

DO ZISWAF FUNDS AND OPERATIONAL PERFORMANCE INFLUENCE MINIMUM RESERVE REQUIREMENTS? EVIDENCE FROM INDONESIAN ISLAMIC BANKS WITH FIRM SIZE AS A MODERATING VARIABLE

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Abstract

This study investigates the determinants of the Minimum Reserve Requirement (Giro Wajib Minimum/GWM) in Indonesian Islamic commercial banks by examining the roles of ZISWAF fund receipts, Operating Expenses to Operating Income (BOPO), and non-operating profit/loss, while assessing the moderating effect of firm size. Although the minimum reserve requirement is an essential macroprudential instrument for maintaining banking liquidity and financial stability, empirical evidence regarding the influence of Islamic banking-specific financial indicators and philanthropic fund management on GWM remains limited. This study addresses this research gap by integrating operational, financial, and Islamic social finance variables into a single empirical framework. A quantitative research design was employed using secondary data obtained from the annual and quarterly financial statements published by the Financial Services Authority of Indonesia (OJK) and the official websites of five Islamic commercial banks. The study covers the period from the first quarter of 2018 to the third quarter of 2023, yielding 115 panel observations. Panel data regression and Moderated Regression Analysis (MRA) were performed using EViews 12. The findings reveal that ZISWAF fund receipts, BOPO, and non-operating profit/loss do not individually have a significant effect on the Minimum Reserve Requirement. Furthermore, firm size does not significantly moderate the relationships between these variables and GWM. However, the variables jointly exhibit a statistically significant effect on GWM, although the model explains only 18.40% of the variation in reserve requirements. These findings suggest that GWM is influenced more by regulatory and macroprudential considerations than by banks' internal operational or philanthropic financial characteristics. The study contributes to the literature on Islamic banking liquidity management and provides practical insights for regulators and bank managers regarding the limited role of internal financial indicators in determining mandatory reserve requirements.

Keywords: Islamic Banking, Minimum Reserve Requirement, GWM, ZISWAF, BOPO, Non-operating Profit/Loss, Firm Size, Panel Data Regression, Indonesia.



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INTRODUCTION

The banking system plays a fundamental role in the economy of almost every country, including Indonesia (Gunawan and Barlinti, 2022). As financial intermediaries, banks facilitate the transfer of funds from surplus economic units to deficit economic units, thereby supporting capital allocation, economic growth, and financial stability (Tenriola, 2019).

Islamic banking constitutes an important component of the Islamic economic system and has attracted increasing attention from both academics and practitioners. Islamic commercial banks operate based on Sharia principles and provide financial services, including payment system facilities, in accordance with Islamic law. Like conventional financial institutions, Islamic banks are exposed to various risks in their operations. Every financing activity provided to customers carries the potential for default or other operational challenges, making risk management an essential aspect of maintaining financial sustainability (Buchori et al., 2022).

Unlike conventional banks, Islamic banks mobilize funds from the public through investment and safekeeping (*wadiah*) schemes rather than interest-based instruments. Consequently, they do not provide interest payments to depositors. Although the expansion of Islamic banking has been relatively slower than that of conventional banking, the industry experienced considerable growth between 2019 and June 2021, indicating increasing public acceptance of Sharia-compliant financial services (Delafadia, 2023).

One of the distinguishing characteristics between Islamic Commercial Banks (BUS) and Conventional Commercial Banks (BUK) is the social objective embedded in Islamic banking operations. Islamic financial institutions are authorized to collect and manage social funds for the benefit of society, including Zakat, Infaq, Sadaqah, and Waqf (ZISWAF). Nevertheless, Islamic banks are not entirely isolated from the conventional financial system, as they still engage in transactions with conventional financial institutions. As a result, transactions that potentially deviate from Sharia principles may still occur (Sholihah, 2021).

Profitability remains one of the primary objectives of banking institutions and serves as a key indicator of their financial performance. Maintaining sustainable profitability is essential for strengthening public confidence among investors and depositors, thereby ensuring the long-term viability of banking institutions. A profitable bank is generally more capable of attracting third-party funds and expanding its financing activities. One commonly used indicator of operational efficiency is the Operating Expenses to Operating Income ratio (BOPO). This ratio measures the effectiveness of a bank in managing its operational costs relative to its operating income. A higher BOPO ratio indicates lower operational efficiency, suggesting that the bank has greater difficulty controlling its operating expenses (Buchori et al., 2022).

Minimum Reserve Requirement (*Giro Wajib Minimum/GWM*) represents the mandatory reserve that Islamic and conventional commercial banks are required to

maintain at Bank Indonesia against the deposits they receive. The reserve requirement ratio is determined by Bank Indonesia as part of its monetary policy framework. A higher reserve requirement reduces the funds available for lending activities, thereby limiting banks' capacity to expand financing and generate income. Accordingly, GWM functions not only as a prudential instrument to safeguard banking liquidity but also as a monetary policy tool to maintain financial system stability. Efficient management of operational costs and sustainable profitability are therefore important factors in enabling banks to comply with reserve requirements while maintaining financial performance (Iriani, 2013).

In addition to operational performance, corporate financial policies are also closely associated with firm performance. Dividend policy reflects management's decision regarding the proportion of earnings distributed to shareholders versus retained for future investment. Companies with relatively high debt levels tend to distribute lower dividends because a substantial portion of their earnings is allocated to debt repayment. The Dividend Payout Ratio (DPR), which represents the proportion of net income distributed as dividends, is commonly used to evaluate dividend policy. According to (Madyoningrum, 2019), a higher dividend distribution can enhance firm value by increasing shareholder wealth and investor confidence.

Despite the growing body of literature on Islamic banking performance, limited empirical evidence has examined the relationship between the receipt of ZISWAF funds, operational efficiency (BOPO), non-operating profit/loss, and the Minimum Reserve Requirement (GWM), particularly by incorporating firm size as a moderating variable. Understanding these relationships is important because reserve requirements play a strategic role in maintaining banking liquidity and financial stability, while firm size may influence how financial and operational factors affect banks' compliance with regulatory requirements.

Based on these considerations, this study aims to examine the effects of ZISWAF fund receipts, BOPO, and non-operating profit/loss on the Minimum Reserve Requirement (GWM) of Islamic banks in Indonesia. Furthermore, this study investigates whether firm size moderates the relationships between these variables and the Minimum Reserve Requirement, thereby providing additional empirical evidence on the determinants of reserve requirements within the Indonesian Islamic banking industry.

LITERATURE REVIEW

Ziswaf

Islamic banks perform a dual function as financial intermediaries by mobilizing public funds and channeling them into productive sectors while operating in accordance with Islamic principles. Law Number 21 of 2008 concerning Islamic Banking defines an Islamic bank as a financial institution that conducts its business activities based on Sharia principles (Sudirman et al., 2023). The development of Islamic banking in

Indonesia demonstrates the growing demand for an alternative banking system capable of complementing the conventional financial system while promoting financial stability (Mahmudah and Harjanti, 2016). Although the growth of Islamic banking has not yet surpassed that of conventional banking, the industry experienced substantial expansion between 2019 and June 2021, reflecting increasing public confidence in Sharia-compliant financial services (Delafadia, 2023).

An important characteristic of Islamic banking is its integration of commercial and social finance through the management of Zakat, Infaq, Sadaqah, and Waqf (ZISWAF) funds. These instruments represent the core components of the Islamic economic system, which emphasizes justice, social welfare, and equitable wealth distribution. The principle of social justice in Islamic economics encourages individuals with greater financial capacity to support disadvantaged members of society, thereby reducing socioeconomic inequality and promoting inclusive economic development (Septianah and Vahlevi, 2021).

Zakat

Zakat is one of the fundamental pillars of Islam and represents an obligatory act of worship that reflects obedience to Allah SWT. It aims to strengthen both the relationship between individuals and God (*hablum minallah*) and the relationship among fellow human beings (*hablum minannas*). Beyond its religious significance, zakat serves as an important socioeconomic instrument within Islamic jurisprudence by facilitating wealth redistribution and improving social welfare. Consequently, zakat contributes not only to individual spiritual development but also to broader economic justice and community prosperity (Winatri, W., Alhidayatillah, N., & Perdamaian, 2023).

Infaq

Infaq refers to the voluntary expenditure of wealth or other valuable resources for charitable purposes in accordance with Islamic teachings. Unlike zakat, infaq is not subject to predetermined requirements regarding the amount, timing, or beneficiaries. It generally encompasses any form of wealth donated for the public good and represents a broader category of charitable giving. From a Sharia perspective, infaq reflects an individual's willingness to allocate part of his or her income or assets to fulfill moral and religious obligations prescribed by Islam (Fakiriyah et al., 2023).

Sadaqah

Sadaqah encompasses all voluntary acts of charity intended to seek the pleasure and reward of Allah SWT. According to (Riantika and Pane, 2023), sadaqah provides continuous spiritual benefits and serves as an enduring source of good deeds. Unlike zakat and infaq, sadaqah extends beyond material donations to include non-monetary acts of kindness, such as offering assistance to those in need, removing obstacles from public pathways, smiling, or demonstrating exemplary moral conduct. Such charitable behavior is believed to cultivate positive personal character while discouraging

undesirable traits, including greed, selfishness, dishonesty, theft, and usury (Fakiriyah et al., 2023).

Waqf

Waqf is a perpetual charitable endowment in which an asset is permanently dedicated for religious or social purposes, while the benefits generated from the asset are distributed to designated beneficiaries according to specific conditions established by the donor. Unlike other forms of charitable giving, the principal asset remains intact, allowing its economic benefits to be continuously utilized for public welfare. Together with zakat and infaq, waqf contributes to reducing wealth concentration and promoting a more equitable distribution of economic resources within society (Hisyamuddin and Halim, 2023).

Operating Expenses to Operating Income (BOPO)

The Operating Expenses to Operating Income ratio (BOPO) is one of the most widely used indicators for evaluating the operational efficiency of banking institutions. This ratio measures the bank's ability to control operating expenses relative to the operating income generated from its core business activities. A lower BOPO ratio indicates greater operational efficiency, implying that the bank is more effective in managing costs while generating income. Conversely, a higher BOPO ratio reflects declining operational performance and inefficiency in cost management (Lekal Budiansyah, 2023). To ensure sound banking performance, Bank Indonesia establishes a maximum BOPO threshold of 90%, above which operational efficiency is considered unsatisfactory (Haznun and Akbar, 2022).

Minimum Reserve Requirement (Giro Wajib Minimum)

The Minimum Reserve Requirement (Giro Wajib Minimum—GWM) is a macroprudential and monetary policy instrument implemented by Bank Indonesia to regulate banking liquidity and influence the amount of funds available for financing and lending activities. Banks are required to maintain a specified proportion of their third-party funds as reserves deposited at Bank Indonesia. These mandatory reserves enable banks to meet short-term liquidity obligations, including customer cash withdrawals, financing disbursements, settlement obligations, and other operational commitments.

The amount of reserves that must be maintained depends on the reserve ratio established by Bank Indonesia. An increase in the reserve requirement ratio reduces the amount of funds available for financing, thereby limiting banks' ability to expand credit or financing activities. Consequently, higher reserve requirements may reduce banks' opportunities to generate income because a larger proportion of their funds remains unutilized for productive financing activities (Iriani, 2013).

Non-Operating Profit/Loss

Non-operating income and expenses refer to financial transactions that arise outside the bank's primary business activities. Non-operating expenses generally include expenditures associated with activities unrelated to core banking operations, such as property development, facility rental, and maintenance of non-operational assets.

Similarly, non-operating income originates from activities that are not directly linked to the bank's principal intermediation functions.

Overall corporate profit represents the difference between total revenues and total expenses incurred during a particular accounting period. For banking institutions, effective management of public funds enables the accumulation of operational capital that can subsequently be invested in productive assets capable of generating returns. Within the Islamic economic framework, business activities are intended to produce lawful profits through mechanisms such as trade margins, service compensation, and investment returns rather than interest-based transactions. Accordingly, non-operating profit or loss may influence a bank's overall financial performance and financial capacity (Yuliana, Marzuki and Ratna, 2018).

Firm Size

Firm size is widely recognized as an important indicator of a company's operational capacity, market position, and resource availability. It is frequently employed in financial and accounting research to explain differences in corporate performance, disclosure practices, and strategic decision-making. Larger firms generally possess greater financial resources, stronger governance structures, and higher levels of operational diversification than smaller firms.

According to (Madyoningrum, 2019), firm size can be measured using several indicators, including total assets, sales volume, average sales, and average total assets. Among these measures, total assets are the most commonly used proxy because they reflect the scale of a firm's economic resources and operational activities. Consequently, firm size is often incorporated as a moderating variable to examine whether organizational scale strengthens or weakens the relationship between financial performance indicators and corporate outcomes.

Hypothesis Development

H1: The Effect of ZISWAF Fund Receipts on the Minimum Reserve Requirement (GWM)

According to the regulations governing zakat management, the Minimum Reserve Requirement (Giro Wajib Minimum GWM) represents the minimum amount of reserves that Commercial Banks (BUK), Islamic Commercial Banks (BUS), and Islamic Business Units (UUS) are required to maintain as determined by Bank Indonesia (Gunawan and Barlinti, 2022). However, the receipt of Zakat, Infaq, Sadaqah, and Waqf (ZISWAF) funds does not directly determine the amount of the Minimum Reserve Requirement because reserve requirements are established through regulatory policy rather than the volume of social funds managed by banks (Hisamuddin, 2018).

H1: ZISWAF fund receipts influence the Minimum Reserve Requirement (GWM).

H2: The Effect of Operating Expenses to Operating Income (BOPO) on the Minimum Reserve Requirement (GWM)

The Minimum Reserve Requirement (GWM) is the mandatory reserve that banks must maintain in accordance with regulations issued by Bank Indonesia. BOPO

represents the ratio of operating expenses to operating income and serves as an indicator of a bank's operational efficiency. Although BOPO does not directly determine the reserve requirement, operational efficiency may influence the bank's financial performance and liquidity management, which can subsequently affect its ability to fulfill the Minimum Reserve Requirement (Aulia and Rani, 2021).

H2: BOPO influences the Minimum Reserve Requirement (GWM).

H3: The Effect of Non-Operating Profit/Loss on the Minimum Reserve Requirement (GWM)

The Minimum Reserve Requirement (GWM) is a regulatory obligation imposed by Bank Indonesia to maintain banking liquidity. Non-operating profit or loss arises from activities that are not directly related to the bank's primary operations, such as investment activities and other non-core business transactions. Although non-operating profit or loss does not directly determine the amount of the Minimum Reserve Requirement, it may affect the bank's overall financial performance, which could subsequently influence its capacity to comply with reserve requirements (Pratito and Puspitasari, 2017).

H3: Non-operating profit/loss influences the Minimum Reserve Requirement (GWM).

H4: Firm Size Moderates the Relationship between ZISWAF Fund Receipts and the Minimum Reserve Requirement (GWM)

Firm size reflects the scale of a bank's operations and resource capacity and may contribute to improved operational management, including the administration of Zakat, Infaq, Sadaqah, and Waqf (ZISWAF) funds. Nevertheless, because the Minimum Reserve Requirement is determined by Bank Indonesia through regulatory policy rather than the amount of ZISWAF funds received, firm size is not expected to directly moderate the relationship between ZISWAF fund receipts and the Minimum Reserve Requirement (Handayani and Putra, 2016).

H4: Firm size moderates the relationship between ZISWAF fund receipts and the Minimum Reserve Requirement (GWM).

H5: Firm Size Moderates the Relationship between BOPO and the Minimum Reserve Requirement (GWM)

Firm size has been recognized as an external factor that may indirectly influence financial performance indicators such as Return on Assets (ROA) and Return on Equity (ROE). An increase in the Minimum Reserve Requirement may lead to a larger proportion of idle funds, thereby reducing banks' opportunities to generate profits. Consequently, reserve requirements may influence banking performance and liquidity management. Many banks maintain excess liquidity to demonstrate financial stability; however, excessive liquidity may also indicate inefficient liquidity management (Liviana, Widiatmoko and Indarti, 2024).

Since the Minimum Reserve Requirement is established by Bank Indonesia as a regulatory obligation, firm size is not expected to directly moderate the relationship

between BOPO and the Minimum Reserve Requirement. Instead, firm size influences banking performance indirectly through operational and financial conditions.

H5: Firm size moderates the relationship between BOPO and the Minimum Reserve Requirement (GWM).

H6: Firm Size Moderates the Relationship between Non-Operating Profit/Loss and the Minimum Reserve Requirement (GWM)

The Minimum Reserve Requirement is a mandatory reserve determined by Bank Indonesia; therefore, firm size is not expected to directly moderate the relationship between non-operating profit/loss and the Minimum Reserve Requirement because firm size constitutes an external organizational characteristic rather than a regulatory determinant. Nevertheless, firm size may influence banking performance through its impact on financial indicators such as ROA and ROE. Higher reserve requirements increase the proportion of idle funds, thereby reducing banks' opportunities to generate returns from productive investments (Dwiyanti and Wondabio, 2023).

H6: Firm size moderates the relationship between non-operating profit/loss and the Minimum Reserve Requirement (GWM).

H7: The Simultaneous Effect of ZISWAF Fund Receipts, BOPO, and Non-Operating Profit/Loss on the Minimum Reserve Requirement (GWM)

The receipt of ZISWAF funds, operational efficiency as measured by BOPO, and non-operating profit/loss collectively represent financial and operational factors that may influence a bank's ability to maintain adequate liquidity and comply with regulatory reserve requirements. Therefore, these variables are expected to simultaneously affect the Minimum Reserve Requirement of Islamic banks.

H7: ZISWAF fund receipts, BOPO, and non-operating profit/loss simultaneously influence the Minimum Reserve Requirement (GWM).

Figure 1 presents the conceptual framework illustrating the relationships among the independent variables, the moderating variable, and the dependent variable.

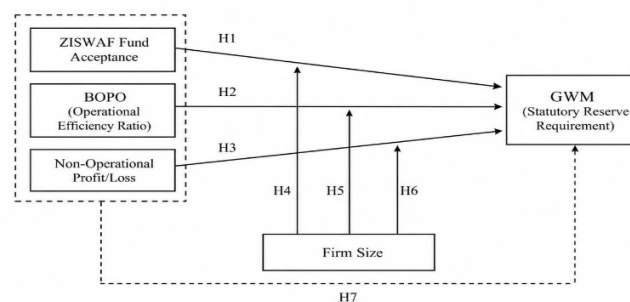


Figure 1. Conceptual Framework

RESEARCH METHOD

Descriptive Statistics

Table 1. Descriptive Statistics of the Research Variables

Statistics	Y	X1	X2	X3	Z
Mean	5.261391	25082.01	90.86165	-7569.826	16.65104
Maximum	11.90000	669879.0	202.7400	148455.0	19.58000
Minimum	0.000000	0.000000	64.64000	-133641.0	14.12000
Standard Deviation	1.938077	87500.44	14.72556	35190.66	1.474160
Observations	115	115	115	115	115

Source: Author's calculations using EViews 12.

Panel Data Model Selection

Prior to estimating the panel regression model, model specification tests were conducted to determine the most appropriate estimation technique. Three alternative panel data models were considered, namely the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The selection procedure consisted of the Chow test, Hausman test, and Lagrange Multiplier (LM) test.

Chow Test

The Chow test was performed to determine whether the Common Effect Model (CEM) or the Fixed Effect Model (FEM) was more appropriate for the panel data estimation.

Table 2. Chow Test Results

Test of Effects	Statistic	Degrees of Freedom	Probability
F-Statistic for Cross-section	1.538915	(4,106)	0.1962
Chi-Square Statistic for Cross-section	6.491594	4	0.1653
Root Mean Squared Error (RMSE)	1.733478	Coefficient of Determination	0.192974
Mean of the Dependent Variable	5.261391	Adjusted Coefficient of Determination	0.163627
Standard Deviation of the Dependent Variable	1.938077	Standard Error of Regression	1.772437

Test of Effects	Statistic	Degrees of Freedom	Probability
Akaike Information Criterion (AIC)	4.025093	Sum of Squared Residuals	345.5687
Schwarz Bayesian Criterion (SBC)	4.144438	Logarithm of the Likelihood	-226.4429
Hannan-Quinn Information Criterion (HQIC)	4.073535	F-statistic	6.575723
Durbin-Watson Statistic	0.748901	Probability (F-statistic)	0.000088

Source: Author's calculations using EViews 12.

The decision criterion for the Chow test is as follows:

If the probability value of the Cross-section F statistic is greater than 0.05, the Common Effect Model (CEM) is selected. If the probability value of the Cross-section F statistic is less than 0.05, the Fixed Effect Model (FEM) is selected. The results indicate a Cross-section F probability of 0.1962, which exceeds the 5% significance level. Therefore, the null hypothesis cannot be rejected, indicating that the Common Effect Model (CEM) is preferred over the Fixed Effect Model.

Hausman Test

The Hausman test was subsequently conducted to determine whether the Fixed Effect Model (FEM) or the Random Effect Model (REM) provided a more appropriate specification for the panel data.

Table 3. Hausman Test Results

Test Summary	Chi-square Statistic	Chi-square d.f.	Probability
Cross-section Random	6.155661	4	0.1878

Source: Author's calculations using EViews 12.

The Hausman test follows the following decision rule:

If the probability value is less than 0.05, the Fixed Effect Model (FEM) is selected. If the probability value is greater than 0.05, the Random Effect Model (REM) is selected. The estimated probability value of 0.1878 is greater than the significance level of 0.05, indicating that the Random Effect Model (REM) is more appropriate than the Fixed Effect Model.

Interpretation of the Lagrange Multiplier Test

The Lagrange Multiplier (LM) test produced a Breusch–Pagan probability value of 0.5506, which is greater than the significance level of 0.05. Based on the decision criterion, the Common Effect Model (CEM) was selected as the most appropriate panel data estimation model for this study.

Classical Assumption Tests

The second stage of the analysis involved conducting classical assumption tests to assess whether the regression model satisfied the statistical assumptions required for panel data analysis. The classical assumption tests included the normality test, multicollinearity test, and heteroscedasticity test.

Lagrange Multiplier Test

The third stage of panel data model selection employed the Lagrange Multiplier (LM) test. This test was conducted to determine the most appropriate estimation model between the Random Effect Model (REM) and the Common Effect Model (CEM) for panel data regression.

Table 4. Lagrange Multiplier Test Results

Test Hypothesis	Cross-section	Time	Both
Breusch-Pagan Statistic	0.356237	57.28685	57.64309
	(0.5506)	(0.0000)	(0.0000)

Source: Author's calculations using EViews 12.

The decision criteria for the Lagrange Multiplier test are as follows:

If the Breusch–Pagan probability value is greater than 0.05, the Common Effect Model (CEM) is selected. If the Breusch–Pagan probability value is less than 0.05, the Random Effect Model (REM) is selected.

Interpretation of the Results

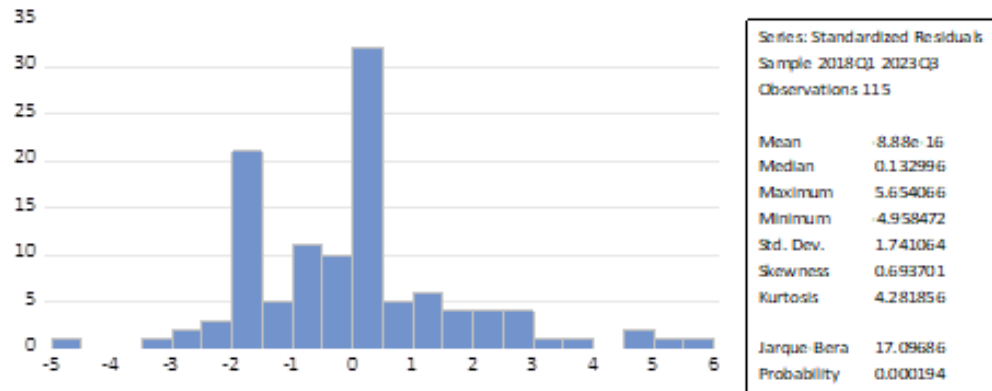
The Lagrange Multiplier test produced a Breusch–Pagan probability value of 0.5506, which is greater than the significance level of 0.05. Therefore, the null hypothesis cannot be rejected, indicating that the Common Effect Model (CEM) is the most appropriate panel data estimation model for this study. Accordingly, the Common Effect Model (CEM) was selected for the subsequent regression analysis

Classical assumption testing

The second stage of sample analysis involves testing using the classical assumption method.

Normality Test

Figure 1. Normality Test Results



Source: Author's calculations using EViews 12.

The decision criteria for the Jarque–Bera test are as follows:

If the Jarque–Bera probability value is less than 0.05, the residuals are not normally distributed, indicating that the normality assumption is not satisfied. If the Jarque–Bera probability value is greater than 0.05, the residuals are normally distributed, indicating that the normality assumption is satisfied.

Interpretation of the EViews Output

The EViews output reports a Jarque–Bera probability value of 0.000194, which is lower than the significance level of 0.05. This finding indicates that the regression residuals are not normally distributed. Therefore, the normality assumption is not satisfied for the estimated regression model.

Multicollinearity Test

The multicollinearity test was conducted to examine whether a high degree of correlation existed among the independent variables included in the regression model. The presence of multicollinearity may reduce the reliability of the estimated regression coefficients and affect the interpretation of the regression results.

Table 5. Multicollinearity Test Results

	X1	X2	X3
X1	1	-0.2725749230524859	-0.6913455056693138
X2	-0.2725749230524859	1	0.1298601689037766
X3	-0.6913455056693138	0.1298601689037766	1
Z	0.5195578877724231	-0.1999646101449418	-0.5479826765545061

Source: Author's calculations using EViews 12.

Heteroscedasticity Test

Table 6. Heteroscedasticity Test Results

Variable	Coefficient	Standard Error	T Statistic	Probability
C	-1.832963	1.751202	-1.046689	0.2975
X1	-1.15E-07	1.84E-06	-0.062597	0.9502
X2	0.005106	0.007857	0.649818	0.5172
X3	-5.37E-07	4.59E-06	-0.117136	0.9070

Source: Author's calculations using EViews 12.

The decision criteria for the heteroscedasticity test are as follows:

If the probability value is greater than 0.05, the regression model is free from heteroscedasticity. If the probability value is less than 0.05, the regression model exhibits heteroscedasticity.

Panel Data Regression Analysis

Table 7. Panel Data Regression Results

Variable	Coefficient	Standard Error	T Statistic	Probability
C	8.052574	2.609067	3.086381	0.0026
X1	8.29E-07	2.75E-06	0.301872	0.7633
X2	-0.054388	0.011706	-4.646094	0.0000
X3	7.65E-06	6.83E-06	1.119133	0.2655
Effects Specification			S.D.	Rho
	Cross-section Random		0.000000	0.0000
	Idiosyncratic Random		1.755321	1.0000
Weighted Statistics				
	Root Mean Squared Error (RMSE)	1.733478	R-squared	0.192974
	Mean Dependent Variable	5.261391	Adjusted R- squared	0.163627
	Standard Deviation of Dependent Variable	1.938077	Standard Error of Regression	1.772437
	Sum of Squared Residualskuatrat	345.5687	F-statistic	6.575723
	Durbin-Watson Statistic	0.748901	Prob. (F- statistic)	0.000088

Source: Author's calculations using EViews 12.

Moderated Regression Analysis (MRA)

Moderated Regression Analysis (MRA) was employed to examine whether firm size moderates the relationships between the independent variables and the dependent variable. A moderating variable may strengthen or weaken the relationship between the independent variables and the dependent variable by interacting with the explanatory variables.

Table 8. Moderated Regression Analysis (MRA) Results

Variable	Coefficient	Std. Error	T Statistic	Probability
C	15.39589	28.77917	0.534967	0.5938
X1	-0.000630	0.000337	-1.870034	0.0643
X2	-0.313312	0.343173	-0.912987	0.3634
X3	-0.000105	0.000129	-0.810267	0.4197
X1_Z	3.25E-05	1.74E-05	1.866934	0.0648
X2_Z	0.016588	0.020963	0.791282	0.4306
X3_Z	6.28E-06	7.28E-06	0.863485	0.3899
Effects Specification				
Cross-section Fixed (Dummy Variables)				
Root Mean Squared Error (RMSE)	1.656898		R-squared	0.262703
Mean Dependent Variable	5.261391		Adjusted R-squared	0.183962
Standard Deviation of Dependent Variable	1.938077		Standard Error of Regression	1.750758
Akaike Information Criterion (AIC)	4.056467		Sum of Squared Residuals	315.7108
Schwarz Criterion (SC)	4.342895		Log Likelihood	-221.2469
Hannan–Quinn Criterion (HQIC)	4.172727		F Statistic	3.336313
Durbin–Watson Statistic	0.785207		Prob. (F-statistic)	0.000585

Source: Author's calculations using EViews 12.

Statistical Hypothesis Testing

Partial Significance Test (t-Test)

The t-test was conducted to examine the partial effect of each independent variable and interaction term on the dependent variable, namely the Minimum Reserve Requirement (GWM). The test evaluates whether each regression coefficient is statistically significant at the 5% significance level.

Table 9. Partial Significance Test (t-Test) Results

Variable	Coefficient	Standard Error	T Statistic	Probability
C	15.39589	28.77917	0.534967	0.5938
X1	-0.000630	0.000337	-1.870034	0.0643
X2	-0.313312	0.343173	-0.912987	0.3634
X3	-0.000105	0.000129	-0.810267	0.4197
X1_Z	3.25E-05	1.74E-05	1.866934	0.0648
X2_Z	0.016588	0.020963	0.791282	0.4306
X3_Z	6.28E-06	7.28E-06	0.863485	0.3899

Source: Author's calculations using EViews 12.

The results of the partial significance test lead to the following conclusions regarding the proposed hypotheses.

- 1) Hypothesis 1 (H1). H1 proposes that ZISWAF fund receipts significantly affect the Minimum Reserve Requirement (GWM). The regression results show a coefficient of -0.000630 , a t-statistic of -1.870034 , and a probability value of 0.0643 , which exceeds the significance level of 0.05 . Therefore, H1 is rejected, indicating that ZISWAF fund receipts do not have a statistically significant effect on the Minimum Reserve Requirement of Islamic banks in Indonesia.
- 2) Hypothesis 2 (H2). H2 states that BOPO significantly affects the Minimum Reserve Requirement (GWM). The estimated coefficient is -0.313312 , with a t-statistic of -0.912987 and a probability value of 0.3634 . Since the probability value is greater than 0.05 , H2 is rejected. This finding indicates that BOPO does not significantly influence the Minimum Reserve Requirement during the observation period.
- 3) Hypothesis 3 (H3). H3 proposes that non-operating profit/loss significantly affects the Minimum Reserve Requirement (GWM). The regression coefficient is -0.000105 , with a t-statistic of -0.810267 and a probability value of 0.4197 . As the probability value exceeds 0.05 , H3 is rejected, suggesting that non-operating profit/loss has no statistically significant effect on the Minimum Reserve Requirement.
- 4) Hypothesis 4 (H4). H4 states that firm size moderates the relationship between ZISWAF fund receipts and the Minimum Reserve Requirement. The interaction term ($X1 \times Z$) has a coefficient of $3.25E-05$, a t-statistic of 1.866934 , and a probability value of 0.0648 . Because the probability value is greater than 0.05 , H4 is rejected. Accordingly, firm size does not significantly moderate the relationship between ZISWAF fund receipts and the Minimum Reserve Requirement in Islamic banks in Indonesia during the study period.
- 5) Hypothesis 5 (H5). H5 proposes that firm size moderates the relationship between BOPO and the Minimum Reserve Requirement. The interaction

coefficient ($X2 \times Z$) is 0.016588, with a t-statistic of 0.791282 and a probability value of 0.4306. Since the probability value exceeds 0.05, H5 is rejected. This finding indicates that firm size is unable to significantly moderate the effect of BOPO on the Minimum Reserve Requirement.

- 6) Hypothesis 6 (H6). H6 states that firm size moderates the relationship between non-operating profit/loss and the Minimum Reserve Requirement. The interaction term ($X3 \times Z$) produces a coefficient of 6.28E-06, a t-statistic of 0.863485, and a probability value of 0.3899. As the probability value is greater than 0.05, H6 is rejected. Therefore, firm size does not significantly moderate the relationship between non-operating profit/loss and the Minimum Reserve Requirement of Islamic banks in Indonesia.
- 7) Hypothesis 7 (H7). H7 proposes that ZISWAF fund receipts, BOPO, and non-operating profit/loss jointly influence the Minimum Reserve Requirement (GWM). The regression model yields a Prob. (F-statistic) of 0.000585, which is below the 5% significance level, indicating that the independent variables jointly have a statistically significant effect on the dependent variable. Furthermore, the Adjusted R-squared value of 0.183962 indicates that approximately 18.40% of the variation in the Minimum Reserve Requirement is explained by the independent variables and their interaction terms included in the model, while the remaining 81.60% is explained by other factors not incorporated into this study.

Simultaneous Significance Test (F-Test)

The F-test was conducted to examine whether the independent variables jointly have a statistically significant effect on the dependent variable, namely the Minimum Reserve Requirement (GWM). This test evaluates the overall significance of the regression model by assessing the combined explanatory power of all independent variables and interaction terms included in the model.

Table 10. F-Test Results

Root Mean Squared Error (RMSE)	1.656898	R-squared	0.262703
Mean Dependent Variable	5.261391	Adjusted R-squared	0.183962
Standard Deviation of Dependent Variable	1.938077	Standard Error of Regression	1.750758
Akaike Information Criterion (AIC)	4.056467	Sum of Squared Residuals	315.7108
Schwarz Criterion (SC)	4.342895	Log Likelihood	-221.2469
Hannan–Quinn Criterion (HQIC)	4.172727	F Statistic	3.336313

Durbin–Watson Statistic	0.785207	Prob. (F-statistic)	0.000585
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Source: Author's calculations using EViews 12.

The regression model produces an F-statistic of 3.336313 with a corresponding Prob. (F-statistic) of 0.000585, which is lower than the 5% significance level ($p < 0.05$). Therefore, the null hypothesis is rejected, indicating that the independent variables jointly have a statistically significant effect on the Minimum Reserve Requirement (GWM). These findings demonstrate that the regression model is statistically significant as a whole, suggesting that the combined effects of ZISWAF fund receipts, BOPO, non-operating profit/loss, and their interaction terms with firm size contribute significantly to explaining variations in the Minimum Reserve Requirement of Islamic banks in Indonesia during the observation period.

Coefficient of Determination (R^2 Test)

The coefficient of determination (R^2) was used to measure the proportion of variation in the dependent variable that can be explained by the independent variables included in the regression model. A higher coefficient of determination indicates greater explanatory power of the model.

Table 11. Coefficient of Determination (R^2) Test Results

Root Mean Squared Error (RMSE)	1.656898	R-squared	0.262703
Mean Dependent Variable	5.261391	Adjusted R-squared	0.183962
Standard Deviation of Dependent Variable	1.938077	Standard Error of Regression	1.750758
Akaike Information Criterion (AIC)	4.056467	Sum of Squared Residuals	315.7108
Schwarz Criterion (SC)	4.342895	Log Likelihood	-221.2469
Hannan–Quinn Criterion (HQIC)	4.172727	F Statistic	3.336313
Durbin–Watson Statistic	0.785207	Prob. (F-statistic)	0.000585

Source: Author's calculations using EViews 12.

As presented in Table 11, the regression model produces an Adjusted R-squared value of 0.183962, indicating that approximately 18.40% of the variation in the Minimum Reserve Requirement (GWM) can be explained by the independent variables and their interaction terms included in the model. The remaining 81.60% of the variation is attributable to other factors not incorporated into the present study. These findings suggest that, although the regression model is statistically significant, the explanatory power of the independent variables is relatively limited. Therefore, additional determinants beyond ZISWAF fund receipts, BOPO, non-operating

profit/loss, and firm size may contribute to explaining variations in the Minimum Reserve Requirement of Islamic banks in Indonesia.

RESULTS AND DISCUSSION

Result

Table 10 presents the results of the Moderated Regression Analysis (MRA) examining the effects of ZISWAF fund receipts, BOPO, non-operating profit/loss, and the moderating role of firm size on the Minimum Reserve Requirement (GWM) of Islamic banks in Indonesia.

The regression results indicate that ZISWAF fund receipts have a negative coefficient of -0.000630 with a t-statistic of -1.870034 and a probability value of 0.0643 . Since the probability exceeds the 5% significance level, the effect of ZISWAF fund receipts on the Minimum Reserve Requirement is statistically insignificant.

Similarly, BOPO records a coefficient of -0.313312 , a t-statistic of -0.912987 , and a probability value of 0.3634 , indicating no statistically significant effect on the Minimum Reserve Requirement. The coefficient for non-operating profit/loss is -0.000105 , with a t-statistic of -0.810267 and a probability value of 0.4197 . These findings suggest that non-operating profit/loss does not significantly influence the Minimum Reserve Requirement.

Regarding the moderating effect of firm size, none of the interaction terms are statistically significant. The interaction between ZISWAF fund receipts and firm size ($X1 \times Z$) has a probability value of 0.0648 , while the interaction between BOPO and firm size ($X2 \times Z$) records 0.4306 , and the interaction between non-operating profit/loss and firm size ($X3 \times Z$) records 0.3899 . Since all probability values exceed the 5% significance level, firm size does not moderate the relationships between the independent variables and the Minimum Reserve Requirement.

Furthermore, the model produces an F-statistic probability of 0.000585 , indicating that all independent variables jointly have a statistically significant effect on the Minimum Reserve Requirement. However, the Adjusted R^2 value of 0.183962 indicates that the model explains approximately 18.40% of the variation in the Minimum Reserve Requirement, while 81.60% is explained by variables outside the research model.

Discussion

The Effect of ZISWAF Fund Receipts on the Minimum Reserve Requirement

The empirical findings indicate that ZISWAF fund receipts do not significantly affect the Minimum Reserve Requirement of Islamic banks. This finding suggests that charitable funds collected through Zakat, Infaq, Sadaqah, and Waqf are managed separately from liquidity reserves required by Bank Indonesia. Consequently, increases in ZISWAF collections do not necessarily alter banks' reserve obligations.

This finding supports Hisamuddin (2018), who argued that ZISWAF receipts do not directly determine the Minimum Reserve Requirement. Likewise, Gunawan and Barlinti (2022) explained that reserve requirements are determined by Bank Indonesia as part of monetary policy rather than by philanthropic fund collections.

The Effect of BOPO on the Minimum Reserve Requirement

The results demonstrate that BOPO does not significantly influence the Minimum Reserve Requirement. Although BOPO reflects operational efficiency, reserve requirements are regulatory instruments designed to maintain banking liquidity rather than indicators of operational performance.

This finding is consistent with Aulia and Rani (2021), who reported that BOPO primarily affects bank profitability instead of reserve obligations.

The Effect of Non-Operating Profit/Loss on the Minimum Reserve Requirement

The findings reveal that non-operating profit/loss has no significant influence on the Minimum Reserve Requirement. Non-operating income generally originates from activities outside banks' core business operations, such as investment gains or asset disposals, which are not directly associated with reserve management.

This result supports Pratito and Puspitasari (2017), who concluded that non-operating profit or loss affects banking performance indirectly rather than determining mandatory reserve levels.

The Moderating Role of Firm Size on the Relationship between ZISWAF Fund Receipts and the Minimum Reserve Requirement

Firm size fails to moderate the relationship between ZISWAF fund receipts and the Minimum Reserve Requirement. This finding indicates that regardless of bank size, reserve obligations remain determined by regulatory requirements rather than by the amount of charitable funds collected.

The findings are consistent with Handayani and Putra (2016), who argued that firm size cannot strengthen or weaken the relationship between ZISWAF management and reserve obligations because reserve requirements are externally regulated.

The Moderating Role of Firm Size on the Relationship between BOPO and the Minimum Reserve Requirement

The interaction between BOPO and firm size is statistically insignificant, suggesting that organizational size does not influence how operational efficiency affects reserve requirements.

This finding corroborates Liviana, Widiatmoko and Indarti (2024), who emphasized that firm size affects banking performance indirectly but does not alter regulatory reserve obligations.

The Moderating Role of Firm Size on the Relationship between Non-Operating Profit/Loss and the Minimum Reserve Requirement

Firm size also fails to moderate the relationship between non-operating profit/loss and the Minimum Reserve Requirement. The reserve requirement remains primarily influenced by regulatory policy rather than organizational characteristics.

This result is in line with Dwiyanti and Wondabio (2023), who found that firm size influences profitability indicators such as ROA and ROE but does not directly affect reserve requirements.

Joint Effect of ZISWAF Fund Receipts, BOPO, and Non-Operating Profit/Loss

Although the individual explanatory variables are statistically insignificant, the overall regression model is significant based on the F-test. This finding indicates that the variables collectively contribute to explaining variations in the Minimum Reserve Requirement.

Nevertheless, the relatively low Adjusted R^2 (18.40%) suggests that reserve requirements are largely influenced by other determinants not included in the present study. These may include macroeconomic conditions, liquidity ratios, capital adequacy, monetary policy, and other regulatory factors. Future research should incorporate these variables to improve the explanatory power of the model and provide a more comprehensive understanding of reserve requirement determinants in Islamic banking.

CONCLUSION

This study investigated the effects of ZISWAF fund receipts, Operating Expenses to Operating Income (BOPO), and non-operating profit/loss on the Minimum Reserve Requirement (GWM) in Indonesian Islamic commercial banks, while also examining the moderating role of firm size. Using panel data from five Islamic commercial banks over the period from the first quarter of 2018 to the third quarter of 2023, the empirical analysis provides several important findings.

First, the results indicate that ZISWAF fund receipts do not have a statistically significant effect on the Minimum Reserve Requirement. This finding suggests that philanthropic funds collected through Zakat, Infaq, Sadaqah, and Waqf are administered independently from regulatory reserve obligations determined by Bank Indonesia. Consequently, fluctuations in ZISWAF receipts do not directly influence banks' reserve positions.

Second, BOPO does not significantly affect the Minimum Reserve Requirement. Although BOPO reflects the operational efficiency of Islamic banks, reserve requirements are primarily determined by monetary and prudential regulations rather than operational performance indicators. Therefore, changes in operational efficiency are insufficient to explain variations in mandatory reserve holdings.

Third, non-operating profit/loss also has no significant effect on the Minimum Reserve Requirement. Income or losses generated from activities outside banks' core operations do not directly contribute to regulatory liquidity management, indicating that reserve requirements remain largely independent of non-operating financial performance.

Fourth, the findings demonstrate that firm size does not moderate the relationships between ZISWAF fund receipts, BOPO, non-operating profit/loss, and the Minimum Reserve Requirement. This suggests that regardless of the size of Islamic banks, reserve requirements remain predominantly determined by regulatory provisions rather than organizational characteristics.

Finally, although the individual explanatory variables are statistically insignificant, the joint effect of ZISWAF fund receipts, BOPO, and non-operating profit/loss is statistically significant, indicating that these variables collectively contribute to explaining variations in the Minimum Reserve Requirement. However, the relatively low explanatory power of the model (Adjusted $R^2 = 18.40\%$) indicates that most of the variation in reserve requirements is explained by other factors outside the model.

Overall, this study contributes to the Islamic banking literature by demonstrating that mandatory reserve requirements are primarily driven by regulatory and macro-financial considerations rather than internal operational or philanthropic financial indicators. These findings provide useful insights for regulators, bank management, and researchers interested in liquidity management and reserve policy within Islamic banking institutions.

Suggestions for Future Research

Several limitations of this study provide opportunities for future research.

First, future studies are encouraged to incorporate additional bank-specific variables, such as the Financing-to-Deposit Ratio (FDR), Capital Adequacy Ratio (CAR), Non-Performing Financing (NPF), liquidity coverage ratio, profitability indicators (ROA and ROE), and financing growth. These variables may better explain the determinants of the Minimum Reserve Requirement.

Second, future research should consider macroeconomic and monetary policy variables, including inflation, policy interest rates, exchange rates, gross domestic product (GDP) growth, money supply, and changes in Bank Indonesia's reserve requirement regulations. Since reserve requirements are largely policy-driven, incorporating macroeconomic indicators may substantially improve the explanatory power of the model.

Third, future studies may employ alternative moderating or mediating variables, such as corporate governance quality, bank ownership structure, risk management practices, digital banking adoption, or liquidity risk, to obtain a deeper understanding of the mechanisms influencing reserve requirements.

Fourth, expanding the research sample to include Islamic business units (UUS), conventional commercial banks, regional development banks, or conducting cross-country comparisons would enhance the generalizability of the findings and provide broader evidence regarding reserve management practices across different banking systems.

Finally, future research is encouraged to apply more advanced econometric approaches, such as dynamic panel estimation using the Generalized Method of Moments (GMM), Panel Vector Autoregression (PVAR), or Panel Autoregressive Distributed Lag (Panel ARDL) models. These methods may better capture dynamic relationships, address potential endogeneity issues, and provide more robust empirical evidence regarding the determinants of reserve requirements in Islamic banking.

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