



Analyzing the Causal Effect of Non-Performing Financing on ROA and ROE Profitability: New evidence from PT Bank Syariah Indonesia Tbk

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ABSTRACT

This study aims to analyze the short-run, long-run, and causal relationships between Non-Performing Financing (NPF) and profitability—proxied by Return on Assets (ROA) and Return on Equity (ROE)—at PT Bank Syariah Indonesia Tbk (BSI). Utilizing post-merger quarterly financial report data from Q1-2021 to Q2-2026 (T=22). Which, as the kick-off phase of a five-year research roadmap for Bank BSI, this study utilizes the currently available small sample size to establish the foundational empirical framework. The small sample size constraint is addressed using the Cheung-Lai finite-sample correction approach to ensure estimation validity. The analytical methods applied include the Johansen Cointegration Test, the Error Correction Model (ECM), and the Granger Causality Test. The cointegration results confirm a stable long-run equilibrium relationship among all variables. Furthermore, the ECM estimation proves that NPF has a significant negative effect on both ROA and ROE in the short run. Specifically, the Error Correction Term (ECT) indicates a speed of adjustment toward long-run equilibrium of 41.2% per quarter for the ROA model and 38.5% per quarter for the ROE model. This study suggests that BSI's management should consistently tighten customer financing risk mitigation systems to maintain long-term profitability stability and bank performance sustainability.

1. Introduction

The role of banks as intermediary institutions holds a strategic position in economic activities. As financial institutions, banks pool third-party or public funds to subsequently redistribute them to business entities in the form of bank financing. Financing quality highly determines the success of financing, particularly in Islamic banking, and it is not merely measured by the nominal amount disbursed to business entities and the public (Priyatno et al., 2022). According to research findings (Suryaningsih, 2020; Nugrohowati & Bimo, 2019), Non-Performing Financing (NPF) is one of the primary benchmarks commonly used to assess the financing quality of Islamic banking. Representing the ratio of problematic financing to the total financing disbursed by Islamic banks, NPF has become a key indicator utilized in the banking sector. A low NPF value indicates good productive asset quality and a low level of financial risk borne by the bank (Nugrohowati & Bimo,

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2019). Non-Performing Financing (NPF) reflects the asset quality and the effectiveness of Islamic financing risk management implemented by PT BSI. This financial ratio also serves as a crucial indicator in measuring the resilience of the bank's domestic financing foundation before expanding into the global arena.

The challenging conditions of the Indonesian economy in 2019 following the US–China trade war, as well as during the COVID-19 pandemic, demanded that the government and banking practitioners implement innovative, creative, and consistent measures to resolve economic issues. Among the policy steps taken was the merger of several state-owned banks (SOE bank merger) to address the macroeconomic challenges faced by the nation, alongside efforts to transform a competitive Islamic economy based on profit-sharing and non-usurious (*non-ribawi*) principles (Fuadi et al., 2026; Fitrianisa et al., 2021). At the beginning of 2021, specifically on February 1, the government officially established PT Bank Syariah Indonesia Tbk through an Islamic banking merger consisting of BRI Syariah, BNI Syariah, and Bank Syariah Mandiri (Fuadi et al., 2026). This merger of Islamic banks was driven by the critical need to establish a national Islamic banking sector in Indonesia that is robust in terms of capitalization, business scale, and broader market reach, alongside achieving higher efficiency levels. This policy measure is expected to enhance the competitiveness of Islamic banking, both at the national and global levels (Hanafi, 2021).

Furthermore, the formulation of BSI was part of the government's strategy to strengthen the bargaining power of the Islamic banking industry. BSI is designated as a supporting pillar for the development of the Islamic economy and finance in Indonesia. Additionally, it aims to increase the contribution of the Islamic banking sector to the national economy in the long term. However, since its inception, BSI has been confronted with the challenge of maintaining financing quality amid the integration process of the Islamic banking system and the dynamics of post-COVID-19 economic recovery. Consequently, the potential financing risks faced by Bank BSI at that time were relatively substantial.

Apart from being influenced by internal policies, the bank's NPF ratio is also affected by various other factors, such as the growth in financing volume, macroeconomic conditions, risk management quality, liquidity levels, capital adequacy, and the effectiveness of the financing monitoring process (Hanafi, 2021; Himmati et al., 2024). The determination of internal and external factors on NPF has implications for the acquisition of Return on Assets (ROA) and Return on Equity (ROE) (Arisanti et al., 2023; Toon et al., 2026; Ardana, 2019). Meanwhile, ROA is used to measure the bank's capability to generate profit from the utilization of its total assets (Hanafi, 2021; Ruchba & Fernanda, 2025). ROA (Return on Assets) and ROE (Return on Equity) signify the efficiency of asset management, acting as the primary engine of growth for PT BSI. These profitability metrics critically evaluate the bank's capability to generate sustainable dividend returns for its shareholders. Ultimately, a robust performance in both indicators establishes the essential financial capital required to drive the bank's long-term sustainability and global expansion.

On the other hand, ROE indicates the bank's ability to generate returns based on the equity (capital) value owned by shareholders (Setiadi & Lusiana, 2024). It is widely found in literature reviews that the correlation between NPF and both ROA and ROE, within Bank Syariah Indonesia as well as various other types of Islamic banking in general, typically exhibits an inverse or negative relationship with one another (Ruchba & Fernanda, 2025; Setiadi & Lusiana, 2024). According to the Indonesian Bankers Association (2018), NPF is formulated as the primary indicator for measuring the level of financing risk inherent in every Islamic bank portfolio due to uncertainties in loan repayments and/or profit-sharing by customers or business partners. The direct impact of financing risk exposure is reflected in a decline in asset productivity and a reduction in the rate of return on equity for shareholders (Syafaat & Timuriana, 2025).

Therefore, analyzing the development of NPF at PT Bank Syariah Indonesia Tbk since early 2021 is crucial to explain the bank's capability to maintain productive asset quality amid non-usurious (non-ribawi) financing expansion and global geopolitical tensions affecting the domestic economy (Fitrianisa et al., 2021; Setiadi & Lusiana, 2024). Although the NPF ratio exhibits a declining trend (Bank Syariah Indonesia, 2026), further examination is required, particularly regarding post-merger financing risk management and profitability. ROA measures operational efficiency and business profitability, whereas ROE serves as a key metric for shareholders to assess management's effectiveness in capitalizing equity to generate dividends and investment value-added (Syatir et al., 2025). NPF negatively impacts profitability; an increase in NPF inflates financing loss provisions, thereby reducing both ROA and ROE. The causal effect of NPF on ROE is linear, operating through a decline in net profit. Conversely, alternative findings indicate that ROE is occasionally more sensitive to capital adequacy ratios and earnings retention (Syafaat & Timuriana, 2025).

The maximum safe threshold for the gross NPF ratio established by the Financial Services Authority (OJK, 2022) is below 5 percent. Potential loss risks arising at any time can be mitigated based on the capital resilience motive. This principle serves as the core argument for novelty in this study, which will be verified using the Granger Causality approach. Consequently, stakeholders—including bankers, investors, and customers—need to implement the principles of *maqashid syariah* as a pillar to foster financial and business conditions oriented toward economic equity and justice.

This initial phase of research intentionally focuses on NPF, ROA, and ROE using available empirical data to assess the resilience and stability of the bank's domestic financing foundation. Serving as a baseline study for a five-year research roadmap on the sustainability of PT Bank Syariah Indonesia Tbk (BSI), evaluating these fundamental risk and profitability indicators is a prerequisite before measuring the bank's global competitiveness. Any failure to control domestic NPF in the short term—as observed across these 22 quarterly observations—would render international expansion mathematically and operationally unfeasible. Conversely, stable profitability acts as the primary engine of growth, providing the financial leverage necessary for BSI to penetrate global markets in the future. Consequently, this research represents a critical kick-off phase aimed explicitly at mapping the initial internal financial health of BSI within the Indonesian banking sector.

Based on the dynamic background described above, investigating the causal effect of Non-Performing Financing (NPF) on Return on Assets (ROA) and Return on Equity (ROE) at PT Bank Syariah Indonesia Tbk from 2021 to the present is highly crucial. The novelty of this study lies in the application of an econometric approach using the Error Correction Model (ECM) and Granger Causality to comprehensively capture both short-term and long-term relational dynamics. The urgency of this research is further reinforced by the strategic position of BSI as the largest state-owned Islamic bank in Indonesia, which carries the vision of integrating the values of justice and equitable Islamic financial inclusion to foster public welfare.

2. Methodology

2.1 Data Types and Sources

This study employs an exploratory quantitative approach using quarterly time series data, spanning from Q1 2021 to Q2 2026. Despite the limited 22 observations ($T=22$), this study serves as a crucial baseline phase to map the initial internal financial health of PT BSI in Indonesia. Utilizing an exploratory quantitative approach, this research analyzes quarterly time series data sourced from PT Bank Syariah Indonesia Tbk's official Financial Ratio Reports *pasca* banks merger.

The analytical framework deployed to examine the reciprocal relationships among variables, alongside their short- and long-term equilibrium dynamics, is anchored on the Granger Causality

test and the Error Correction Model (ECM). The adoption of this econometric approach is designed to confirm the stability of PT BSI's post-merger domestic financial structure. Consequently, this short- and long-run empirical evaluation serves as a scientific prerequisite before modeling BSI's global competitiveness in subsequent phases of the research roadmap, as the temporal span and data observations expand over time (Himmati et al., 2024).

2.2 Operational Definition of Variables

1. Non-Performing Financing (NPF): The gross non-performing financing ratio, calculated by dividing the total financing classified as substandard, doubtful, and loss by the total financing of Bank BSI from Q1 2021 to Q2 2026, expressed in percentage.
2. Return on Assets (ROA): A financial ratio used to measure the capability of Bank BSI's management to generate profit from the total assets managed from Q1 2021 to Q2 2026, expressed in percentage.
3. Return on Equity (ROE): A financial ratio that measures the ability of Bank BSI to generate net profit from its own equity from Q1 2021 to Q2 2026, expressed in percentage.

2.3 Data Analysis Methods

To investigate the presence of long-term and short-term reciprocal relationships among the NPF, ROA, and ROE variables, Stationarity Tests and Cointegration Tests must be performed beforehand. To mitigate small-sample bias ($T=22$) and avoid over-rejecting the null hypothesis, this study applies the scaled correction factor by Cheung and Lai (1993) to adjust Johansen's asymptotic critical values.

The Cointegration Test is applied to the residual values of the long-term linear regression equation to determine whether a long-term equilibrium relationship exists among the NPF, ROA, and ROE variables. Based on the Cointegration Test results, if the absolute t-statistic value obtained is greater than the MacKinnon critical value, a long-term equilibrium relationship is confirmed, justifying further estimation using the Error Correction Model (ECM).

2.4 Data Analysis Model

If cointegration is present, the ECM model can be utilized to correct short-term imbalances toward long-term equilibrium. The ECM model in this study is formulated in the following equations:

$$\Delta ROA_t = \alpha_0 + \sum_{i=1}^p \beta_i \Delta NPF_{t-i} + \gamma ECT_{t-1} + \varepsilon_t \quad (1)$$

$$\Delta ROE_t = \alpha_1 + \sum_{i=1}^p \omega_i \Delta NPF_{t-i} + \delta ECT_{t-1} + \varepsilon_t \quad (2)$$

Where:

Δ is the first difference operator ($Y_t - Y_{t-1}$).

α_0, α_1 are constants.

β_i, ω_i are short-term regression coefficients.

γ, δ are the speed of adjustment coefficients, which must be negative and statistically significant ($-1 < \gamma < 0$).

ECT_{t-1} is the Error Correction Term, representing the lagged residual from the long-term relationship.

ε_t is the error term (residual).

To specifically examine the bidirectional or reciprocal relationships between variables, the Granger Causality test is employed using the following models:

$$Y_t = \sum_{i=1}^p \alpha_i Y_{t-i} + \sum_{i=1}^p \beta_i X_{t-i} + U_{1t} \quad (3)$$

$$X_t = \sum_{i=1}^p \theta_i X_{t-i} + \sum_{i=1}^p \delta_i Y_{t-i} + U_{2t} \quad (4)$$

If the p-value is less than 0.05 (p-value < 0.05), the null hypothesis (H_0) is rejected, indicating a significant causal relationship between variables X and Y .

3. Results

Empirically, PT Bank Syariah Indonesia Tbk (BSI) has consistently reduced its Non-Performing Financing (NPF) ratio post-merger, dropping from 2.93% in 2021 to 1.80% in early 2026. This downward trend reflects strengthened risk management and improved financial health, aligning with the bank's founding vision. By maintaining sound asset quality, BSI fosters sustainable financing harmonization that supports internal financial stability while driving the growth of the real sector and business world. This qualitative explanation serves as supplementary information that reinforces the statistical results of the ECM model used in this study.

This indicates that BSI's management has successfully enhanced financing quality, implemented effective risk management, and fostered expanding customer trust and loyalty through harmonious partnership relations. Prior to the merger, the market share of Islamic banking was relatively modest compared to large-scale conventional commercial banks (Mauliddiana et al., 2026; Santosa et al., 2020). However, following the integration into PT Bank Syariah Indonesia Tbk, financing capacity has significantly expanded, positively impacting asset accumulation and capitalization. Aligned with prior findings (Fitrianisa et al., 2021; Syafaat & Timuriana, 2025), the mitigation of NPF reduction post-merger in 2021 has proven capable of boosting ROA and ROE exponentially.

3.1 ECM Prerequisite Test Results

Prior to estimating the ECM model, the data must be verified as stationary to avoid spurious regression results. This step is conducted through a Unit Root Test.

3.1.1 Unit root test results with small-sample-correction

The unit root test results (Augmented Dickey-Fuller Test) indicate that all variables (NPF, ROA, ROE) have a p-value > 0.05, meaning the data are non-stationary at the level stage, $I(0)$. After applying first-order differencing, $I(1)$, the results show that all variables exhibit a p-value < 0.01. The Johansen cointegration test with Cheung-Lai (1993) finite-sample correction confirms a long-run relationship among NPF, ROA, and ROE at Bank BSI. This is evidenced by the Trace Statistic of 36.450, which exceeds the adjusted Cheung-Lai critical value of 29.265. The rejection of the null hypothesis (H_0) implies that the linear combination of these credit risk and profitability variables yields a stationary error term, establishing a stable long-run equilibrium. Consequently, the data become stationary at the First Difference level.

3.1.2 Engle-Granger cointegration test results

A unit root test on the residuals of the long-run regression equation, using the small-sample critical value correction, yielded an ADF t-statistic of -4.152, which is more negative than the critical value of -3.631, while the MacKinnon critical value at $\alpha = 5\%$ is -2.987. Since the absolute value of the t-statistic $|-4.152| > |-2.987|$. This proves that a long-term relationship (cointegration) exists among the NPF, ROA, and ROE variables (Himmaty et al., 2024).

3.2 Error Correction Model (ECM) Estimation Results

The short-term relationship estimations and equilibrium corrections for Equation (1) with the dependent variable D(ROA) and Equation (2) with the dependent variable D(ROE) are obtained through the Error Correction Term (ECT) coefficient values. The respective estimation results can be observed in Table 1 and Table 2 below:

Table 1 Estimation results of equation (1)

Variabel dependen D(ROA).				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.04512	0.015120	2.984127	0.0084*
D(NPF)	-0.12451*	0.041240	-3.019156	0.0076*
ECT(-1)	-0.412450	0.110240	-3.741382	0.0018*
R-squared: 0.584100				
F-statistic: 11.93240				
Prob(F-stat): 0.0006				

Source: Processed Data (2026).

Based on the Johansen Cointegration test results, the Trace Statistic value of 35.412 exceeds its critical value of 29.265 at the 5 percent significance level. This proves that the NPF, ROA, and ROE variables exhibit a stable, long-term equilibrium relationship at PT Bank Syariah Indonesia Tbk over the quarterly period from 2021 to 2026 (Fuadi et al., 2026; Himmati et al., 2024).

Regarding the short-term relationship (the ECM model) for Equation (1), the results demonstrate that the NPF variable has a negative and significant effect on ROA where $\beta = -0.124$ (t-statistic -3,019 and p-value = 0.0076). This implies that every 1 percent increase in NPF in the short term will directly reduce the return on assets (ROA) by 0.12 percent. Empirical evidence shows BSI management's capability to lower NPF and enhance bank profitability, as indicated by the increase in ROA to 2.54 percent in March 2026, compared to 2.43 percent in March 2025 (Bank Syariah Indonesia, 2026).

Table .2 Estimation results of equation (2)

Variabel dependen D(ROE).				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.124150	0.051240	2.422912	0.0271
D(NPF)	-0.68412*	0.221410	-3.089833	0.0067*
ECT(-1)	-0.385410	0.121400	-3.174712	0.0055*
R-squared: 0.512410				
F-statistic: 8.941200				
Prob(F-stat): 0.0024				

Source: Processed Data (2026).

In the short-term relationship (the ECM model) for Equation (2), the NPF variable exerts a negative and significant effect on ROE where $\omega = -0.68$ (t-statistic -3,089 and p-value = 0.0067). This implies that every 1 percent increase in NPF in the short term will directly reduce the return on equity (ROE) by 0.68 percent. A key indicator of success in Islamic bank financing is the institution's capability to minimize the NPF ratio to 1.80 percent as of March 2026, while consistently generating increased profitability for shareholders (Fuadi et al., 2026; Syatir et al., 2025). In March 2026, the ROE reached 19.36 percent, reflecting a substantial increase compared to 17.58 percent recorded in the same quarter of 2025 (Bank Syariah Indonesia, 2026).

Based on the Error Correction Term (ECT_{t-1}) coefficients in Table 1 and Table 2, the $ECT(-1)$ is negative, less than one, and statistically significant. In the ROA model (Equation 1), the ($ECT < 1$)

coefficient is -0.412 with a p-value of 0.0018. This indicates that short-term fluctuations or disequilibria are corrected toward long-term equilibrium at a rate of 41.2 percent per quarter, requiring approximately 37 days to return to the equilibrium state. Meanwhile, in the ROE model, the speed of adjustment stands at 38.5 percent per quarter—where the ECT(-1) coefficient is -0.385 with a p-value of 0.0055—implying a recovery period of 35 days.

These findings confirm a stable, long-term equilibrium relationship among Non-Performing Financing (NPF), Return on Assets (ROA), and Return on Equity (ROE) at Bank BSI. The post-merger consolidation process has proven successful in establishing a financially integrated performance system over the long term (Fuadi et al., 2026; Mubarak et al., 2026).

3.3 Granger Causality Test Results

The Granger Causality test was conducted to analyze the reciprocal (two-way) relationships among the NPF, ROA, and ROE variables using an optimal lag length of 2. Based on the statistical test results, the parameter estimations are presented in Table 3 below:

Table 3Granger Causality Test Results

Pairwise Granger Causality Tests		
Lags: 2		
Null Hypothesis:	F-Statistic	Prob.
D(NPF) x D(ROA)	5.41240	0.0162*
D(ROA) x D(NPF)	1.12450	0.3491
D(NPF) x D(ROE)	4.98120	0.0210*
D(ROE) x D(NPF)	0.94120	0.4102

Source: Processed Data (2026).

Based on the Granger Causality test results in Table 3, which estimates Equations (3) and (4), a unidirectional causality (one-way causality) runs exclusively from the NPF variable at Bank BSI. NPF statistically affects ROA and ROE, but not vice versa. The null hypothesis (H_0) is rejected as the respective p-values are 0.0162 and 0.0210 (below the 0.05 threshold). This evidence confirms that financing quality acts as the primary driver behind banking profitability fluctuations. Conversely, ROA and ROE do not Granger-cause NPF; the p-values of 0.3491 and 0.4102 indicate that the net profit levels generated by PT Bank Syariah Indonesia Tbk are not a determining factor for customers in fulfilling their financing repayment obligations. This aligns with prior literature suggesting (Santosa, et al., 2020) that NPF is influenced by both internal banking factors and external macroeconomic variables (Mubarak et al., 2026).

However, alternative findings indicate that ROE has a negative and significant long-term impact on NPF (Kuswahariani et al., 2020). This condition might be triggered by overly aggressive equity return targets, which tend to encourage management to adopt a higher risk-seeking behavior in financing (Wangi & Sunarya, 2023). Reflecting on the core motivation behind establishing Bank BSI—as part of the government's consolidation agenda to strengthen state-owned Islamic banking—the institution is ultimately expected to contribute significantly to national economic growth (Fuadi et al., 2026; Toon et al., 2026). Therefore, in relation to the ROE financial ratio, capital resilience is highly imperative (Fuadi et al., 2026; Santosa et al., 2020). Capital resilience serves as the fundamental structural capacity and resource for the banking system to withstand economic pressures and financial crises.

4. Conclusions

The Johansen test with Cheung-Lai correction confirms a stable long-run relationship among NPF, ROA, and ROE at Bank BSI, as the Trace Statistic (35.450) exceeds the adjusted critical value (29.265). Empirical data from 2021–2026 shows that Bank BSI successfully reduced its NPF ratio from 2.93% to 1.90%, driving ROA up from 1.61% to 2.49% and ROE from 13.71% to 17.77%, which reinforces the theory that healthier asset quality directly enhances profitability. This dynamic is supported by significant, negative Error Correction Terms (ECT) across both models; short-term disequilibria are adjusted toward long-run equilibrium at a rate of 41.2% per quarter (approx. 37 days) for the ROA model and 38.5% per quarter (approx. 35 days) for the ROE model. Overall, while these post-merger trends are positive, BSI's management must consistently apply prudential banking principles to maintain performance sustainability.

Furthermore, the econometric analysis confirms a stable, long-term equilibrium relationship and a unidirectional causality, wherein NPF significantly Granger-causes ROA and ROE, but not vice versa. The neutrality of profitability in predicting NPF indicates management's substantial liquidity flexibility to deploy loan loss provisions or execute write-off policies on non-performing retail financing. This mechanism offers a novel insight for future research in explaining the rapid decline of NPF. Practically, these findings serve as a strategic reference for BSI's management to optimize financing quality and risk management frameworks to sustain long-term financial stability.

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