0319	0	0.474	-345.7	Bankrupt
2021	56.8	340.1	0.033	0	0.361	1573.1	Healthy
2022	57.3	-238.6	0.159	0	0.286	-333.9	Bankrupt
Average							Healthy

Source : self-processed 2024

The results of the Z-Score calculation show that the financial condition of PT Bank Muamalat Indonesia Tbk fluctuated significantly throughout the 2015–2022 period. Based on the Altman model's cut-off value ($Z > 2.99$ = healthy; 1.81 – 2.99 = grey zone; $Z < 1.81$ = bankrupt), the company's performance indicates alternating years of financial health and distress.

From 2015 to 2017, the bank consistently achieved high Z-Score values, indicating a **healthy financial condition**. However, in 2018, the score fell sharply below the critical threshold of 1.81 , reaching a value of **0.9495**, which suggests a state of **financial distress**. The same trend persisted in 2019 and 2020, where the scores were **0.8965** and **–345.7**, respectively, signaling severe instability and risk of bankruptcy.

In 2021, PT Bank Muamalat Indonesia Tbk recorded a strong recovery with a Z-Score of **1573.1**, placing it once again in a **healthy** condition. This improvement could be attributed to better asset management, restructuring efforts, or external capital injections that strengthened the company's financial standing. However, the downward trend reappeared in 2022, when the Z-Score drastically declined to **–333.9**, signaling a potential relapse into financial distress.

Overall, the Z-Score results suggest that PT Bank Muamalat Indonesia Tbk experienced alternating phases of strength and weakness between 2015 and 2022. Despite the generally

healthy average, the significant fluctuations indicate underlying operational inefficiencies or external pressures affecting financial stability. Hence, continuous monitoring and improvement in operational performance are crucial to prevent recurring financial distress in the future.

Springate Analysis

The Springate model was then applied to further evaluate the financial health of PT Bank Muamalat Indonesia Tbk using four key ratios: Working Capital to Total Assets, EBIT to Total Assets, Earnings Before Taxes to Current Liabilities, and Sales to Total Assets. The following table presents the results of the Springate ratio calculations for the period 2015–2022.

Table 4 Springate Ratios and Results

PT Bank Muamalat Indonesia Tbk (2015–2022)

Values in percentage ratios

Year	X1 (%)	X2 (%)	X3 (%)	X4 (%)	Springate	Result
2015	21.3	0.292	60.93	0.863	63.403	Healthy
2016	19.2	0.153	66.44	0.682	64.228	Healthy
2017	19.4	0.0704	30.63	0.601	40.705	Healthy
2018	32.7	0.12	23.03	0.560	49.594	Healthy
2019	29.4	0.0385	29.83	0.546	50.267	Healthy
2020	31.4	0.0319	12.48	0.474	40.862	Healthy
2021	56.8	0.033	1.16	0.361	59.512	Healthy
2022	57.3	0.159	44.73	0.286	89.191	Healthy
Average						Healthy

Source : self processed, 2024

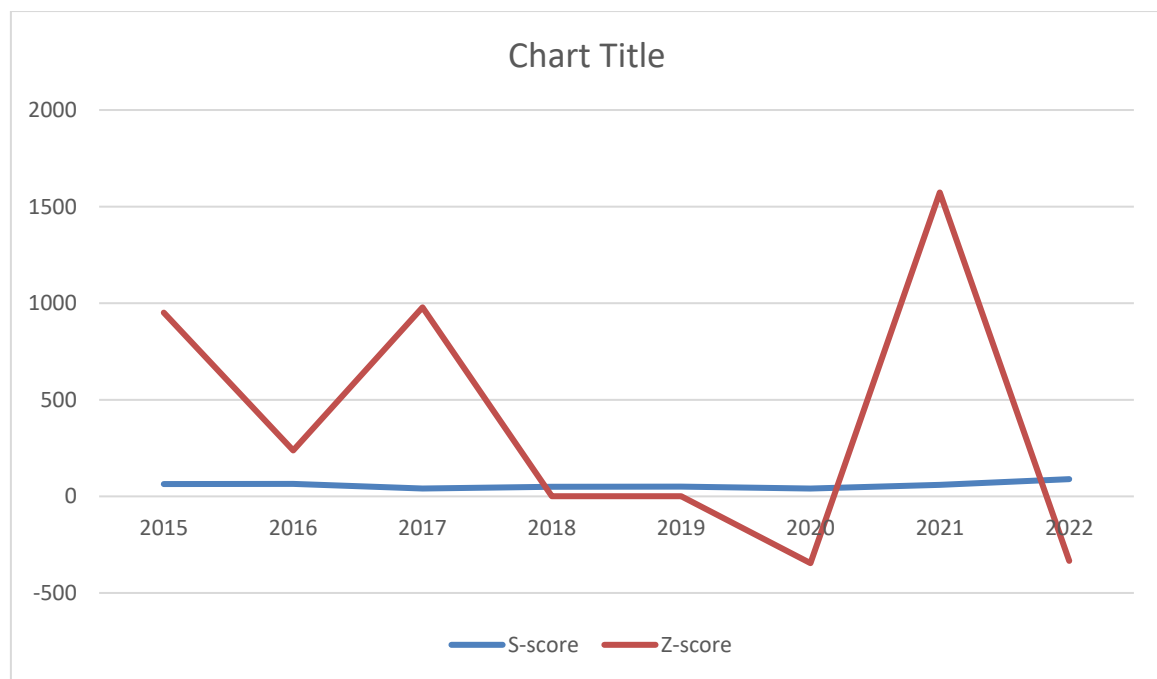


Figure 1 S-score dan Z-score between 2015 and 2022

Based on the results in Table 2, the Springate analysis shows that PT Bank Muamalat Indonesia Tbk maintained a **consistently healthy financial condition** throughout the 2015–2022 period. According to the Springate model, a score above **0.862** indicates a financially healthy company, while a score below this value signifies potential bankruptcy. All the calculated Springate values for the observed years are significantly above this threshold, suggesting the company’s **financial strength and resilience** during the study period.

Even during the years when the Altman Z-Score indicated distress (2018–2020 and 2022), the Springate results still categorized the company as **healthy**. This discrepancy highlights that the two models may produce different results depending on the variables emphasized—Altman places stronger weight on retained earnings and equity value, while Springate focuses more on profitability and liquidity ratios. In the case of PT Bank Muamalat Indonesia Tbk, it appears that short-term liquidity and profitability remained sufficient to sustain operations despite fluctuations in asset utilization and equity valuation.

Overall, the Springate model presents PT Bank Muamalat Indonesia Tbk as a financially stable institution with sufficient operational strength to manage its obligations and maintain stability in the face of market challenges. These results imply that the bank has strong internal management practices, efficient asset utilization, and the capacity to withstand financial

pressures. The findings also suggest that the institution holds considerable potential to continue improving its performance and maintaining long-term financial sustainability.

The results of the Altman Z-Score and Springate analyses provide a comprehensive picture of PT Bank Muamalat Indonesia Tbk's financial condition over the 2015–2022 period. The Altman model revealed fluctuating performance with several years indicating financial distress, while the Springate model consistently categorized the bank as financially healthy. These contrasting outcomes highlight the importance of model selection and contextual interpretation when assessing bankruptcy risk in Islamic banking institutions.

In addition to internal management factors, the fluctuations observed in PT Bank Muamalat Indonesia Tbk's financial ratios were also influenced by external macroeconomic and regulatory conditions. Policies issued by the Financial Services Authority (OJK) and Bank Indonesia—such as the post-COVID-19 financing restructuring program—significantly affected liquidity and capital adequacy. Moreover, exchange rate volatility, national inflation, and investor confidence in Islamic finance products contributed to variations in profitability and retained earnings. These contextual factors help explain the temporary declines in the Altman Z-Score between 2018 and 2020 and reaffirm the importance of integrating macroeconomic indicators into future bankruptcy prediction frameworks for Islamic banks.

The findings of this study are consistent with several previous research results, although with certain contextual differences. For instance, **Putri and Lestari (2020)** in their study *“Analisis Model Altman Z-Score dalam Memprediksi Potensi Kebangkrutan pada Bank Syariah di Indonesia”* found that the Altman model tends to produce fluctuating results for Islamic banks, especially when profitability margins are low due to non-interest-based income structures. Similar to this study, they observed that despite several years showing low Z-Scores, most Islamic banks remained operationally stable and did not experience actual bankruptcy. This supports the idea that the Altman model, while useful, may **overstate financial distress** in Sharia-compliant institutions that apply different accounting treatments and profit-sharing mechanisms.

Figure 1 illustrates the fluctuation trends of PT Bank Muamalat Indonesia Tbk's financial health as measured by the Altman Z-Score and Springate S-Score models during the 2015–2022 period. The Z-Score line shows high volatility across the years, reflecting alternating conditions between financial strength and distress. In the early observation years (2015–2017), the Z-

Score remained at relatively high levels, indicating a healthy position. However, a sharp decline occurred in 2018–2020, where the score fell below the bankruptcy threshold ($Z < 1.81$), suggesting a high risk of financial distress. This downturn corresponded with the bank's capital difficulties and rising Non-Performing Financing (NPF) ratio during that period.

A temporary recovery is visible in 2021, marked by a strong rebound in the Z-Score value, which likely resulted from internal restructuring and capital reinforcement initiatives. Nevertheless, the downward movement in 2022 signals renewed financial pressure that could be attributed to post-pandemic market adjustments and limited profit growth.

In contrast, the Springate S-Score line demonstrates remarkable stability throughout the observation period. All values remain well above the healthy threshold of 0.862, implying that PT Bank Muamalat Indonesia Tbk maintained adequate liquidity and profitability even during periods when the Altman model signaled distress. This consistency reinforces the argument that the Springate model may be better suited for Islamic banking institutions, which emphasize operational efficiency and risk-sharing mechanisms over market-based valuation metrics.

The comparative trend shown in Figure 1 confirms that while the Altman Z-Score is more sensitive to changes in retained earnings and capital structure, the Springate S-Score captures the bank's ongoing operational soundness. Such visual evidence supports the study's conclusion that combining both models provides a more balanced and accurate depiction of the financial resilience of Islamic banks.

In contrast, the findings of the **Springate analysis** in this research align closely with the study by **Sari and Nugroho (2021)** titled "*Komparasi Model Springate dan Altman dalam Memprediksi Kebangkrutan pada Perbankan Syariah di Indonesia*". Their research concluded that the Springate model often presents more optimistic results, reflecting the liquidity and profitability strength of Sharia banks. They argue that the Springate model may be more adaptable to Islamic banking because it places greater weight on short-term operational efficiency rather than market-based variables like equity valuation—which are less relevant for banks that rely on profit-sharing rather than capital market instruments. The consistent "healthy" condition observed in PT Bank Muamalat Indonesia Tbk under the Springate model in this study reinforces their conclusion.

A further comparison can be drawn with **Rahman and Dewi (2019)**, who applied both Altman and Springate models to conventional banks in Indonesia. Their study found that the

Altman model was more sensitive to leverage and retained earnings, often indicating distress when retained earnings were negative, even if liquidity was sufficient. Conversely, the Springate model showed stability in results for the same institutions. These patterns mirror those observed in PT Bank Muamalat Indonesia Tbk, where the Z-Score produced extreme fluctuations, especially in 2018–2020, whereas the Springate scores remained consistently above the healthy threshold. Such findings reinforce the idea that **the Altman model is more volatile and sensitive to accumulated losses**, while **Springate reflects ongoing operational viability**.

The contrast between the two models also aligns with the observations of Hapsari (2022), who emphasized that in banking institutions—particularly those operating under Sharia principles—the **Altman model may not fully capture the nuances of non-interest income and asset-based financing structures**. Hapsari suggested modifying the model or using complementary analyses to achieve a more accurate reflection of financial health. The present study supports this argument, as PT Bank Muamalat Indonesia Tbk’s healthy operations despite low or negative retained earnings in certain years reveal that the Altman model alone could misrepresent the institution’s actual financial condition.

When comparing this study’s findings with the broader literature on bankruptcy prediction in Islamic finance, a recurring pattern emerges: **Islamic banks often exhibit high liquidity ratios and stable earnings before taxes and interest, yet their retained earnings and equity market values may fluctuate more sharply** than those of conventional banks. This structural distinction explains why the Springate model, which emphasizes liquidity and profitability ratios, tends to produce more stable results than the Altman model, which heavily weights retained earnings and market-based equity values.

The divergence between the Altman and Springate results in this research can also be attributed to external macroeconomic factors and internal strategic adjustments during the study period. The years 2018–2020, which the Altman model categorized as financially distressed, coincided with Indonesia’s broader financial market volatility and the lingering effects of global economic uncertainty. Despite this, PT Bank Muamalat Indonesia Tbk continued to operate without major liquidity crises, suggesting that the decline in retained earnings reflected **temporary accounting losses or restructuring efforts** rather than genuine insolvency risk. This further supports the relevance of combining multiple models to assess financial performance comprehensively.

In synthesis, the results of this research confirm several patterns found in previous literature: **The Altman model is highly sensitive to retained earnings and capital structure variables**, which may not always represent the true financial strength of Islamic banks. **The Springate model provides a more stable assessment** by focusing on liquidity and profitability, making it better suited for institutions operating under profit-and-loss-sharing systems. **Empirical discrepancies between both models** suggest that bankruptcy prediction should not rely on a single model but rather a comparative analytical framework.

Therefore, this research contributes to the ongoing academic discussion by demonstrating that, in the context of PT Bank Muamalat Indonesia Tbk, the **Altman model signals caution in long-term solvency**, while the **Springate model reflects short-term operational health**. These dual perspectives provide a more balanced understanding of financial resilience in Islamic banking institutions. The findings support the argument that model selection must consider the **institutional characteristics and financial reporting standards** unique to Islamic financial systems.

Conclusion

Based on the results of the analysis and discussion conducted using two bankruptcy prediction models, namely the **Altman Z-Score** and **Springate** models, applied to **PT Bank Muamalat Indonesia Tbk** for the 2015–2022 period, it can be concluded that the company's financial condition exhibited significant fluctuations throughout the observation period. The results of the Altman Z-Score analysis show that PT Bank Muamalat Indonesia Tbk experienced variations in financial performance, where from 2015 to 2017 the company was in a healthy condition. However, during 2018 to 2020, the Z-Score values fell below the cut-off point of 1.8, indicating a potential risk of bankruptcy. Although there was a sharp increase in 2021 with a score of 1573.1, a subsequent decline occurred in 2022, reaching a negative value, which reflects instability in the company's financial performance. This condition suggests that even though the company did not experience actual bankruptcy, it faced certain financial pressures that require managerial attention, particularly in improving operational efficiency and working capital management.

Meanwhile, the analysis using the Springate model shows a contrasting result. Based on the calculations for the period 2015–2022, the Springate scores of PT Bank Muamalat

Indonesia Tbk consistently remained above the threshold value of 0.862, indicating that the company was in a healthy financial condition throughout the period. This result demonstrates that, in terms of liquidity, profitability, and operational earnings capacity, the financial performance of PT Bank Muamalat Indonesia Tbk remained relatively stable. These findings suggest that the Springate model tends to provide a more optimistic assessment of the financial health of Islamic banking institutions compared to the Altman Z-Score model.

The difference in results between the two models arises from their differing analytical focuses. The Altman Z-Score model is more sensitive to changes in capital structure and retained earnings, while the Springate model emphasizes liquidity efficiency and earnings before taxes and interest. Since Islamic financial institutions do not utilize interest-based income as their primary source of revenue, the Springate model is considered more appropriate for depicting the actual financial condition of Islamic banks. Therefore, it can be concluded that, in general, PT Bank Muamalat Indonesia Tbk is in a relatively healthy financial state, although there were indications of performance decline in certain years.

The findings of this study are consistent with previous research, which indicates that the Altman model tends to show greater volatility when applied to Islamic financial institutions, whereas the Springate model provides more stable and accurate results in assessing the performance of Islamic banking. Considering these findings, it can be concluded that PT Bank Muamalat Indonesia Tbk demonstrates adequate financial resilience to withstand economic pressures, but still requires strategic improvements in operational performance, retained earnings management, and income diversification to maintain long-term financial stability.

From a theoretical perspective, this research highlights the need to adapt conventional bankruptcy prediction models to better reflect the operational realities of Islamic financial institutions. Incorporating *maqashid al-sharia* principles and *profit-loss sharing* mechanisms into the analytical framework would provide a more holistic understanding of financial resilience in Islamic banks.

Therefore, future research should develop an “Islamic-Adjusted Bankruptcy Prediction Model” that integrates conventional financial ratios with Islamic-specific indicators such as NPF, financing diversification, and zakat or social responsibility commitments. Such adaptation would not only improve predictive accuracy but also align the analytical approach with the ethical and economic foundations of Islamic finance.

Policy Implications

The results of this study provide several important implications for policymakers, regulators, and banking practitioners:

For Regulators (OJK and Bank Indonesia):

It is necessary to develop or adapt bankruptcy prediction tools specifically designed for Islamic banks that consider *profit-and-loss sharing* mechanisms and non-interest income structures. Integrating such models into regular supervisory frameworks will enhance the early warning system for financial instability.

For Islamic Banking Management:

The findings emphasize the need to strengthen internal risk management systems, particularly in controlling Non-Performing Financing (NPF) and optimizing working capital efficiency. Improving the capital adequacy ratio and maintaining sustainable profitability are essential to mitigate long-term solvency risks.

For Investors and Stakeholders:

The study suggests that investors should interpret bankruptcy prediction results contextually—recognizing that conventional financial models such as the Altman Z-Score may not fully represent Islamic bank realities. Thus, investment decisions should be complemented with qualitative assessments of governance and compliance with *sharia* principles.

For Policymakers in Islamic Finance Development:

The results indicate the importance of establishing a standardized model of financial health assessment for Islamic financial institutions, which aligns with *maqashid al-sharia* principles and the distinctive financial reporting systems used by Islamic banks.

In conclusion, this study not only contributes academically to the understanding of bankruptcy prediction models in Islamic banking but also provides practical guidance for policymakers to design more effective regulatory frameworks and for Islamic banks to strengthen their financial resilience and operational sustainability.

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