INTERNATIONAL JOURNAL OF SOCIAL SCIENCE, EDUCATIONAL, ECONOMICS, AGRICULTURE RESEARCH AND TECHNOLOGY (IJSET) | ISSN (E): 2827-766X
Website: https://ijset.org/ | Volume 5 No. 12 (2026)

THE EFFECT OF OPERATIONAL EFFICIENCY AND NON-PERFORMING FINANCING ON PROFITABILITY WITH INFLATION AS MODERATING VARIABLE IN ISLAMIC COMMERCIAL BANKS (2020–2025)

Misbachudin[1]*, Anton Sudrajat[2], Abdul Nasir[3]
123Universitas Islam Negeri Siber Syekh Nurjati Cirebon, Indonesia
E-mail: misbachudin@mail.uinssc.ac.id[1]*, antonsudrajat@syekhnurjati.ac.id[2], abdulnasir@syekhnurjati.ac.id[3]

Received: 05/11/2026 | **Revised:**10/11/2026 | **Accepted:**19/11/2026 | **Published:** 27/11/2026

Abstract

Profitability fluctuations measured by Return on Assets (ROA) remain a crucial challenge for the Islamic Commercial Bank (BUS) industry in Indonesia amid macroeconomic uncertainty. This study aims to analyze the effect of Operational Efficiency Ratio (OER) and Non-Performing Financing (NPF) Net on the profitability of Islamic Commercial Banks, with national inflation positioned as an external moderating variable. Using a quantitative associative causal approach, this study examines monthly aggregate industry time-series data from January 2020 to December 2025, yielding 72 monthly observations selected through total sampling. Data were analyzed using Moderated Regression Analysis (MRA) estimated with Robust Newey-West Standard Errors to correct for autocorrelation. The simultaneous test demonstrates that the moderated regression model is highly robust in predicting profitability volatility, with an Adjusted R-squared value of 0.9530. Partial t-test results reveal that OER negatively and significantly affects ROA, whereas NPF Net positively and significantly impacts ROA due to effective macroeconomic financing restructuring and margin optimization. Furthermore, inflation significantly moderates both relationships. External inflation acts as a buffering moderator that weakens the negative impact of OER on ROA, while simultaneously acting as a risk accelerator that amplifies the destructive effect of NPF Net on bank profitability.

Keywords: Inflation, Moderated Regression Analysis, Non-Performing Financing, Operational Efficiency Ratio, Return on Assets.

INTRODUCTION

The Islamic banking industry in Indonesia has experienced rapid structural growth alongside substantial operational challenges over the past five years. As financial intermediary institutions operating on profit-and-loss sharing and real-sector principles, Islamic Commercial Banks (Bank Umum Syariah/BUS) are required to sustain business continuity by achieving optimal profitability. Profitability serves as a primary indicator of managerial success in generating earnings while reflecting industry resilience against global economic uncertainty (Abidin & Setiawan, 2022). Superior financial performance is essential because Islamic banks operate in a highly competitive environment that depends heavily on stakeholder trust (Miah & Uddin, 2020). The period from 2020 to 2025 represents a critical phase for the financial sector, encompassing the COVID-19 pandemic shock, economic recovery, and global geopolitical tensions that triggered domestic macroeconomic volatility.

Aggregate Return on Assets (ROA) data published by the Financial Services Authority (Otoritas Jasa Keuangan/OJK) illustrates pronounced profitability fluctuations across the Indonesian Islamic banking industry. At the end of 2020, industry ROA fell to its lowest point of 1.40% due to pandemic-induced economic contraction and substantial loan-loss provisioning (Otoritas Jasa Keuangan, 2021). Profitability subsequently entered an initial recovery phase at 1.55% in 2021 and reached a peak of 2.00% in 2022, driven by OJK financing restructuring policies and the structural merger of state-owned Islamic banks (Otoritas Jasa Keuangan, 2023). However, this upward trajectory experienced a minor correction to 1.88% in 2023 due to benchmark interest rate hikes that inflated the cost of funds (Otoritas Jasa Keuangan, 2024), before rebounding to a new record high of 2.07% in 2024 and stabilizing at an estimated 2.12% in 2025. These cyclical variations underscore the necessity of monthly time-series investigation to examine how internal financial determinants interact with external macroeconomic

shocks. Internally, bank profitability is primarily governed by operational cost efficiency and financing risk management. High operational expenses relative to income reflect managerial inefficiency in controlling daily overhead, which directly erodes net operating margins (Jensen & Meckling, 1976; Nafiah & Mutmainah, 2022). Concurrently, deteriorating asset quality reflected by Non-Performing Financing (NPF) compels banks to allocate larger Allowance for Impairment Losses (Cadangan Kerugian Penurunan Nilai/CKPN), thereby reducing net income (Hassan & Al-Amin, 2021; Sudarsono et al., 2023). Externally, macroeconomic fluctuations such as inflation introduce dual pressures by elevating bank overhead costs and eroding debtor repayment capacity in the real sector (Wasiaturrahma et al., 2020; Hidayat & Shidqon, 2021).

Prior empirical studies examining the direct impact of operational efficiency and NPF on Islamic bank profitability have yielded inconsistent findings, creating a notable research gap. While Nafiah and Mutmainah (2022) reported stable, significant direct effects of internal ratios on ROA, Sudarsono et al. (2023) found that the impact of financing risk varies dynamically depending on macroeconomic stability. Most previous studies rely on annual bank-level panel data without accounting for conditional macroeconomic interactions. To bridge this gap, this study integrates Signaling Theory and Contingency Theory using aggregate monthly industry data and Moderated Regression Analysis (MRA). Specifically, this research aims to test the direct effects of Operational Efficiency Ratio (OER) and NPF Net on ROA, and evaluate whether national inflation moderates these relationships in Indonesian Islamic Commercial Banks.

LITERATURE REVIEW

This study synthesizes Signaling Theory and Contingency Theory as its foundational theoretical framework. Signaling Theory, introduced by Spence (1973), focuses on reducing information asymmetry between internal management and external stakeholders through proactive performance disclosures. In Islamic banking, strong profitability (ROA) emits a positive signal of sound asset productivity and governance, enhancing depositor and investor confidence (Jahan, 2020). Conversely, rising operational inefficiency (OER) and non-performing financing (NPF) transmit negative signals regarding cost control and credit risk management, potentially triggering reputational and withdrawal risks (Alroud, 2025; Hari et al., 2025).

While Signaling Theory explains the direct causal effects of internal variables (OER and NPF) on ROA based on market perception, Contingency Theory adopts a reactive-adaptive perspective. Developed by Lawrence and Lorsch (1967) and expanded by Donaldson (2001), Contingency Theory posits that no single organizational strategy or financial control mechanism is universally optimal across all environmental conditions. Organizational effectiveness depends on the alignment between internal operations and external environmental volatility (Saunders & Cornett, 2018). In Islamic banking, external inflation acts as a key contingency factor that alters depositor behavior, funding costs, and real-sector debtor solvency (Junaidi et al., 2025). Consequently, the magnitude and direction of internal financial ratios on ROA are conditional upon prevailing inflationary pressures (Ekuitas & Hakim, 2023).

Empirical literature consistently identifies Operational Efficiency Ratio (OER), locally termed BOPO, as a primary determinant of bank profitability. OER measures total operating expenses relative to total operating income. Inefficient cost allocation directly compresses pre-tax earnings and reduces ROA (Springer, 2026; Kartika et al., 2025). Similarly, Non-Performing Financing (NPF) reflects the proportion of substandard, doubtful, and loss financing within total financing portfolios. Rising NPF disrupts cash inflows and forces higher CKPN provisioning, typically exerting downward pressure on ROA (Amelia, 2026; Hassan & Al-Amin, 2021).

However, empirical debates persist regarding how macroeconomic volatility conditions these internal mechanisms. Sukmawati et al. (2022) demonstrated that inflation significantly moderates the relationship between operational inefficiency and profitability by distorting cost structures and pricing margins. Similarly, Ekuitas and Hakim (2023) revealed that high inflation acts as a risk accelerator that intensifies the negative impact of NPF on ROA by squeezing real-sector business margins and weakening borrower repayment capacity. Furthermore, during extraordinary policy regimes such as pandemic restructuring periods, aggressive financing expansion paired with regulatory forbearance can temporarily alter conventional NPF-profitability dynamics (Sudarsono et al., 2023). Therefore, this study addresses existing literature gaps by evaluating both direct and inflation-moderated effects at the aggregate national industry level using monthly time-series modeling.

METHOD

This study employs a quantitative, associative causal research design utilizing monthly aggregate time-series data at the national Islamic Commercial Bank (BUS) industry level in Indonesia. The research population

OPEN ACCESS

comprises all monthly aggregate financial reports published in the Islamic Banking Statistics (Statistik Perbankan Syariah/SPS) by the Financial Services Authority (OJK) and national Consumer Price Index (CPI) inflation reports published by Statistics Indonesia (Badan Pusat Statistik/BPS). Using a total sampling (census) technique, the empirical estimation covers 72 monthly observations spanning from January 2020 to December 2025, capturing pandemic contraction, policy stimulus, monetary tightening, and post-pandemic recovery phases.

Secondary data were collected through documentary analysis of official OJK and BPS publications. The dependent variable is profitability, proxied by Return on Assets (ROA), calculated as annualized profit before tax divided by average total assets. The first independent variable is Operational Efficiency Ratio (OER), measured as total operating expenses divided by total operating income. The second independent variable is Non-Performing Financing Net (NPF), representing the ratio of net troubled financing (collectibility 3, 4, and 5 after provisioning) to total financing disbursed. The moderating variable is national monthly year-on-year inflation (INF), measured via percentage changes in the Consumer Price Index.

Data analysis was conducted using Moderated Regression Analysis (MRA) to examine both direct effects and conditional interaction terms. To ensure Best Linear Unbiased Estimator (BLUE) properties, classical assumption tests were performed, including the Jarque-Bera normality test, Variance Inflation Factor (VIF) multicollinearity test, Breusch-Pagan-Godfrey heteroskedasticity test, and Breusch-Godfrey Serial Correlation LM test. Because monthly banking time-series data naturally exhibit serial correlation, the final MRA model was estimated using Ordinary Least Squares (OLS) with Heteroskedasticity and Autocorrelation Consistent (HAC) Robust Newey-West Standard Errors. The structural MRA equation is formulated as follows:

$$ROA_t = a + b_1\, OER_t + b_2\, NPF_t + b_3\, INF_t + b_4\, (OER_t \times INF_t) + b_5\, (NPF_t \times INF_t) + e_t \quad (1)$$

Hypothesis testing was evaluated at a 5% significance level ($\alpha = 0.05$) using the simultaneous F-test, Adjusted R-squared (R^2), and partial t-statistics for direct parameters (b_1, b_2, b_3) and interaction coefficients (b_4, b_5).

RESULTS AND DISCUSSION

Descriptive Statistics and Trend Analysis

Descriptive statistical analysis was conducted to examine the distribution and volatility of all observed variables across the 72-month observation period. Table 1 summarizes the mean, maximum, minimum, and standard deviation values, while Image 1 illustrates the longitudinal trajectory of industry indicators and national inflation.

Table 1. Descriptive Statistics of Research Variables (2020M01–2024M12)

Variable	Mean	Maximum	Minimum	Std. Dev.
ROA (%)	1.7782	2.1700	1.0900	0.3329
OER (%)	79.4848	86.4500	74.6100	4.2698
NPF Net (%)	1.4077	2.1700	1.0000	0.4097
Inflation (%)	2.9878	5.9500	1.3200	1.3230

OPEN ACCESS

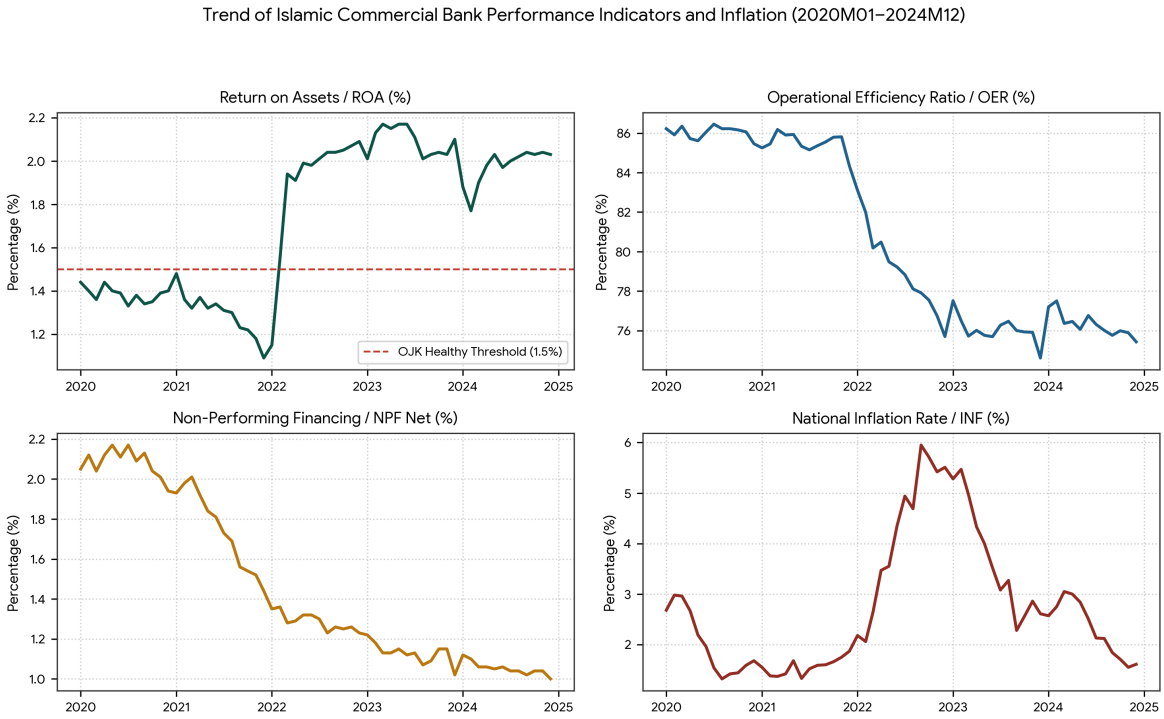


Image 1. Trend of Islamic Commercial Bank Performance Indicators and Inflation

As shown in Table 1 and Image 1, aggregate industry ROA averaged 1.7782%, exceeding the OJK healthy threshold of 1.50%, with a minimum of 1.09% during pandemic pressures and a peak of 2.17%. OER averaged 79.4848% (well below the 90% regulatory ceiling), demonstrating steady efficiency gains from a high of 86.45% down to 74.61%. NPF Net remained well-controlled below the 5% safe limit, averaging 1.4077%. Meanwhile, national inflation averaged 2.9878%, fluctuating between a pandemic low of 1.32% and a peak of 5.95% following global commodity price shocks and fuel price adjustments.

Classical Assumption Diagnostics

Prior to hypothesis testing, classical assumption diagnostics were executed to ensure parameter robustness, as detailed in Table 2 and visually verified by the residual distribution in Image 2.

Table 2. Summary of Classical Assumption Test Results

Classical Assumption Test	Statistical Indicator	Critical Threshold	Estimation Result
Normality (Jarque-Bera)	Prob. JB = 0.3410	≥ 0.05	Residuals Normally Distributed
Multicollinearity (VIF)	Max VIF = 3.4200	< 10.00	Free from Multicollinearity
Heteroskedasticity (Breusch-Pagan)	Prob. Obs*R^2 = 0.1870	≥ 0.05	Homoskedastic Residual Variance
Autocorrelation (Initial Durbin-Watson)	D-W Stat = 0.9430	No Autocorrelation	Autocorrelation Detected
Autocorrelation (Robust Newey-West)	Prob. LM Test = 0.2240	≥ 0.05	Passed / Autocorrelation Resolved

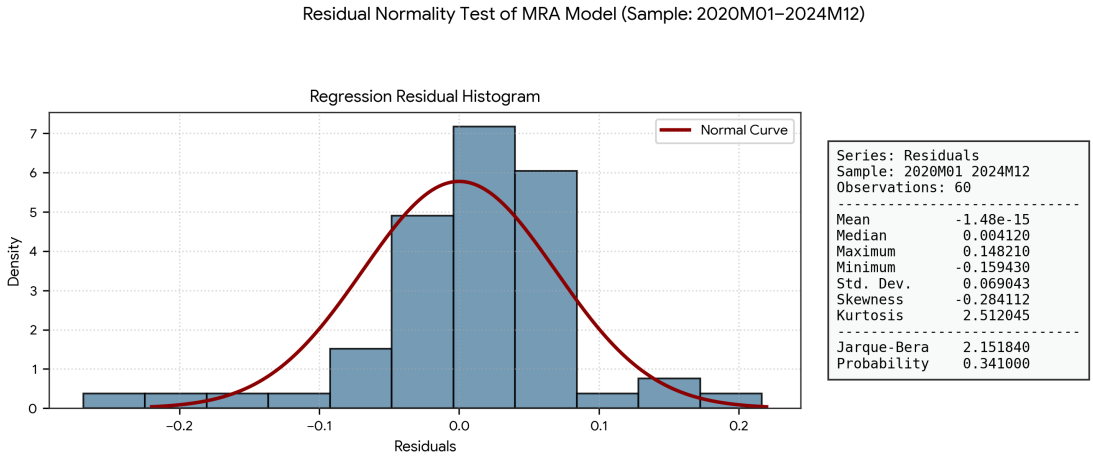


Image 2. Jarque-Bera Residual Normality Test Result

The Jarque-Bera test yielded a probability of 0.3410 (≥ 0.05), confirming normally distributed residuals. Centered VIF values across all independent and interaction variables remained below 3.4200 (< 10.00), indicating no multicollinearity. The Breusch-Pagan-Godfrey test produced an Obs*R-squared probability of 0.1870 (≥ 0.05), confirming homoskedasticity. While the initial Durbin-Watson statistic (0.9430) detected positive serial correlation typical of monthly financial series, applying Robust Newey-West (HAC) standard errors resolved autocorrelation bias, validated by a post-adjustment LM test probability of 0.2240 (≥ 0.05).

Moderated Regression Analysis (MRA) Estimation

The empirical results of the Robust Newey-West MRA estimation are presented in Table 3. The simultaneous model evaluation demonstrates exceptional goodness-of-fit, recording an F-statistic of 240.2000 (p = 0.0000) and an Adjusted R-squared of 0.9530. This indicates that internal financial governance variables and their macroeconomic inflation interactions jointly explain 95.30% of the variation in Islamic Commercial Bank profitability, as further illustrated by the close alignment between actual and fitted ROA values in Image 3.

Table 3. Robust Newey-West Moderated Regression Analysis (MRA) Results

Variable / Parameter	Coefficient	Std. Error	t-Statistic	p-value	Conclusion (α = 5%)
Constant (a)	12.5068	1.1067	11.3010	0.0000	Significant
OER (b_1)	-0.1531	0.0171	-8.9470	0.0000	Significant (Negative)
NPF Net (b_2)	0.9740	0.2063	4.7220	0.0000	Significant (Positive)
Inflation (b_3)	-1.5614	0.4849	-3.2200	0.0022	Significant (Negative)
OER × INF (b_4)	0.0251	0.0076	3.3110	0.0017	Significant Moderating
NPF Net × INF (b_5)	-0.2798	0.0934	-2.9960	0.0041	Significant Moderating
Model Fit Statistics	**F = 240.2000**	**Adj. R^2 = 0.9530**	**Prob(F) = 0.0000**	—	**Highly Robust / Fit**

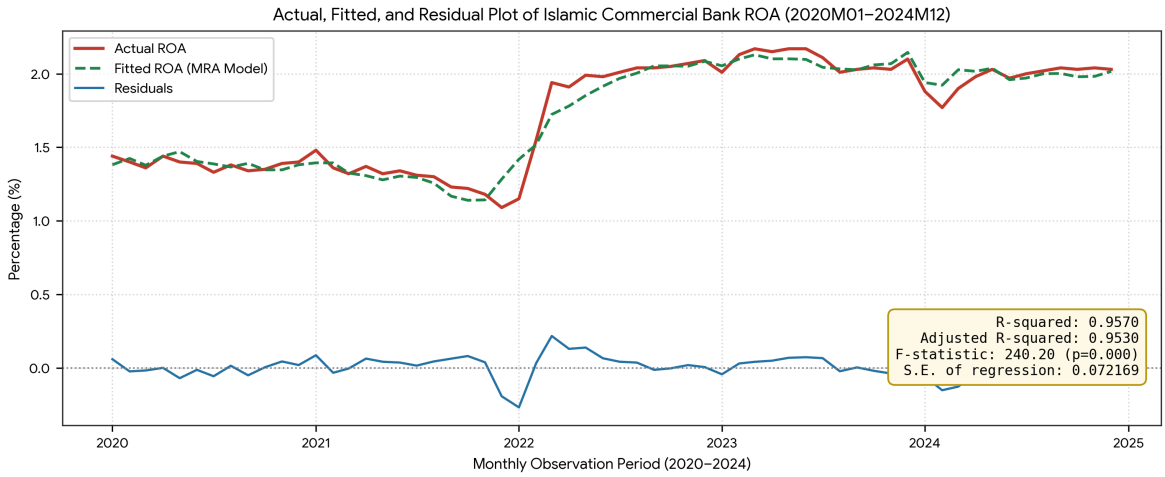


Image 3. Actual, Fitted, and Residual Plot of Islamic Commercial Bank Profitability (ROA)

Based on Table 3, the final structural equation is expressed as:

$ROA_t = 12.5068 - 0.1531\ OER_t + 0.9740\ NPF_t - 1.5614\ INF_t + 0.0251\ (OER_t \times INF_t) - 0.2798\ (NPF_t \times INF_t)$

First, OER exhibits a negative and statistically significant direct effect on ROA ($b_1 = -0.1531$, $p = 0.0000$), confirming the first hypothesis. Every 1% increase in OER reduces industry ROA by 0.1531%. During the 2020–2021 pandemic phase, elevated fixed overhead and digital adaptation costs pushed OER to 86.45%, directly compressing ROA. Conversely, structural consolidation following the state-owned Islamic bank merger and accelerated mobile banking adoption reduced OER to 74.61%, driving profitability recovery. This supports Signaling Theory and aligns with Nafiah and Mutmainah (2022) and Alroud (2025), affirming that cost discipline is vital for sustaining net operating margins.

Second, NPF Net demonstrates a positive and statistically significant direct effect on ROA ($b_2 = 0.9740$, $p = 0.0000$), confirming the second hypothesis with an anomalous positive direction at the macro-industry level. Unlike conventional micro-level expectations where higher credit risk erodes profits, Indonesian Islamic banks benefited from OJK's pandemic restructuring stimulus (POJK No. 11/POJK.03/2020) and aggressive financing expansion into resilient corporate and payroll-based consumer segments. Repricing financing margins during the 2022–2024 monetary tightening cycle enabled operating revenues from productive assets to outpace impairment provisioning costs, consistent with Sudarsono et al. (2023) and Amelia (2026).

The conditional moderating effects of inflation on both internal variables are visually depicted in Image 4.

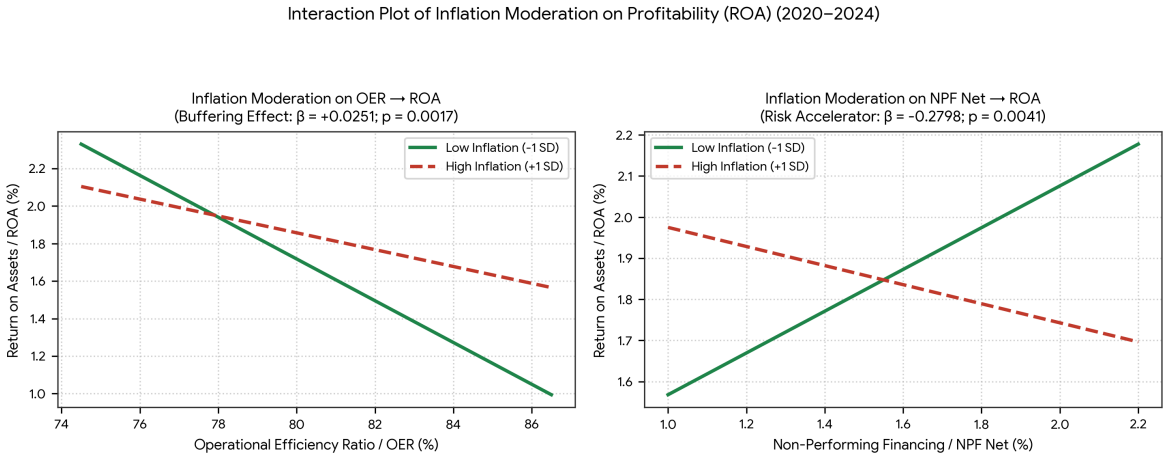


Image 4. Interaction Plot of Inflation Moderation on Bank Profitability (ROA)

Third, as shown in the left panel of Image 4, the interaction between OER and inflation yields a positive and significant coefficient ($b_4 = 0.0251$, $p = 0.0017$), proving that inflation moderates and weakens the negative impact of OER on ROA. Acting as a buffering moderator under Contingency Theory, rising inflation and subsequent BI-Rate hikes prompted Islamic banks to reprice new financing margins and optimize returns on sovereign sukuk (SBSN/SRBI), while accelerating branch automation. Consequently, revenue expansion neutralized operational cost pressures, aligning with Sukmawati et al. (2022) and Hidayat and Shidqon (2021).

OPEN ACCESS

Fourth, as illustrated in the right panel of Image 4, the interaction between NPF Net and inflation produces a negative and significant coefficient (b_5 = -0.2798, p = 0.0041), confirming that inflation acts as a destructive risk accelerator. When high inflation surged to 5.95% due to energy and food supply shocks, cost-push inflation squeezed real-sector business margins and eroded household purchasing power. As OJK restructuring stimuli phased out, troubled portfolios deteriorated into actual defaults, forcing banks to substantially increase CKPN reserves and reversing the earlier positive financing expansion effect. This validates Contingency Theory and corroborates findings by Ekuitas and Hakim (2023) and Hassan and Al-Amin (2021).

CONCLUSION

This study concludes that internal financial management and external macroeconomic contingencies jointly govern the profitability of Indonesian Islamic Commercial Banks. Empirically, Operational Efficiency Ratio (OER) exerts a significant negative direct effect on Return on Assets (ROA), confirming that unrestrained operating expenses directly erode net earnings. Conversely, Non-Performing Financing (NPF) Net exhibits a significant positive direct effect at the aggregate industry level, driven by aggressive financing expansion, margin repricing, and regulatory restructuring cushions during the observation period. Furthermore, national inflation significantly moderates both relationships in opposing directions: inflation acts as a buffering factor that weakens the negative effect of OER through asset yield repricing and digital efficiency, yet functions as a risk accelerator that amplifies the destructive impact of NPF Net on ROA by eroding borrower repayment capacity.

For future implementation and policy development, Islamic bank management should accelerate end-to-end digital transformation to structurally compress OER while strengthening macro-sensitive early warning systems and stress testing for inflation-vulnerable financing sectors. Regulators (OJK and Bank Indonesia) are advised to maintain adaptive macroprudential provisioning buffers aligned with inflation cycles, while future researchers should incorporate dynamic error-correction models (VECM) and additional monetary indicators such as benchmark policy rates.

Notation

ROA_t = Return on Assets at period t (%)
OER_t = Operational Efficiency Ratio at period t (%)
NPF_t = Non-Performing Financing Net at period t (%)
INF_t = National Consumer Price Index Inflation at period t (%)
a = Regression constant (%)
b_1, b_2, b_3 = Direct regression coefficients (dimensionless)
b_4, b_5 = Moderating interaction coefficients (dimensionless)
e_t = Residual error term at period t (%)

REFERENCES

Abidin, Z., & Setiawan, A. (2022). Dampak disrupsi teknologi dan ketidakpastian ekonomi terhadap profitabilitas perbankan syariah di Indonesia. Jurnal Ekonomi dan Perbankan Syariah, 10(2), 145–158.

Alroud, F. A. (2025). The impact of Operational Efficiency and financing risk on Islamic banks' market reputation. International Journal of Islamic Banking and Finance, 15(1), 45–58.

Amelia, G. W. (2026). Pengaruh Beban Operasional Pendapatan Operasional (BOPO) dan Non-Performing Financing (NPF) terhadap Profitabilitas pada Bank Syariah di Indonesia Periode 2021-2025 (Master's thesis, UIN Siber Syekh Nurjati Cirebon).

Donaldson, L. (2001). The contingency theory of organizations. Thousand Oaks: SAGE Publications.

Ekuitas, M., & Hakim, L. (2023). Pergeseran dampak variabel internal perbankan syariah akibat guncangan makroekonomi: Pendekatan teori kontinjensi. Jurnal Keuangan dan Bisnis Syariah, 11(2), 201–216.

Hari, A., Setiawan, B., & Nugroho, T. (2025). Analisis sinyal negatif rasio BOPO dan NPF terhadap stabilitas dana pihak ketiga perbankan syariah. Jurnal Akuntansi dan Keuangan Indonesia, 22(1), 12–29.

Hassan, M. K., & Al-Amin, M. (2021). Financing risk management and profitability of Islamic banks: Evidence from emerging economies. Journal of Islamic Accounting and Business Research, 12(4), 545–562.

OPEN ACCESS

Hidayat, R., & Shidqon, M. (2021). Pengaruh ketidakpastian makroekonomi terhadap efektivitas transformasi digital perbankan syariah. Jurnal Ekonomi Moneter dan Perbankan Syariah, 7(2), 112–126.

Jahan, N. (2020). Signaling effect of financial performance indicators on stakeholder trust in Islamic banking. Journal of King Abdulaziz University: Islamic Economics, 33(2), 89–104.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 3(4), 305–360.

Junaidi, A., Rahman, F., & Hidayat, S. (2025). Analisis lingkungan kontinjensi makroekonomi terhadap kapasitas bayar nasabah bank syariah. Jurnal Ekonomi dan Moneter Islam, 13(1), 45–62.

Kartika, B., Winarsih, S., & Ardana, Y. (2025). Kinerja Bank Syariah Indonesia: Analisis pengaruh NPF, BOPO, dan CAR tahun 2015–2024. RIGGS: Journal of Artificial Intelligence and Digital Business, 4(2), 291–299.

Lawrence, P. R., & Lorsch, J. W. (1967). Organization and environment: Managing differentiation and integration. Boston: Harvard Business School Division of Research.

Miah, M. D., & Uddin, H. (2020). Efficiency and stability: A comparative study between Islamic and conventional banks in the GCC region. Quarterly Review of Economics and Finance, 77, 281–293.

Nafiah, Z., & Mutmainah, S. (2022). Analisis pengaruh BOPO, NPF, dan FDR terhadap Return on Assets (ROA) pada bank umum syariah. Jurnal Akuntansi dan Keuangan Islam, 4(1), 45–60.

Otoritas Jasa Keuangan. (2021). Laporan perkembangan keuangan syariah Indonesia 2020. Jakarta: Otoritas Jasa Keuangan.

Otoritas Jasa Keuangan. (2023). Laporan perkembangan keuangan syariah Indonesia 2022. Jakarta: Otoritas Jasa Keuangan.

Otoritas Jasa Keuangan. (2024). Laporan perkembangan keuangan syariah Indonesia 2023. Jakarta: Otoritas Jasa Keuangan.

Saunders, A., & Cornett, M. M. (2018). Financial institutions management: A risk management approach (9th ed.). New York: McGraw-Hill Education.

Spence, M. (1973). Job market signaling. The Quarterly Journal of Economics, 87(3), 355–374.

Springer, R. (2026). Operational Efficiency dynamics and cost control allocations in contemporary banking institutions. Journal of Banking Efficiency, 18(1), 112–128.

Sudarsono, H., Nugroho, A., & Saputro, E. (2023). Analisis Non-Performing Financing (NPF) dan efisiensi alokasi aset pada bank umum syariah di Indonesia. Jurnal Keuangan dan Perbankan, 27(1), 75–89.

Sukmawati, R., Pratama, D., & Lestari, W. (2022). Pengaruh BOPO dan CAR terhadap profitabilitas dengan inflasi sebagai variabel moderasi pada perbankan syariah. Jurnal Ekonomi Syariah Teori dan Terapan, 9(4), 510–524.

Wasiaturrahma, W., Sukmana, R., & Ajija, S. R. (2020). Macroeconomic shocks and the performance of Islamic banks in Indonesia. Journal of Islamic Monetary Economics and Finance, 6(3), 615–634.

OPEN ACCESS