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Internal Variables and Macroeconomic Factors as Determinants of Profitability in Islamic Banking Indonesia

Adi Gunanto

Professional Accountant, Statistics Class Instructor, External Auditor, Universitas Muhammadiyah Surakarta, Indonesia, <https://orcid.org/0009-0003-9578-1814>

Corresponding author: adigunamanusia@gmail.com.

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Abstract: The purpose of this research was to analyse the influence of internal and macroeconomic variables on the profitability of the Islamic banking industry in Indonesia. A panel data regression approach, applying fixed effect and common effect models in order to to address potential biases in the estimation was used. The research sample consisted of five Islamic banks and covered the period from Q1 to Q4 of 2022. Chow test and Lagrange multiplier test were used to compare the analysis results. The used control variables included financing quality, financing to deposit ratio, exchange rate, and gross domestic product growth. The research was also based on economic, efficiency, and productivity theories in Islamic banking. Findings, The research results showed that the Islamic banking industry in Indonesia was increasingly compliant with prevailing regulations. The Bank Indonesia's policy interest rate (BI rate) did not significantly influence the profitability. Inflation had a negative impact on profitability, while the capital adequacy ratio showed a non-linear effect. All tested control variables exhibited an influence on profitability. Financing quality and exchange rate had negative impacts, while liquidity and economic growth had positive impacts on the profitability of the Islamic banking industry in Indonesia. The novelty of the paper is visible in the panel data regression approach that uses fixed effect and common effect models and provides an effective way to address estimation bias. Additionally, this research identified control variables that have a significant impact on profitability, including financing quality, liquidity, exchange rate, economic growth, and capital adequacy ratio to present breakthroughs and innovations.

Keywords: Macroeconomic, Profitability, Panel data regression, Islamic banking.

Introduction

Indonesia, with the world's largest Muslim population, has significant potential for the development of the Islamic banking industry. Data shows that the total assets of Islamic banks grew by 15.63% YoY in 2022, equivalent to USD 53.48 billion. Empirical studies on the determinants of profitability in Islamic banking have supported the development of literature and policy making by internal management (Jallow, 2022; Kanapiyanova et al., 2023; Salam, 2022; Tahir et al., 2023), which categorise these factors into bank specific and macroeconomic factors. Bank specific factors include the management's ability to achieve efficiency and high profitability in asset and liability management, as well as maintaining liquidity, optimal capital, quality financing expansion, and optimal bank size (Athari & Bahreini, 2023; Joudar et al., 2023; Khatib et al., 2023; Sghaier & Guizani, 2023).

Besides internal management factors, Islamic banking in countries with mixed economies is influenced by external conditions, particularly monetary policy and macroeconomic factors such as interest rates, inflation, exchange rates, and economic growth of a country (Al Sharif, 2023; Setyawati et al., 2022). The high Capital Adequacy Ratio (CAR) will determine the banking's ability to absorb losses and maintain stability (Amran & Ahmad, 2021; Itibi et al., 2023; Rouetbi et al., 2023). The relationship between CAR and profitability is still a subject of debate, considering the inconsistent findings of empirical studies (Achsani & Kassim, 2021; Esfahani et al., 2023). Meanwhile, Alnajjar & Othman (2021) and Smaoui et al. (2020) conducted research on Islamic banks worldwide and reached the same conclusion that high capital adequacy has not yet been able to significantly impact profitability.

A total of 11 Islamic banks in the Gulf countries have experienced negative impacts on profitability, specifically Return on Assets (RoA) and Return on Equity (RoE) (Ben Abdallah & Bahloul, 2021; Jaara, 2021; Supriani et al., 2021; Zaiane & Moussa, 2021). Different results are shown by Elhalaby et al. (2023), where high capital adequacy will enhance the ability of Islamic banks to generate profit in terms of RoA, although it has a negative effect on Return on Equity (RoE). According to Khan et al. (2023b), this is because they have not been able to effectively utilise their capital for optimal allocation of productive and risk-bearing assets. Furthermore, a high CAR provides opportunities for increasing weighted-risk assets that generate profit, in addition to fee-based income from investments for expanding access to services and transaction convenience.

Research Issues and Objectives

What is the relationship between the CAR and the profitability of Islamic banking in Indonesia, considering specific bank factors and indicators, as well as macroeconomic factors, and how does it impact RoA and RoE in the context of the rapidly growing Islamic banking industry today? In addressing this research question, the aim was to examine how CAR, specific banking factors and indicators, and macroeconomic factors influence the profitability of Islamic banking in Indonesia. Additionally, this research also seeks to understand the implications of this relationship on RoA and RoE. In this regard, concerning the factors influencing the profitability of Islamic banking in Indonesia, especially in the context of the rapid growth of the Islamic banking industry. This research aimed to identify the determinants of profitability in two main aspects: internal bank factors, such as management efficiency, liquidity, capitalisation, and bank size, as well as external factors, including monetary policy, interest rates, inflation, exchange rates, and economic growth. Additionally, the study also explored the relationship between the level of capital adequacy CAR and the profitability of Islamic banking, which remains a subject of debate in the literature. The findings of this research will provide valuable insights for Islamic bank management to optimise their performance amidst a dynamic industry growth.

Literature Review

Capital Adequacy Ratio has a Positive Influence on the Profitability of Islamic Banking in Indonesia

A high CAR in Islamic banking indicates that the bank has sufficient capital to face risks in accordance with Sharia principles. The Islamic banking industry, which is capable of effectively mobilising funds, will be able to expand its ratio of Sharia financial portfolio. This is consistent with previous empirical research findings (Al-Harbi, 2022; Baldwin et al., 2019; Harkati et al., 2020) that show Islamic banks with a high CAR tend to have better profitability, measured by RoA or RoE. On the other hand, Akter et al. (2021), Alandejani (2022), and Penikas & Stefanenko (2021) concluded that having a certain level of capital adequacy, whether measured by RoA or RoE, has a negative effect following a U-shaped pattern. Therefore, the hypothesis proposed in this study accommodates the two groups of previous findings through non-linear modeling between capital and profitability Yudha et al. (2021). Thus, the research hypothesis was formulated as follows:

Inflation has a Positive Influence on the Profitability of Islamic Banking in Indonesia

Inflation refers to a general increase in prices, measured by the percentage increase in consumer prices. The rise in inflation can have a negative impact on the real sector due to the decrease in consumer purchasing power (Fuadi et al., 2022). This affects the willingness of businesses to increase investments or working capital funded by banks. Additionally, the decline in demand in the real sector potentially worsens the quality of financing. Alsouri et al. (2023) and Santoso et al. (2023) affirm that the potential for profit-sharing in mudaraba and musharaka financing schemes in Islamic banking will generate profits from murabah, ijarah, and ishtishna schemes. The negative impact of inflation on profitability has been tested by (Salman et al., 2023). Thus, based on these factors, the hypothesis of this research states that inflation has a positive impact on the real sector's profitability. Therefore, the research hypothesis was formulated as follows:

Bi Rate has a Positive Influence on the Profitability of Islamic Banking in Indonesia

The Bi rate is the benchmark interest rate for credit in conventional banks. Islamic banking does not use interest in its operations, both in terms of fund gathering and financing. However, in a mixed economy where Islamic banking customers, especially institutional depositors or large depositors, will still pay attention to rate indications or compare them with conventional banks. Ideally, if there is no substitution between conventional banks and Islamic banks, the Bi rate would not be an important factor in determining the rate indication for deposits, considering that the contract between the bank and the depositor is based on profit and loss sharing. The argument for the relationship between the Bi rate and the performance of Islamic banks is that competition with conventional banks will drive Islamic banks to provide returns following the increase in interest rates on deposits in conventional banks, even if it means reducing the returns that Islamic banks receive. The policy of adjusting the profit-sharing ratio for third-party funds, besides increasing inefficiency, also reduces profitability. The negative impact of interest rates on profitability is proven by Shahwan and Habib (2023) in Egyptian Islamic banking, Isnurhadi et al. (2023) in Indonesian Islamic banking, Khan et al. (2023a) in Pakistani Islamic banking, and cross-country Islamic banking by (Ben Amar & El Alaoui, 2023; Tabash et al., 2023). Therefore, the research hypothesis was formulated as follows:

Although there is a considerable amount of literature analysing the profitability of Islamic banking in various countries, including Indonesia, there is currently no consistent conclusion regarding the influence of capital, inflation, and interest rates on the profitability of Islamic banking. This indicates the need for more in-depth and comprehensive research in the Islamic banking industry. This study aimed to fill the knowledge gap by presenting new hypotheses regarding the relationship between capital and the profitability of Islamic banking. This approach allows researchers to depict a more complex

relationship between the variables under investigation. Furthermore, this research also examines the resilience of the Islamic banking industry in responding to monetary policies, such as changes in the benchmark interest rate (Bi rate) and inflation. In this context, the researcher utilise appropriate analytical methods to measure the extent to which Islamic banking is capable of adjusting its performance in response to changes in monetary policy. This is important in providing stronger empirical support and relevant information for the Islamic banking industry in facing changes in the economic environment. Therefore, the results of this study are expected to provide a deeper understanding of the relationship between capital, inflation, interest rates, and the profitability of Islamic banking.

Research Hypotheses

In the context of this research, the paper was focused on the profitability of Islamic banking in Indonesia and the formulation of three hypotheses to explore the factors and indicators that may influence it. The first hypothesis asserted that the CAR had a significant positive influence on the profitability of Islamic banking in Indonesia. This was based on the assumption that when CAR, which reflects the level of bank capital adequacy, increases, banks will be better able to withstand risks and perform better. The second hypothesis suggested that inflation also had a significant positive influence on the profitability of Islamic banking in Indonesia. In this context, when the inflation rate rises, Islamic banks can achieve greater profits through financing at higher interest rates. Finally, the third hypothesis focused on the reference interest rate (Bi Rate) and stated that the Bi Rate had a significant positive influence on the profitability of Islamic banking in Indonesia. This means that when the Bi Rate increases, Islamic banks can enhance their profit margins.

In this research financial data from Islamic banking in Indonesia were utilised in order to test these three hypotheses. By applying relevant statistical methods, such as regression, to analyse the correlation between CAR, inflation rates, Bi Rate, and the profitability of Islamic banking. The results of the statistical analysis allowed determining whether there was a statistically significant relationship between the variables used and in the hypothesized direction. In other words, empirical evidence that can support or reject each hypothesis. Therefore, if the findings from this research provide valuable insights for stakeholders in Islamic banking in Indonesia they could be used as a basis for making better decisions in managing the factors influencing their profitability. Therefore, in conclusion, the hypotheses in this research were as follows:

H₁ : Capital Adequacy Ratio has a Positive Influence on the Profitability of Islamic Banking in Indonesia

H₂ : Inflation has a Positive Influence on the Profitability of Islamic Banking in Indonesia

H₃ : Bi Rate has a positive influence on the profitability of Islamic Banking in Indonesia

Research Methodology

This research utilised panel data with quarterly time series from 2022 Q1-Q4 in order to analyse the performance of 5 Islamic banking industries operating in Indonesia. The selection of banking samples was based on recent operational experience, aiming to provide a good understanding of their long-term performance and contribution to the economy. The research sample consisted of 5 prominent Islamic banking industries in Indonesia, namely PT. Bank Syariah Indonesia, Tbk. PT. Bank Mega Syariah, Tbk. PT. Bank Syariah Bukopin, Tbk. PT. Bank Central Asia Syariah, Tbk. and PT. Bank Muamalat Indonesia, Tbk. These banks were chosen due to their extensive experience and prominent role in the Islamic financial industry sector. Meanwhile, the data used in this research was obtained from several reliable sources. Some used data sources included the Otoritas Jasa Keuangan (OJK), Statistik Keuangan Indonesia (SEKI), Jakarta Islamic Index (JII), and the Badan Pusat Statistik (BPS). These data sources provided important and comprehensive information regarding the financial performance, assets, loans, and other relevant variables for analyzing the performance of the Islamic Banking Industry in Indonesia.

By utilising panel data and selecting quarterly time periods during a specific period, this research had the advantage of observing the changes in the performance of Islamic banking over time and gaining a more comprehensive understanding of its contribution to the overall economy.

By using panel data and quarterly time intervals over a specific period, as explained earlier, this research also had the advantage of observing the changes in the performance of Islamic banking over time in real-time. This allowed for a more comprehensive understanding of the contribution of the Islamic banking industry to the overall economy. Thus, this research had the strength of using relevant samples and reliable data to analyse the performance of the Islamic Banking Industry in Indonesia. The results of this research were expected to provide valuable insights for stakeholders, regulators, and participants in the Islamic banking industry. Furthermore, to analyse the influence of capital and inflation on profitability, a static panel data regression model with equation 1-n was used. Several control variables were added to the independent variables, referring to previous research, namely specific banking factors consisting of the Financing To Deposit Ratio (FDR) and Non-Performing Financing (NPF). Meanwhile, the macroeconomic variables were the Exchange Rate and Gross Domestic Product (GDP).

This research focused on analysing the impact of capital and inflation on profitability within the Indonesian Islamic banking industry. It utilised a quarterly panel data from the year 2022 and a sample of leading Islamic banking industries. The main objective was to provide a deeper understanding of how these variables affected profitability while considering control variables such as FDR and NPF. The study also incorporated essential macroeconomic variables like Exchange Rate and GDP in its analysis to explore a more comprehensive relationship. Data obtained from reliable sources such as OJK, SEKI, JII, and BPS establish a strong and dependable analytical foundation. The research findings were expected to offer profound insights into the contribution of the Islamic banking industry to the Indonesian economy, which is of significant interest to decision-makers and regulators in the Islamic finance sector. Furthermore, the research considered additional factors such as asset size, ownership structure, and the risk profile of Islamic banks to provide a more comprehensive understanding of the factors influencing the profitability of these banks. The results of this study will assist in formulating more effective policies to support the growth and stability of the Islamic finance sector in Indonesia, making a valuable contribution to further understanding the role of the Islamic banking industry in the national economy.

Table 1

Research Methods Used

Variable Notation	Description
<i>Dependent Variable :</i>	
Profitability	The ability of Islamic banking to generate profit every 3 months as measured by Return on assets (RoA) before tax revenue to total assets expressed in (%)
<i>Independent Variable :</i>	
Capital	The ratio of bank capital (tier ¹ and tier ²) to risk-weighted assets, expressed in (%)
Inflation	Price increases in general, measured in terms of the relative change in the Consumer Price Index over time expressed in (%)
Bi Rate	Credit reference interest rate set by Bank Indonesia (BI) as an instrument of monetary policy, in (%)
<i>Control Variables :</i>	
Liquidity	The ratio of total financing to third party funds in (%)
Financing Risk	The ratio of total troubled financing, measured in gross non-Performing Financing (NPF), in (%)

Macroeconomic Variables :

Exchange rate	Rupiah to dollar exchange rate expressed in \$1, in Rupiah
Gross Domestic Product	The value of all goods at current prices expressed in billions of Rupiah

Source: data processed by researchers, 2023.

$$ROA_{it} = \beta_0 + \beta_1 CAR_{it} + \beta_2 CAR^2_{it} + \beta_3 FDR_{it} + \beta_4 NPF_{it} + \beta_5 INF_{it} + \beta_6 InER_{it} + \beta_7 InGDP_{it} + \beta_8 InBirate_{it} + u_{it}$$

Where,

ROA _{it}	: Return on Assets in period "t"
CAR _{it}	: Capital Adequacy Ratio in period "t"
CAR ² _{it}	: Squared Capital Adequacy Ratio in period "t"
FDR _{it}	: Financing to Deposit Ratio in period "t"
NPF _{it}	: Non-Performing Financing in period "t"
INF _{it}	: Inflation in period "t"
InER _{it}	: Interest Rate (Mutual Funds) in period "t"
InGDP _{it}	: Gross Domestic Product (GDP) Growth in period "t"
InBirate _{it}	: Bank Interest Rate in period "t"
β ₀ -β ₈	: Regression coefficients to estimate from empirical data.
U _{it}	: Residual or error in period "t"

$$ROA_{it} = \sum \alpha_0 u_{it} + \alpha_1 CAR_{it} + \alpha_2 CAR^2_{it} + \alpha_3 FDR_{it} + \alpha_4 NPF_{it} + \alpha_5 INF_{it} + \alpha_6 InER_{it} + \alpha_7 InGDP_{it} + \alpha_8 InBirate_{it} + u_{it}$$

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InBirate _{it}	: Bank Interest Rate in period "t"
α ₀ it	: Intercept term in period "t"
U _{it}	: Residual or error in period "t"

$$ROA_{it} = \delta_0 + \delta_1 CAR_{it} + \delta_2 CAR^2_{it} + \delta_3 FDR_{it} + \delta_4 NPF_{it} + \delta_5 INF_{it} + \delta_6 InER_{it} + \delta_7 InGDP_{it} + Vit$$

Where,

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InGDP _{it}	: Gross Domestic Product (GDP) Growth in period "t"
δ ₀ -δ ₇	: Regression coefficients to estimate from empirical data
V _{it}	: Error term or residual in period "t"

$$ROA_{it} = \sum \Omega_0 + \Omega_1 CAR_{it} + \Omega_2 CAR^2_{it} + \Omega_3 FDR_{it} + \Omega_4 NPF_{it} + \Omega_5 INF_{it} + \Omega_6 InER_{it} + \Omega_7 InGDP_{it} + E_{it}$$

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NPF _{it}	: Non-Performing Financing in period "t"
INF _{it}	: Inflation in period "t"
InER _{it}	: Interest Rate (Mutual Funds) in period "t"
InGDP _{it}	: Gross Domestic Product (GDP) Growth in period "t"
Ω ₀ -Ω ₇	: Regression coefficients to estimate from empirical data
E _{it}	: Error term or residual in period "t"

$$ROE_{it} = \beta_0 + \beta_1 CAR_{it} + \beta_2 CAR^2_{it} + \beta_3 FDR_{it} + \beta_4 NPF_{it} + \beta_5 INF_{it} + \beta_6 InER_{it} + \beta_7 InGDP_{it} + \beta_8 InBirate_{it} + u_{it}$$

Where,

ROE _{it}	: Return on Equity in period "t"
CAR _{it}	: Capital Adequacy Ratio in period "t"
CAR ² _{it}	: Squared Capital Adequacy Ratio in period "t"
FDR _{it}	: Financing to Deposit Ratio in period "t"
NPF _{it}	: Non-Performing Financing in period "t"
INF _{it}	: Inflation in period "t"
InER _{it}	: Interest Rate (Mutual Funds) in period "t"
InGDP _{it}	: Gross Domestic Product (GDP) Growth in period "t"
InBirate _{it}	: Bank Interest Rate in period "t"
β ₀ -β ₈	: Regression coefficients to estimate from empirical data
U _{it}	: Error term or residual in period "t"

$$ROE_{it} = \sum \alpha_0_{it} + \alpha_1 CAR_{it} + \alpha_2 CAR^2_{it} + \alpha_3 FDR_{it} + \alpha_4 NPF_{it} + \alpha_5 INF_{it} + \alpha_6 InER_{it} + \alpha_7 InGDP_{it} + \alpha_8 InBirate_{it} + u_{it}$$

Where,

- ROE_{it} : Return on Equity in period "t"
- CAR_{it} : Capital Adequacy Ratio in period "t"
- CAR²_{it} : Squared Capital Adequacy Ratio in period "t"
- FDR_{it} : Financing to Deposit Ratio in period "t"
- NPF_{it} : Non-Performing Financing in period "t"
- INF_{it} : Inflation in period "t"
- InER_{it} : Interest Rate (Mutual Funds) in period "t"
- InGDP_{it} : Gross Domestic Product (GDP) Growth in period "t"
- InBirate_{it} : Bank Interest Rate in period "t"
- α_{0it} : Intercept term in period "t"
- U_{it} : Error term or residual in period "t"

$$ROE_{it} = \delta_0 + \delta_1 CAR_{it} + \delta_2 CAR^2_{it} + \delta_3 FDR_{it} + \delta_4 NPF_{it} + \delta_5 INF_{it} + \delta_6 InER_{it} + \delta_7 InGDP_{it} + V_{it}$$

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- INF_{it} : Inflation in period "t"
- InER_{it} : Interest Rate (Mutual Funds) in period "t"
- InGDP_{it} : Gross Domestic Product (GDP) Growth in period "t"
- δ₀-δ₇ : Regression coefficients to estimate from empirical data
- V_{it} : Error term or residual in period "t"

$$ROE_{it} = \sum \Omega_0 + \Omega_1 CAR_{it} + \Omega_2 CAR^2_{it} + \Omega_3 FDR_{it} + \Omega_4 NPF_{it} + \Omega_5 INF_{it} + \Omega_6 InER_{it} + \Omega_7 InGDP_{it} + E_{it}$$

Where,

- ROE_{it} : Return on Equity in period "t"
- CAR_{it} : Capital Adequacy Ratio in period "t"
- CAR²_{it} : Squared Capital Adequacy Ratio in period "t"
- FDR_{it} : Financing to Deposit Ratio in period "t"
- NPF_{it} : Non-Performing Financing in period "t"
- INF_{it} : Inflation in period "t"
- InER_{it} : Interest Rate (Mutual Funds) in period "t"
- InGDP_{it} : Gross Domestic Product (GDP) Growth in period "t"
- Ω₀-Ω₇ : Regression coefficients to estimate from empirical data
- E_{it} : Error term or residual in period "t"

Different symbols in the model were used in order to explain the relationship between the variables under analysis. There were two types of models used: the Common Effect Model and the Fixed Effect Model. Symbols such as β_0 , δ_0 , β_1 - β_8 , $\sum \alpha_{0i}$, α_1 - α_8 , δ_1 - δ_7 , $\sum \Omega_0$, and Ω_1 - Ω_7 were constants and regression coefficients in these models. The selection of the model was based on the available data and variables. The common effect model assumed that there were no specific effects from individual banks, while the Fixed Effect Model assumed the presence of specific effects from each bank. After selecting the model, statistical tests were conducted to ensure that the model assumptions were met. Multicollinearity test and heteroskedasticity test were performed to ensure accurate regression results.

Research Results

Multicollinearity testing is an important step in regression analysis or statistical modeling because it helps identifying potential issues that can affect the analysis results. The main purpose of this test is to determine whether there is a high correlation between two or more independent variables in the model. High correlations between independent variables can lead to problems in interpreting regression results because it can be challenging to distinguish the contributions of each variable to the dependent variable. The results of multicollinearity testing are often examined by looking at the correlation coefficients among variables in the correlation matrix. If there is a high correlation between two or more variables, this can be an indication of multicollinearity issues. To address this problem, the research may need to take actions such as removing variables with high correlations or combining these variables into one. This is done to maintain relative independence among independent variables so that the results of the regression analysis are more reliable and interpretable. The multicollinearity test also shows the correlation matrix among the variables as shown in Table 2 below :

Table 2

Correlation Matrix

	ROA	ROE	LnGDP	INF	LnER	CAR	FDR	NPF	IR
Return on Assets	1.00								
Return on Equity		1.00							
Natural Logarithm of Gross Domestic Product	-0.28	-0.37	1.00						
Inflation	-0.04	-0.02	-0.07	1.00					
Natural Logarithm of Exchange Rate	-0.32	-0.39	0.69	-0.02	1.00				
Capital Adequacy Ratio	-0.02	-0.26	-0.11	0.04	-0.16	1.00			
Funds Deposit Ratio	0.16	-0.05	-0.13	0.02	-0.08	0.33	1.00		
Non-Performing Loan Ratio	-0.30	-0.06	-0.30	0.02	0.29	-0.44	-0.25	1.00	
Interest Rate		0.06	0.42	0.14	-0.18	-0.02	0.19	-0.10	1.00

Source: regression output, eviews, 2023.

Table 2 above is a representation of the results of the correlation matrix among the research variables used in the model. This correlation matrix provides an overview of how closely related each variable pair used in the analysis is. In this case, the research uses several interrelated variables, and the table provides information on the level of correlation between the variables. From the results of the correlation matrix, it can be seen that there is no significant correlation among the variables used. The correlation coefficients between variables have values less than 0.8 for all variable pairs. Values less than 0.8 indicate that the level of correlation between the variables is relatively low. In this study, it is important to ensure that the variables used in the analysis are not highly correlated with each other, so that the estimation results can be relied upon. The table also provides information about the estimation results from the model that uses RoA and RoE as dependent variables representing the profitability of Islamic banking.

The use of "Error Correction Model" (ECM) and "Generalized Least Squares Seemingly Unrelated Regression" (GLS-SUR) aims to address the issue of high correlation between variables in the analysis with accurate and effective statistical approaches. When the correlation matrix is evaluated, if there is a high correlation (values approaching +1 or -1) between two variables, it indicates a strong relationship between the variables and is highly likely to have redundancy in the model. ECM is a method of time series data analysis involving related variables. It addresses the issue of high correlation between variables by using differencing to separate short-term and long-term changes, providing a better understanding of the relationships between variables in the study. This process eliminates correlation, revealing the short-term and long-term impacts, resulting in more accurate and interpretable analysis. On the other hand, GLS-SUR is used by researchers to handle multicollinearity among interrelated regression models. It improves estimation by assigning optimal weights to each model, achieving the most efficient coefficient estimates. GLS-SUR enables researchers to overcome high correlation between dependent variables, leading to more reliable analysis results and accurate interpretations.

Thus, both methods, ECM and GLS-SUR, are powerful statistical approaches to address the issue of high correlation between variables in the analysis. By implementing the ECM, researchers can comprehend the short-term and long-term relationships between variables in time series data. Meanwhile, the use of GLS-SUR helps researchers enhance the accuracy of coefficient estimates in several related regression models. By utilising both methods, researchers can avoid multicollinearity issues.

In this research, the representation of the correlation matrix among the variables used in the analysis are explained. The results of the correlation matrix indicate that there is no significant correlation among these variables, with all correlation coefficients between variables having values less than 0.8. This indicates a relatively low level of correlation among the variables. To maintain the reliability of estimation results, it is important to avoid high correlations among independent variables.

Therefore, the research adopts two statistical methods, namely the ECM and the GLS-SUR, to address the potential issue of multicollinearity. ECM is used to understand the short-term and long-term relationships among variables in time series data, while GLS-SUR helps improve the accuracy of coefficient estimation in several related regression models. By applying both of these methods, the research aims to produce more reliable analysis results and accurate interpretations in the context of the profitability of Islamic banking in Indonesia. The estimation results from that model are presented in the table below :

Table 3

Panel Model A Profitability Estimation of the Islamic Banking Industry

Return on Assets PANEL (A)	CEM	FEM	EGLS SUR¹	EGLS SUR²
LnGDP	-0,3062 1,1246 -0,0442 (0,7923)	-0,4464 (0,6656) -0,0404 (0,6228)	0,6106 (0,3044) 0,00007 (0,9868)	1,1246 (0,0028)* -0,0219 (0,5959)
INF	-1,4039 (0,0863)	-1,3271 (0,0700)*	-1,6567 (0,0001)**	-2,0557 (0,0000)*
LnER	-0,1136 (0,0585)	-0,1109 (0,0374)*	-0,0530 (0,0844)	
IR	0,0024 (0,8558)	0,0228 (0,1422)	0,00145 (0,0306)*	0,0148 (0,0243)**
CAR	-0,0003 (0,0425)*	-0,0004 (0,0040)**	-0,0003 (0,0000)**	-0,0003 (0,0000)*
CAR [^]	-0,1232 (0,0000)**	-0,1077 (0,0003)**	-0,1263 (0,0000)**	-0,1215 (0,0000)*
NPF	0,0103 (0,0025)*	0,0115 (0,0010)**	0,0078 (0,0000)**	0,0071 (0,0000)*
FDR	0,0103 (0,0025)*	0,0115 (0,0010)**	0,0078 (0,0000)**	0,0071 (0,0000)*
Cons	19,0119	19,836	7,5861	3,5478
Adjusted R ²	0,2278	0,3951	0,6941	0,7178
Chow		0,0000		
Lagrange Multiplier	0,0000			
Redundant Cross Section		0,0000		
Redundant Variable			0,0928	0,0000**
Specify Bank		Effect		
PT. Bank Syariah Indonesia, Tbk.		0.375823		
PT. Bank Mega Syariah, Tbk.		0.375823		
PT. Bank Syariah Bukopin, Tbk.		-0.199979		
PT. Bank Central Asia Syariah, Tbk.		-0.148987		
PT. Bank Muamalat Indonesia, Tbk.		0.581333		

Note: *, ** indicates significance at 1% and 5%.

Source: regression output, Eviews, 2023.

In this research, a comparison was conducted between two models, namely Model A and Model B, to measure the profitability of Islamic banking. In Model A, the variable used as a proxy is RoA, while in Model B, the variable used is RoE. Both models have the same components of independent variables and control variables. Through model selection tests, testing was conducted using the Chow method with the Chi Square probability value. The test results indicate that the Fixed Effects Model provides the best results. This is evidenced by the Chi Square probability value in the Chow test, which is smaller than 1% and 5%. Furthermore, a redundant cross-sectional test was conducted to identify the correlation of errors among cross-sections in the Fixed Effect Model. The magnitude test results show a value of 0.000, indicating a significant correlation of errors among cross-sections in the Fixed Effect Model. Therefore, model improvement is needed by applying the Error Correction Model EGLS SUR method.

The results of the EGLS SUR model show that several macroeconomic variables, such as economic growth, inflation, and interest rates, do not have a significant influence on the profitability of Islamic banking. However, the exchange rate variable shows a significant negative influence on the profitability of Islamic banking. On the other hand, specific banking variables such as CAR, CAR^{^2}, NPF, and FDR have a significant influence on the profitability of Islamic banking. These results confirm that the previously suspected relationship between interest rates and the profitability of Islamic banking is not simultaneously significant. Therefore, the interest rate variable is eliminated from the model. Furthermore, in the fourth equation of Model A, it can be observed that the economic growth variable

has a significant positive influence on the profitability of Islamic banking, while the exchange rate variable has a significant negative influence on the profitability of Islamic banking.

Specific banking variables, such as CAR, also have a significant positive influence on profitability, while the addition of capital represented by CAR^2 has a significant negative influence on Islamic banking profitability. The NPF variable is also found to have a significant negative relationship with profitability, while the FDR as a proxy for the third-party fund financing shows a significant positive influence. These findings strengthen the hypothesis that increasing financing capital can enhance banking profitability, but when the capital is doubled, it actually decreases Islamic banking profitability. Overall, this research provides a deeper understanding of the factors influencing Islamic banking profitability. The Fixed Effect Model proves to be the best model with significant error correlation. Macroeconomic variables are not significant simultaneously, while specific banking variables play a crucial role in determining Islamic banking profitability. These findings can provide valuable insights for practitioners in enhancing profitability in Islamic banking sustainably.

Table 4

Panel Model B Profitability Estimation of the Islamic Banking Industry

Return on Equity PANEL (B)	CEM	FEM	EGLS SUR¹	EGLS SUR²
LnGDP	-1,4690 (0,9398)	16,3425 (0,8546)	3,3819 (0,5815)	1,1953 (0,7802)
INF	-0,9277 (0,5512)	-0,7918 (0,5436)	-0,7558 (0,1222)	-0,7564 (0,1112)
LnER	-33,593 (0,0145)*	-32,154 (0,0058)**	-3,1070 (0,0000)**	-0,2998 (0,0000)**
IR	-0,5107 (0,6105)	-0,6324 (0,4521)	0,0695 (0,8256)	
CAR	-1,0260 (0,0000)**	-0,5679 (0,0217)*	-0,3146 (0,0000)**	-0,2768 (0,0000)**
CAR [^]	0,0060 (0,0262)	0,0018 (0,4859)	0,0004 (0,5542)	
NPF	-1,1126 (0,0199)*	-1,1695 (0,0128)*	-1,1137 (0,0000)**	-1,0907 (0,0000)**
FDR	-0,0018 (0,9737)	0,0922 (0,0941)	0,0453 (0,0042)**	0,0415 (0,0084)**
Cons	372,4895	366,7212	258,6526	282,6255
Adjusted R ²	0,2863	0,5003	0,7373	0,7547
Chow		0,0000		
Lagrange Multiplier				
Redundant Cross Section		0,7046		
Redundant Variable			0,8387	0,4973
Specify Bank		Effect		
PT. Bank Syariah Indonesia, Tbk.		18.63145		
PT. Bank Mega Syariah, Tbk.		-0.318220		
PT. Bank Syariah Bukopin, Tbk.		-3.926421		
PT. Bank Central Asia Syariah, Tbk.		1.010083		
PT. Bank Muamalat Indonesia, Tbk.		4.066112		

Note: *, ** indicates significance at 1% and 5%.

Source: regression output, Eviews, 2023.

The results of Model B with RoE proxy also underwent a similar testing for selecting the best model. Furthermore, cross-section error correlation testing was conducted, and the results indicated significant error correlation among cross-sections. To improve the estimation, the EGLS SUR method was used. The testing results showed a significant negative influence of exchange rate, NPF, and CAR on Islamic banking profitability. The coefficient values for the variables were -3.1070, -1.1137, and -0.3146, with variable probabilities of 0.0000. However, inflation, interest rate, and CAR^2 variables did not have a significant influence on Islamic banking profitability with RoE proxy. On the other hand, the FDR variable exhibited a significant positive influence with a coefficient value of 0.0453 and a probability of 0.0042.

To answer the hypothesis regarding the appropriate interest rate mechanism in Islamic banking, a redundant cross-section variable test was conducted. The results showed that simultaneously, the interest rate variable did not have a significant influence on Islamic banking profitability, which was

confirmed by an F -statistic value of 0.8387. Furthermore, the redundant variable test related to the influence of CAR when capital is added also indicated that simultaneously, CAR does not have a significant influence on Islamic banking profitability, with an F -statistic value of 0.4973. Next, testing was carried out on the fourth equation in Model B using EGLS SUR without including the interest rate and CAR^2 variables in the model. The estimation results showed that the exchange rate has a significant negative influence on Islamic banking profitability, with a coefficient value of -0.2998 and a probability of 0.0000. Specific banking variables such as CAR, NPF, and FDR also exhibited a significant influence on Islamic banking profitability through the RoE proxy. CAR and NPF showed a significant negative influence, with coefficient values of -0.2768 and -1.0907, respectively, and a probability of 0.0000. Meanwhile, FDR as a financing ratio showed a significant positive influence, with a coefficient value of 0.0415 and a probability of 0.0084.

Research Limitations

This research primarily focused on investigating the factors that impacted the profitability of Islamic banking in Indonesia. There were two main aspects of interest in this study. Firstly, the research examined factors directly related to these banks. This encompassed various aspects such as how efficient the bank management was in running their operations, the extent to which the bank's liquidity management was handling fund availability, how the bank's capital structure was formed and maintained, and the size of the bank itself. In this context, the research attempted to answer questions like whether banks with more efficient management tended to have better profitability, or whether high liquidity had a positive impact on bank profitability.

Secondly, the research also explored macroeconomic factors that affected Islamic banking in Indonesia. This included elements such as the monetary policies implemented by the government, how central bank-set interest rates influenced the performance of Islamic banks, the extent to which inflation rates had an impact, how currency exchange rates played a role in bank profitability, and how a country's economic growth could affect bank profitability. Additionally, the research sought to understand the relationship between the level of capital adequacy in banks, known as the CAR, and the profitability of Islamic banks. CAR is a crucial indicator that measures how adequately a bank is capitalised to handle risks. However, there is still a debate in the literature about whether a higher CAR always means better profitability or if there are more complex nuances in this relationship.

Discussion

The effect of Capital Adequacy Ratio (CAR) on the Profitability of Islamic Banking in Indonesia

This confirms that the law of diminishing returns applies to the role of CAR in the profitability of Islamic banks, both in terms of asset and equity profitability. Initially, increasing the capital adequacy ratio can enhance profitability as Islamic banks have more capital for financing, leading to increased profitability. However, once the CAR reaches a certain maximum point, Islamic banks need to decrease the capital ratio to avoid disrupting their profitability. The panel regression estimation results show a *U-shaped* curve. A very high CAR indicates that banks still face challenges in financing allocation or have excessive non-productive funds derived from equity. On the other hand, a very high CAR can also occur in banks undergoing a restructuring phase where capital is used to absorb losses from NPF. The regression results indicate that CAR initially has a positive impact on bank profitability, but the impact becomes negative when CAR^2 is too high. These findings can explain the varied results of previous studies that showed positive, insignificant, or negative effects of CAR on the profitability of Islamic banks (Aydoğmuş, 2023; Hunjra et al., 2023; Ishak et al., 2023; Mujadiddah et al., 2023; Nihayah & Aryani, 2022; Putri & Gunanto, 2022; Rouetbi et al., 2023). The quadratic nonlinear model for the capital variable successfully accommodates these findings. However, further research is still needed to deepen the analysis, especially in distinguishing between Islamic banks' sizes.

The effect of BI Rate on the Profitability of Islamic Banking in Indonesia

The findings of this research confirm that Islamic banking demonstrates resilience to monetary policies, particularly regarding the determination of the benchmark interest rate (BI rate). The use of relatively recent data and significant control variables of micro companies and other macroeconomic factors, in line with previous studies by Alafi (2023), Ashraf et al. (2021), Haddad (2023), Raouf and Ahmed (2022), Remzi (2021), Shah et al. (2021), Toh and Jia (2021), and Ullah et al. (2021) indicates that the Islamic banking sector in Indonesia is becoming more compliant with the prohibition of interest. Theoretically, if the dominance of Islamic banks in the national banking industry becomes stronger, they are expected to be more stable compared to conventional banks. The research findings also indicate that the progress of Islamic banking is supported by industry stakeholders, with a strong role of the Dewan Pengawasan Syariah (DPS) and increasing awareness of depositors and mudharib in financial transactions. However, it is necessary to interpret these research findings with caution, considering the government's role in determining the allocation of Hajj funds to Islamic banks. On the other hand, the insignificant impact of interest rate policies is in line with the Murabaha scheme, where the margin at the beginning of the contract cannot be changed despite changes in monetary policies. These research findings provide positive signals for the progress of Islamic banking in Indonesia, which is expected to contribute significantly to the provision of funds for the real sector. However, previous empirical studies on Islamic banking in Indonesia still provide evidence that monetary policies have a negative impact on the profitability of the Islamic banking industry, as seen in studies by (Afif et al., 2023; Asif et al., 2022; Aydemir et al., 2022; Idrees et al., 2022; Nouman et al., 2022).

The effect of Inflation on the Profitability of Islamic Banking Industry in Indonesia

Dynamics fundamental makroekonomi can affect the profitability of Islamic banks. The price stability is important for macroeconomic instruments as it can impact aggregate demand, which in turn affects the economic growth of a country. Aggregate demand also indirectly affects financing performance in the banking sector. The research findings from Table 4 (Panel A) and Table 5 (Panel B) using the SUR² model show that inflation has a negative influence on RoA and RoE profitability, but not significantly. These findings are not in line with empirical evidence by Abaidoo and Agyapong (2023), Abbass et al. (2022), Hamza (2023), Javed et al. (2021), Saif-Alyousfi and Saha (2021), Sehen Issa and Abbaszadeh (2023), and Tashkandi (2022) although they share the same direction of the relationship. Several arguments can be explained, such as the possibility that the inflation rate during the research period was still conducive to the development of the real sector and did not disrupt the financing performance of Islamic banks, ultimately not impacting profitability. Inflation within certain limits can be an incentive for the real sector to grow, but if it is too high, it can have a negative impact on people's purchasing power, the real sector, and the banking sector. Additionally, the linear model used does not yet show the positive and negative impact of inflation on profitability as capital levels. It is possible that using a different model may support previous researchers' findings without denying the contrasting findings for Islamic banking in Indonesia.

Effect of Control Variables on Profitability and Specific effects of Islamic Banking in Indonesia

High NPF has a negative impact on the profitability of Islamic banking, according to research (Mala et al., 2023). Fluctuations in the NPF ratio indicate the fluctuating trend of financing defaults in the Islamic banking industry, which affects the profitability of RoA and RoE. FDR has a significant positive influence on the profitability of Islamic banking. Exchange rates have a negative impact on the profitability of Islamic banking, according to research (Ekananda & Syahrivar, 2023; Shahwan & Habib, 2023; Toymuxamedov et al., 2023). Economic growth is positively related to RoA, but not significantly related to RoE. Strong economic growth stimulates demand and production, with the banking sector playing a crucial role through credit provision to households and the real sector. During strong economic growth, the real sector experiences robust demand, which leads to smooth financing in Islamic banks and an improvement in financing quality. Financing with Profit Loss Sharing (PLS) schemes provides greater benefits during periods of high economic growth.

Conclusions and Implications

Based on the research findings, it can be concluded that Islamic banking becomes more resilient and compliant with the prohibition of interest, as confirmed by the non-significant influence of the BI Rate on bank profitability. This research also proved that the CAR can have both positive and negative effects through a quadratic nonlinear relationship. Furthermore, this study reinforced the theory that the FDR had a significant positive impact, while NPF had a significant negative impact on profitability. Islamic banking requires stable macroeconomic conditions (*positive economic growth, low inflation, and stable exchange rates*) because macroeconomic stability can have partial or simultaneous effects on the performance of the entire sector, including the banking sector, real sector, and other economic sectors. The model's ability to explain the variation in profitability is quite good, as evidenced by the adjusted R^2 of 0.75. However, this study had several limitations, including its inability to accommodate the conflict between inflation and profit, the lack of clustering of samples based on the size of core capital requirements, the analysis limited to long-term responses, and the failure to analyse the uniqueness of Islamic banking in terms of product advantages and technology aspects. Based on these limitations, it is expected to provide opportunities for further research to explore the issues in a more in-depth and complex manner regarding the performance of Islamic banking, even comparing it with Islamic banking on a global scale to measure competitiveness. These findings also suggest that Islamic banks should pay attention to the sufficiency of capital limits that can enhance bank profitability. For monetary authorities, it is important to maintain price stability, exchange rates, and economic growth that have a tangible impact on the development of Islamic banks.

In this research, several key differences from other studies have been revealed. Firstly, this study highlighted that Islamic banking was not significantly influenced by the BI Rate (Bank Indonesia's *benchmark interest rate*) in terms of its profitability, indicating greater resilience to conventional interest rate fluctuations. Secondly, these findings illustrated that the relationship between the CAR and the profitability of Islamic banks was non-linear and quadratic, which means that excessively high or low CAR levels can have both positive and negative impacts. Additionally, this research focused on the influence of the FDR, which had a significant positive impact, and the NPF, which had a significant negative impact on profitability. Furthermore, macroeconomic stability, such as positive economic growth, low inflation, and stable exchange rates, becomes a key element in influencing the performance of Islamic banking. The analytical model used in this study has also proven to be quite effective in explaining variations in Islamic bank profitability with an Adjusted R^2 of 0.75. In its academic honesty, this research also identified some limitations, including the inability to accommodate conflicts between inflation and earnings and the limited analysis of long-term responses. The recommendations provided offer a strong foundation for further research that can address these limitations and delve deeper into Islamic banking performance, even in a global context, to assess its competitiveness. In conclusion, this research presented a new and profound insight into the unique characteristics of Islamic banking and the factors that influence its performance, providing valuable insights for stakeholders and researchers in this field.

Suggestions For Future Research

For future research in this field, several intriguing aspects can be focused. First, considering the expansion of the sample by involving other Islamic banks, both in Indonesia and neighboring countries, could provide a more holistic understanding of the performance of the Islamic banking industry. Second, the incorporation of additional variables such as liquidity ratios, efficiency ratios, or other factors related to the characteristics of the Islamic banking industry could enrich the analysis. Furthermore, research could delve deeper into analysing the factors affecting profitability, including sensitivity analysis to changes in regulations or different economic conditions. The development of more complex models or the utilisation of advanced analytical methods also presents an enticing option. Additionally,

comparing the performance of Islamic banks in various regions in Indonesia or with neighboring countries can identify trends and differences that may exist.

Moreover, research can involve the social and economic impact aspects of the development of Islamic banks in Indonesian society. Qualitative studies can also be incorporated to gain a deeper understanding of the factors influencing the decisions and strategies of Islamic banks. In the context of technological advancements, the influence of technology and digitization on the performance of Islamic banks, especially in fin tech and technology-based banking services, can also be a relevant research focus. Lastly, a comparative study on the development of the Islamic banking industry at the global level and its relationship with developments in Indonesia could offer valuable insights. Subsequent research will be guided by the research objectives and the desired focus areas of the researchers.

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