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Determinant of Murabaha financing in Indonesian Sharia banking: The ARDL and NARDL approach

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ABSTRACT

Introduction
Murabaha financing accounts for the largest portion of Sharia bank financing, and many previous studies have analyzed this topic using symmetric impact. However, studies using the asymmetric link, a common phenomenon in economic theory, are limited.

Objectives
This study explores the determinants of Murabaha financing with symmetric and asymmetric approaches.

Method
The explanatory variables are the bank-specific variables in the form of the Murabaha financing rate, the cost of borrowing money, and the macroeconomic conditions in the form of the Industrial Production Index, which is a proxy of domestic output. The period of study is from 2010 to 2021 using monthly data. The method is Autoregressive distributed lag (ARDL) for symmetric analysis and non-linear ARDL (NARDL) for asymmetric analysis.

Results
The symmetric effect method indicates that the Murabaha financing rate negatively affects Murabaha financing, but the Industrial Production Index has no effect on Murabaha financing. The asymmetric effect method suggests that the Murabaha financing rate and Industrial Production Index asymmetrically affect Murabaha financing.

Implications
Murabaha financing will experience a drastic fall if there is a rise in the Murabaha financing rate, but a fall in the Murabaha financing rate will not have an impact on an increase in Murabaha financing. Economic upturns boost Murabaha financing, but economic downturns have no impact on Murabaha financing.

Originality/Novelty
The main contribution of our research is evidence of the asymmetric response of Murabaha financing to bank-specific variables as well as macroeconomic conditions in which Sharia banks are resilient to the business cycle.

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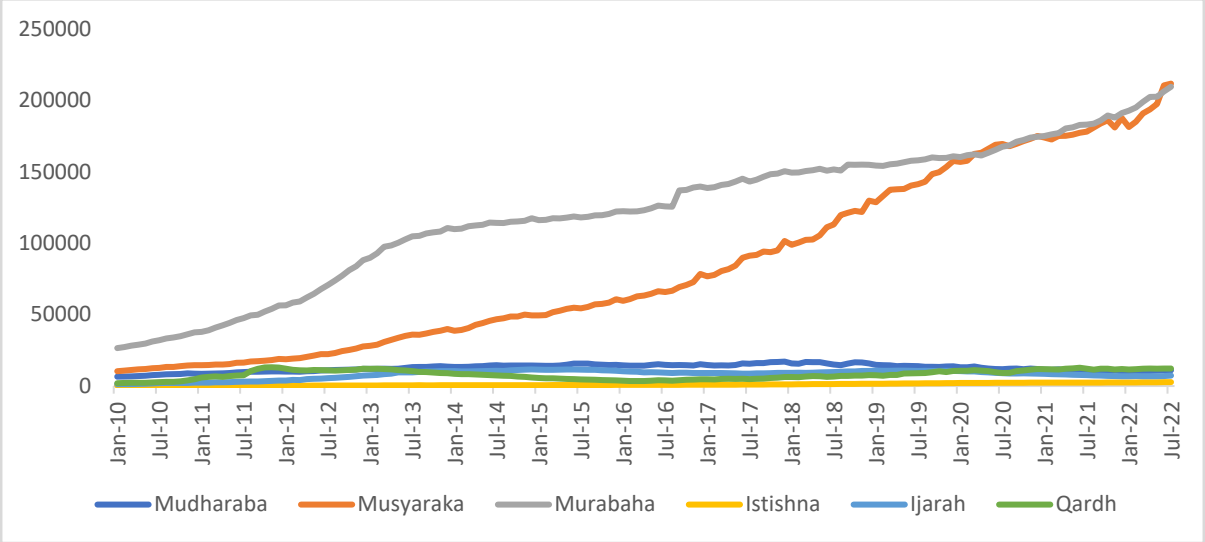
INTRODUCTION

Indonesia started practicing the Sharia banking system in 1992. The government allows a bank to offer a risk-sharing financing scheme for its operations using Law No. 7 1992. Sharia banking practices were strengthened by the issuance of Banking Law No. 23 1998. There are 32 Sharia banks in Indonesia consisting of Sharia commercial banks (12 banks) and Sharia business units (20 banks). In addition, Indonesia also has a bank with small size, well-known Sharia rural banks with a total of 165 banks. Bank Syariah Indonesia, one of the Sharia banks in Indonesia, is ranked 7th in the Indonesian banking market. Furthermore, Sharia banking in Indonesia is ranked 10th in the world, with assets of USD 38 billion in 2021 (Fitrah, 2018; Khodiron et al., 2022; Widuhung & Machmud, 2022).

With the presence of Sharia banks, the Indonesian banking system has been a dual banking system since 1992. This dual banking system has caused entrepreneurs to have alternative sources of financing for their businesses (Kristianti, 2015; Rahmatika, 2014; Rianda, 2018). On the other hand, Sharia banks must be able to attract customers to borrow funds from Sharia banks. Sources of financing for Sharia banks consist of financing based on profit-loss sharing (PLS) contracts and non-PLS contracts. PLS contracts comprise Mudharaba and Musyaraka, while non-PLS contracts consist of Murabaha, Istisna, Salam, Ijarah, and Qard (Widarjono & Rudatin, 2021).

Figure 1

Sharia Bank Financing, January 2010-July 2022



Source: Otoritas Jasa Keuangan (2023).

Figure 1 illustrates the development of Sharia bank financing from 2010-2021. The largest portion of Sharia bank financing is Murabaha followed by Musyaraka financing. Like other countries, Muraba financing is the largest portion of Sharia bank financing because it is easy to implement and monitor and poses a low risk (Louhichi & Boujelbene, 2016; Sutrisno & Widarjono, 2022). Therefore, research associated with

the factors that affect Sharia bank financing is important for Sharia banks as well as policymakers in further understanding the behavior of debtors, who may be concerned with the bank-specific variables as well as macroeconomic conditions in determining their lending.

Some studies examined the behavior of Sharia bank financing. Research on Sharia bank financing can be divided into two groups, comprising total financing and financing based on the type of contracts such as Mudharaba, Musharaka, and Murabaha. Sudarsono (2017), using aggregate data on Sharia banking in Indonesia, shows that third-party funds, equity, and PLS financing positively affect financing, but inefficiency negatively affects financing. Another study using data from 12 Sharia commercial banks in Indonesia documented that Sharia bank financing is influenced by liquidity, efficiency, and financing risk (Alsyahrin et al., 2018). Using Sharia commercial banks in Indonesia, Risfandy et al. (2020) suggested that competition, stability, profit, and inefficiency negatively affect PLS financing, but bank size positively influences PLS financing. Sudarsono & Shiddiqi (Sudarsono & Shiddiqi, 2021), using aggregate data for Sharia banks, show that profitability, inefficiency, and bank size negatively affect Mudharaba and Musharaka financing. Ibrahim (2016), by investigating Sharia banks in Malaysia, analyzes the influence of the business cycle on Sharia bank financing. The results show that fluctuations in domestic output affect Sharia bank financing, but Sharia banks are more resilient than conventional banks. This study confirms the existing research on which domestic output positively affects Sharia bank financing, such as (Caporale et al., 2020).

However, a bunch of previous studies utilize symmetric impact, but the asymmetric link is a common phenomenon in economic theory. Asymmetric price results from the fact that the speed of cost increase is faster than cost decrease because of downward sticky prices (Tappata, 2009). Karim et al. (2017) analyze the effect of Sharia financing rates and domestic output using aggregate data on Sharia banks in Malaysia. This study uses the non-linear Autoregressive Distributed Lag (NARDL) model to analyze the asymmetric effect of the Sharia financing rate and domestic output variables on financing. The results show that the financing rate and domestic output have no effect on the total financing of Sharia banks.

The goal of our research is to explore the role of financing costs, encompassing the Sharia financing rate and the macroeconomic variable, namely the Industrial Production Index (IPI), on Murabaha financing. Murabaha financing was chosen because Murabaha financing is the largest portion of the financing in Indonesian Sharia banking. The methods are the Autoregressive Distributed Lag (ARDL) model and non-linear ARDL (NARDL) as a time series dynamic regression. The ARDL method assumes that the effect of the explanatory variables is symmetric, while the NARDL model assumes that the impact of the independent variables is asymmetric. There are two contributions of this study to the Sharia bank literature in Indonesia. First, this study broadens the existing empirical study on Murabaha financing. Second, to the best of our knowledge, there has been no research that examines the determination of Sharia bank financing in Indonesia using an asymmetric approach such as NARDL.

NARDL can capture well the behavior of explanatory variables such as the Sharia financing rate and the Industrial Production Index (IPI) for which both variables are sluggish variables and the response of borrowers to the business cycle is asymmetric and associated with both variables instead of symmetric.

LITERATURE REVIEW

Theoretical Foundation

Murabaha is a form of sale and purchase contract for an item, in which in the sales process, the cost of the goods is stated, and additional profits and other costs incurred to obtain the goods are paid at a predetermined time or in installments. According to the Fatwa of National Sharia Board – Indonesian Ulama Council (DSN-MUI) No. 04/DSN-MUI/V/2000 concerning Murabaha states that the meaning of Murabaha is selling an item by approving price to the buyers, and they pay it at a given price as profit (Mauluddin, 2018; Syaifullah, 2019). Based on the Statement of Financial Accounting Standards (*Pernyataan Standar Akuntansi Keuangan* abbreviated PSAK in Bahasa Indonesia) No. 102, the definition of Murabaha is a contract of sale and purchase of goods at a selling price of acquisition cost plus agreed profit, and the seller must disclose the acquisition cost of the goods to the buyer (Hiya et al., 2022; Yusuf, 2013). Therefore, Murabaha financing is a type of Sharia bank financing based on the concept of debt-based financing.

The purpose of Islamic banks as financial intermediaries is to collect funds from one party and distribute funds to other parties. Following Stein (1998) for conventional banks, bank loans depend on bank-specific variables and external factors such as national output and interest rate. We focus on the role of the Sharia financing rate as the cost of Sharia bank financing and domestic output in influencing Murabaha financing.

Hypothesis Development

Microeconomic and macroeconomic factors influence Sharia bank financing. Bank-specific variables, such as equity, bank size, profitability, cost of financing, and liquidity (Šeho et al., 2020), are widely employed to investigate the determinants of Sharia bank financing at the microeconomic level. At the macroeconomic level, the Sharia financing rate depends on economic growth and inflation (Ibrahim, 2016). Both microeconomic and macroeconomic variables are widely used to explore the determinants of Sharia bank financing (Karim et al., 2017).

The price of financing products, namely Islamic financing rates (IFR), is the key factor in determining Murabaha financing. The high IFR represents the expensive cost of financing, and the low IFR indicates the low cost of financing for Islamic banks. Zulkhibri & Sukmana (2017) indicated that IFR negatively affects Islamic bank financing in Indonesia. The cost of financing is also negatively linked to financing Islamic banking in Malaysia (Karim et al., 2017). Šeho et al. (2020) found that sale-based financing is positively influenced by bank size, but it is negatively associated with interest rate. Some studies documented that total assets and deposits positively

influence Islamic bank financing (Rashid et al., 2020). The strand of literature also indicates that domestic output positively influences Islamic bank financing (Caporale et al., 2020; Rashid et al., 2020).

We employ the cost of financing and the Industrial Production Index as a proxy for economic growth to determine the Murabaha financing rate in Indonesia. Sharia Bank is a financial intermediary institution that manages public funds. The community saves to Sharia banks in the form of deposits, which are then channeled by Sharia banks through financing. In channeling the funds, the bank sets the financing price as income, and the bank will then use this income to repay public funds invested in deposits (Hutapea & Kasri, 2010). The difference between revenue from financing and the cost of payment of deposits is called the margin (Trinugroho et al., 2018). Thus, the Murabaha financing rate is the price that Sharia borrowers must pay when choosing this type of financing. The higher the Murabaha financing rate, the less this financing will be available because the price for this type of contract is expensive. On the other hand, the low Murabaha financing rate increases financing due to the cheap cost of financing (Karim et al., 2017).

H_1: Murabaha financing rate negatively affects Murabaha financing

Business activities, including bank financing, are highly dependent on a country's macroeconomic conditions. One important macroeconomic indicator is gross domestic product (GDP). GDP is the production value of final goods and services produced within a country. if GDP rises, banks will expand financing to support the production of goods and services. Conversely, if GDP decreases, banks will reduce their financing (Rashid et al., 2020; Widarjono, 2018).

H_2: Industrial Production Index positively affects Murabaha financing

METHOD

This study uses the dynamic time series regression method utilizing a symmetric and asymmetric relationship between dependent and independent variables approach. The dependent variable is the Murabaha financing, and the independent variables are the Murabaha financing rate and Industrial Production Index. Murabaha financing rate represents the cost of Murabaha financing, and the Industrial Production Index indicates economic growth. Our study employs two independent variables for two basic reasons. First, instead of a complex model, it is a parsimony model since both variables can represent both micro and macro conditions (Karim et al., 2017). Second. ARDL and NARDL are time series models that require large data so regression models with many independent variables cannot be estimated properly due to insufficient data. Accordingly, the determinant of Murabaha financing can be stated using the time series regression following the study of Karim et al. (2017):

$$\mathrm{LMUR}_t = \emptyset_0 + \emptyset_1 \mathrm{Mr}_t + \emptyset_2 \mathrm{LIPI}_t + \mathrm{e}_t \quad (1)$$

Where MUR is the amount of Murabaha financing, Mr is the Murabaha financing rate, and IPI is the Industrial Production Index. Murabaha financing and Industrial Production Index are expressed in logarithmic form.

ARDL Method

Equation (1) can be estimated by assuming the impact of the explanatory variable on the dependent is the symmetric effect. That is the effect of rising and falling independent variables on the dependent variable is the same magnitude. We employ the Autoregressive Distributed Lag (ARDL), which was developed by Pesaran & Shin (1998) as follows:

$$\Delta \mathrm{LMUR}_t = \vartheta_0 + \theta_1 \mathrm{LMUR}_{t-1} + \theta_2 \mathrm{Mr}_{t-1} + \theta_3 \mathrm{LIPI}_{t-1} + \sum_{i=1}^{p} \vartheta_{1i} \Delta \mathrm{LMUR}_{t-1} + \sum_{i=1}^{p} \vartheta_{2i} \Delta \mathrm{MR}_{t-1} + \sum_{i=1}^{p} \vartheta_{3i} \Delta \mathrm{LIPI}_{t-1} + e_t \quad (2)$$

Where θ_1, θ_2, and θ_3 indicate the long-run coefficients. ϑ_{1i}, ϑ_{2i}, and ϑ_{3i} represents the short-run coefficients. p is the optimal lag on the first-differenced variables.

Some steps are required to estimate the ARDL model. The first step is a unit root test to check data stationarity. The next step is to estimate the ARDL model. The important thing in step two is to determine the length of the lag. The optimal lag is selected by the Akaike Information Criterion (AIC). The third step is the cointegration test to examine the long-term relationship between variables. This cointegration test is the bound testing approach developed by Pesaran et al. (Pesaran et al., 2001). This test requires testing the null hypothesis of no-cointegration $\theta_1 = \theta_2 = \theta_3 = 0$ against the alternative hypothesis of cointegration $\theta_1 \neq \theta_2 \neq \theta_3 \neq 0$. The final step is the long-run estimation of the regression coefficient in the ARDL model.

NARDL Method

The fall and rise in Murabaha financing rate and Industrial Production Index likely affect Murabaha financing asymmetrically. Both explanatory variables are sluggish, and the borrowers' response to the business cycle condition differs. Higher financing rate leads to borrowers slowing down their financing applications, but lower financing rate causes them to increase their financing applications. Similarly, during an economic upturn, Shariah banks will expand their financing due to the good financing profile of borrowers. Nevertheless, the bank will slow down its financing during the economic downturn because of the high financing risk. Based on existing banking literature, the impact of the independent variable on the dependent variable is asymmetric for the cases of Sharia bank products. A strand of empirical study confirms an asymmetric link, for example, the relationship between conventional bank interest rates and the Sharia bank deposit rates (Sukmana & Ibrahim, 2017; Widarjono et al., 2023), the relationship between Sharia bank deposit rates and Sharia deposits (Widarjono et al., 2022), link between interest rate and Islamic financing rate (Widarjono & Rafik, 2023). The influence of the asymmetric effect of Murabaha financing and the Industrial Production Index on Murabaha financing can be written as follows:

$$LMUR_t = \alpha + \theta^+ Mr_t^+ + \theta^- Mr_t^- + \delta^+ LIPI_t^+ + \delta^- LIPI_t^- + e_t \quad (3)$$

Mr_t^+, Mr_t^-, $LIPI_t^+$, and $LIPI_t^-$ denote partial sums of positive and negative changes in Mr and $LIPI$, respectively, and are calculated by Shin et al. (2014) as:

$$Mr_i^+ = \sum_{i=1}^{t} \Delta Mr_{i-1}^+ = \sum_{i=1}^{t} \max(Mr_i, 0)$$
$$Mr_i^- = \sum_{t=1}^{t} \Delta Mr_{i-1}^- = \sum_{i=1}^{n} \min(Mr_i, 0)$$
$$LIPI_i^+ = \sum_{i=1}^{t} \Delta LIPI_{i-1}^+ = \sum_{i=1}^{t} \max(LIPI_i, 0)$$
$$LIPI_i^- = \sum_{t=1}^{t} \Delta LIPI_{i-1}^- = \sum_{i=1}^{n} \min(LIPI_i, 0) \quad (4)$$

We employ the NARDL model to investigate the asymmetric effect of the Murabaha financing rate and Industrial Production Index on Murabaha financing, following Shin et al. (2014). The NARDL model of equation (3) can be written as:

$$\Delta LMUR_t = \vartheta_0 + \vartheta_1 LMUR_{t-1} + \vartheta_2^+ Mr_{t-1}^+ + \vartheta_2^- Mr_{t-1}^- + \vartheta_3^+ LIPI_{t-1}^+ + \vartheta_3^- LIPI_{t-1}^- + \sum_{i=1}^{l} \delta_{1i} \Delta LMUR_{t-1} + \sum_{i=0}^{m} \theta_i^+ \Delta Mr_{t-1}^+ + \sum_{i=0}^{n} \theta_i^- \Delta Mr_{t-1}^- + \sum_{i=0}^{m} \varphi_i^+ \Delta LIPI_{t-1}^+ + \sum_{i=0}^{n} \varphi_i^- \Delta LIPI_{t-1}^- + \mu_t \quad (5)$$

Some steps are required to estimate the NARDL model. The first step is the unit root test. The second step is the estimation of the NARDL. We employ the AIC method to determine the optimum lag with a maximum lag of 6 in estimating the NARDL model. The third step is the cointegration test, following the null hypothesis of no cointegration $\vartheta_1 = \vartheta_2^+ = \vartheta_2^- = \vartheta_3^+ = \vartheta_3^- = 0$. The fourth step is the asymmetric test. The long-run asymmetric impacts of fall and rise in financing rate and Industrial Production Index on financing are $\pi^+ = -\frac{\vartheta_2^+}{\vartheta_1}$, $\pi^- = -\frac{\vartheta_2^-}{\vartheta_1}$, $\rho^+ = -\frac{\vartheta_3^+}{\vartheta_1}$, $\rho^- = -\frac{\vartheta_3^-}{\vartheta_1}$. Two asymmetric tests are mandatory, consisting of $\pi^+ = \pi^-$ and $\rho^+ = \rho^-$. The last step in calculating the magnitude of the long-run coefficients of the NARDL are π^+, π^-, ρ^+ dan ρ^-.

Data

The data set of our study is the aggregate data of Murabaha financing of Sharia banks while the Murabaha financing rate is the average Murabaha financing rate of all Sharia banks, both Sharia commercial banks and Sharia business units. The research period is from January 2010 to December 2021 using monthly data. This study began in 2010, considering the number of Sharia banks before that year was small but since 2010, the number of Sharia banks has increased sharply to 33 Sharia banks. Data on Murabaha financing and Murabaha financing rates are sourced from the Indonesia Financial Service Authority (OJK). Industrial Production Index data are extracted from the Central Bureau of Statistics (www.bps.go.id).

RESULTS AND DISCUSSION

Table 1 displays the summary statistics of the variables. The average Murabaha financing was IDR 11.78 trillion, with a very wide variation due to the large standard deviation (IDR 46.229 trillion). This condition occurs because the development of the

number and assets of Sharia banking has accelerated after 2013. The average Murabaha rate was 12.93% with a standard deviation of 1.79%, meaning that the variation in the Murabaha financing rate is relatively small. The average Industrial Production Index was 125.93, with a relatively stable level of variation. This condition demonstrates that Indonesia's macroeconomic conditions did not experience much turmoil during the study period.

Table 1

Summary Statistics

Variable	Mean	Maximum	Minimum	Std. Dev.
MUR (IDR Millar)	117815.60	190884.20	26532.00	46229.98
MR (%)	12.93	17.15	9.85	1.79
IPI	125.93	158.00	92.32	16.68

Source: Authors' estimation.

The requirements for the ARDL and NARDL methods can be applied if there is no stationary data in the second differenced data. The advantage of the ARDL and NARDL models is that the level of data stationarity is not the same as long as the data is not stationary in the second differenced data (Pesaran & Shin, 1998; Shin et al., 2014). Table 2 presents the results of the unit root test. All variables are stationary at levels using the ADF and PP tests. Meanwhile, on the first differenced data, the findings of the ADF and PP tests reveal that any variable is stationary. These findings suggest that the ARDL and NARDL models can be used to estimate the determinant of Murabaha financing in Indonesia.

Table 2

Unit Root Test Results

	Level				First difference			
	ADF		PP		ADF		PP	
Var.	Constant	Trend	Constant	Trend	Constant	Trend	Constant	Trend
Lmur	-9.816***	-4.240***	-6.231***	-2.972	-1.732	-3.695**	-8.333***	-10.805***
Mr	-1.719	-3.517**	-1.671	-4.807***	-16.823***	-16.770***	-18.282***	-18.235***
LIPI	-1.572	-5.418***	-2.029	-5.463***	-12.515***	-12.479***	-25.635***	-26.755***

Source: Authors' estimation.

Note**: ***, **, *** reject the null hypothesis at 1%, 5%, and 10%.

ARDL Results

The first method assumes that the influence of the financing rate and Industrial Production Index is symmetric using the ARDL method. The estimation method uses Ordinary least squares (OLS). The maximum lag length chosen is 6 using the AIC method. The results of the ARDL model are shown in Table 3. The AIC method produces an ARDL model (5,0,0). Murabaha financing is affected by one previous month of Murabaha financing $(LMUR_{t-1})$, two previous months of Murabaha financing $(LMUR_{t-2})$, and the Murabaha financing rate.

Table 3

ARDL Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ARDL				
$LMUR_{t-1}$	0.9840***	0.0842	11.6826	0.0000
$LMUR_{t-2}$	0.1470*	0.0773	1.9014	0.0594
$LMUR_{t-3}$	0.0578	0.1437	0.4026	0.6879
$LMUR_{t-4}$	-0.0863	0.1333	-0.6471	0.5187
$LMUR_{t-5}$	-0.1193	0.1090	-1.0945	0.2758
Mr	-0.0015**	0.0006	-2.2865	0.0238
$LIPI$	0.0015	0.0125	0.1210	0.9039
$Const.$	0.2121***	0.0810	2.6177	0.0099
Long-run				
Mr	-0.0870***	0.0352	-2.4734	0.0074
$LIPI$	0.0903	0.7431	0.1216	0.9034
$Const.$	12.6872***	3.9742	3.1924	0.0018
R-squared	0.9994			
Diagnostic test				
LM	6.4065**	0.0406		
ARCH	0.0155	0.9009		
CUSUM	Stable			
CUSUM squares	Stable			
Cointegration test	4.1570**			

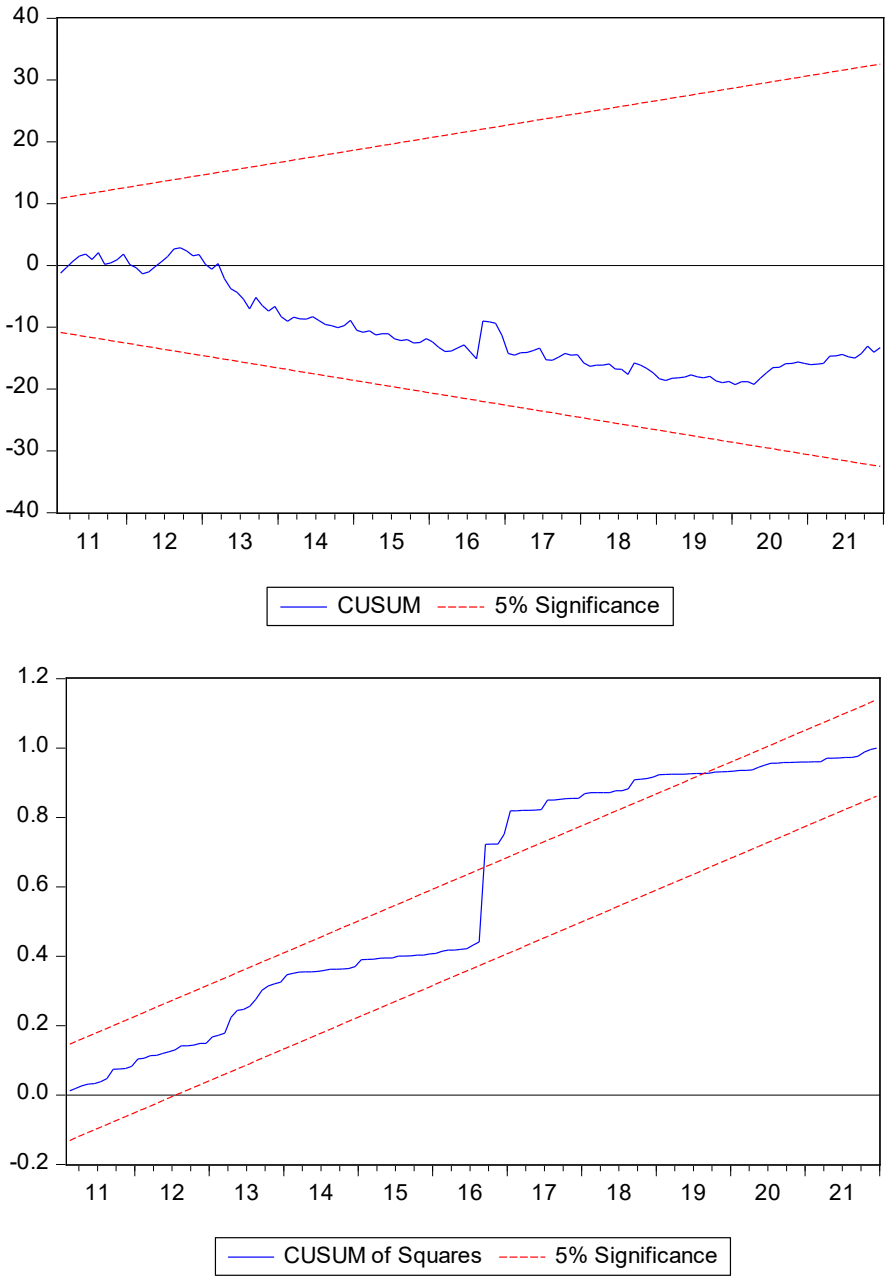
Source: Authors' estimation.

Note**: ***, **, *** reject the null hypothesis at 1%, 5%, and 10%.

This study utilizes the HAC method to overcome the autocorrelation problem to produce an unbiased and consistent estimator, although it is not efficient so it can be employed for hypothesis testing, both the F test and the t-test. The OLS method will produce an unbiased and efficient estimator if there are no autocorrelation and heteroscedasticity problems. We employ the Lagrange Multiplier test (LM) and Autoregressive conditional heteroscedasticity (ARCH) to examine autocorrelation and heteroscedasticity problems. In addition, this study also checked the stability of the estimated parameters using CUSUM and CUSUM-Squares. The results of diagnostic tests are shown at the bottom of Table 3. The model contains autocorrelation problems but passes from heteroscedasticity problems, and there is a stable regression coefficient which is presented in Figure 1.

Figure 1

CUSUM and CUSUM-Squares for the ARDL Model



Source: Authors' estimation.

ARDL model produces a coefficient of determination (R^2) of 0.9994, which means that the ARDL can describe 99.94% of Murabaha financing in Sharia banks in Indonesia. The next step is to evaluate the long-run relationship between the variables using the cointegration test with the bound testing approach. The cointegration test results are shown at the bottom of Table 3. This cointegration test follows the F-statistics test (F_{PSS}), while its critical value follows (Pesaran et al., 2001). The critical value comprises the lower bound I(0) and the upper bound I(1). If the calculated F value is greater than I(1), the conclusion is evidence of cointegration. However, if the

calculated F is less than I(0), the result suggests evidence of no cointegration. Meanwhile, as the calculated F is greater than I(0) but smaller than I(1), the result is indecision. The calculated F value of F_{PSS} is 3.9253. The calculated F value of F_{PSS} exceeds I(1) at α=5%, implying evidence of the long-run relationship between the explanatory and dependent variables.

The long-run coefficients of the ARDL model are presented in the middle of Table 3. The Murabaha financing rate (Mr) variable is negative and significant at α=1%, as expected in the first hypothesis, meaning that a rise in the Murabaha financing rate causes a fall in Murabaha financing. Conversely, a decrease in the Murabaha financing rate increases Murabaha financing. The financing rate is the cost of borrowing. If the Murabaha financing rate increases, the cost of borrowing will be expensive for customers, so they will reduce their financing. This finding is in line with the study of Karim et al. (2017), in which the cost of borrowing has a negative effect on Sharia bank financing. The Industrial Production Index is positive but not significant, implying that domestic output does not affect Murabaha financing. In conclusion, Sharia banks are resilient to the business cycle, confirming a study by Ibrahim (2016).

NARDL Results

The NARDL method assumes that the influence of the financing rate and the Industrial Production Index is an asymmetric relationship. Like the ARDL model, we estimate the NARDL model with Ordinary least squares (OLS) and the highest lag is 6. The optimum lag is chosen using the AIC method. Table 4 displays the estimation results of the NARDL model. The results of the NARDL model show that the explanatory variables that affect Murabaha financing are the previous month's Murabaha financing ($LMUR_{t-1}$), the increase in the Murabaha financing rate (Mr_t^+), and the increase in the Industrial Production Index ($LIPI_t^+$). Meanwhile, the decrease in Murabaha financing rate (Mr_t^-) and Industrial Production Index ($LIPI_t^-$) have no effect on Murabaha financing.

If the autocorrelation and heteroscedasticity assumptions are not violated, then the OLS method generates an unbiased as well as an efficient estimator. Autocorrelation problems were tested using the Lagrange Multiplier test (LM) method and heteroscedasticity problems were checked using Autoregressive conditional heteroskedasticity (ARCH). In addition, the CUSUM and CUSUSM-Squares tests are used to check the stability problems of the estimated parameters. Based on the LM test, we fail to reject the null hypothesis, so the model is free from autocorrelation problems. The NARDL model is also free from heteroscedasticity problems with ARCH because we fail to reject the null hypothesis. The CUSUSM and CUSUM-squares tests in Figure 2 indicate that the estimated coefficients of the NARDL model are stable.

Table 4

NARDL Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NARDL				
$LMUR_{t-1}$	0.9874***	0.0049	200.3315	0.0000
Mr_t^+	-0.0045***	0.0013	-3.4694	0.0007
Mr_t^-	-0.0002	0.0012	-0.1819	0.8559
$LIPI_t^+$	0.0368*	0.0203	1.8075	0.0729
$LIPI_t^-$	0.0190	0.0192	0.9864	0.3257
$Const.$	0.1685***	0.0524	3.2148	0.0016
Long run				
Mr_t^+	-0.3582**	0.1732	-2.0679	0.0203
Mr_t^-	0.0176	0.0953	-0.1846	0.4269
$LIPI_t^+$	2.9158**	1.7216	1.6937	0.0463
$LIPI_t^-$	-1.5028	1.4822	1.0139	0.1562
$Const$	13.3641***	1.0832	12.3381	0.0000
R-squared	0.9995			
Diagnostic test				
LM test	0.9494	(0.6221)		
ARCH test	0.0450	(0.8320)		
CUSUM	Stable			
CUSUM Squares	Stable			
Cointegration test	58.3012***			
Asymmetric test				
Mr.	4.1845**	(0.0427)		
LIPI	4.7611**	(0.0308)		

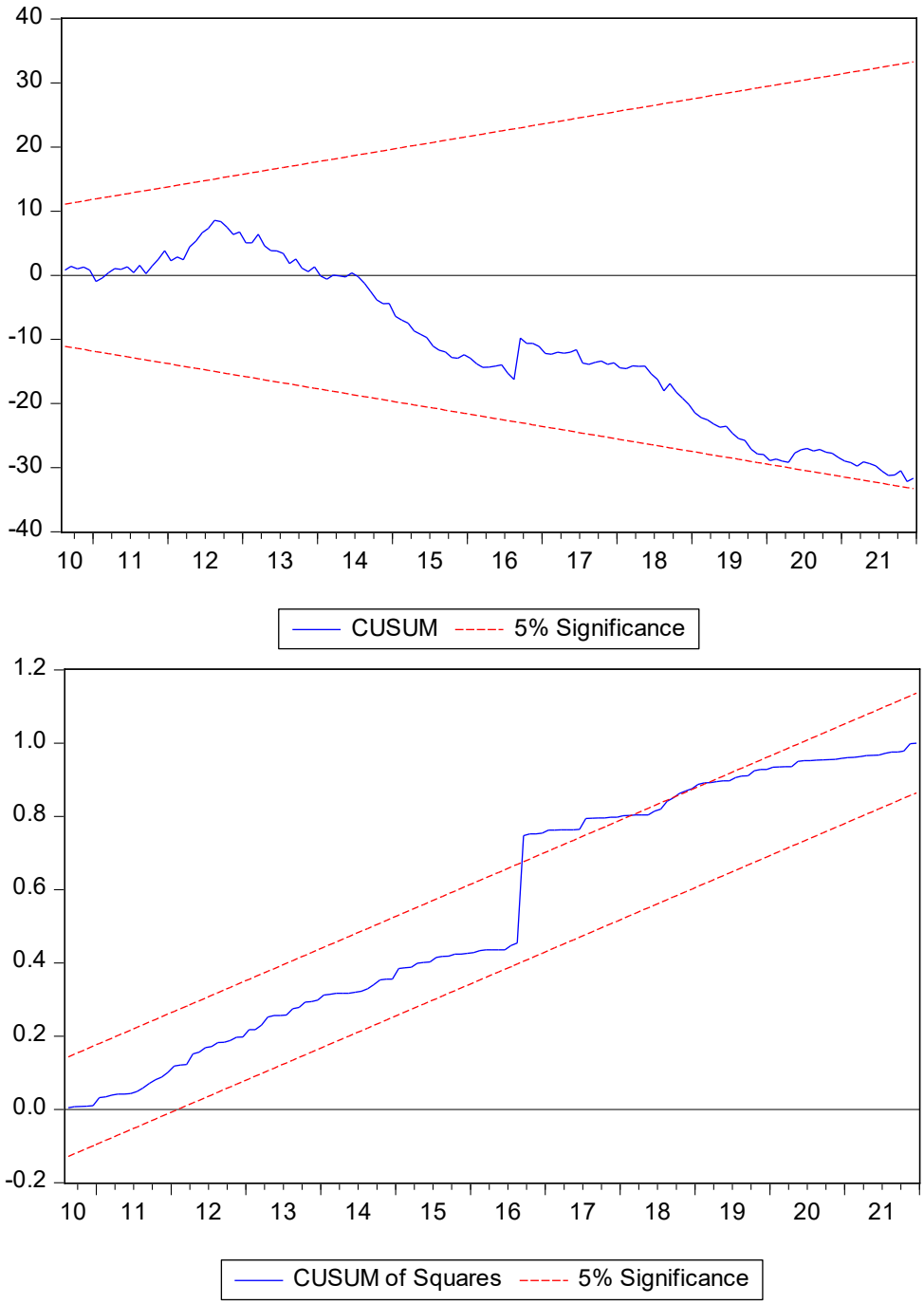
Source: Authors' estimation.

Note**: ***, **, *** reject the null hypothesis at 1%, 5%, and 10%.

The coefficient of determination (R^2) indicating the goodness of fit in the NARDL model is 0.9995. The NARDL model can explain the variation of Murabaha financing in Indonesia well because the explanatory variable is able to explain 99.95% of the Murabaha financing. As a dynamic time-series regression model like the ARDL model, the long-run relationship between variables is very important. The cointegration test with the bound testing approach reveals that the calculated F_{PSS} is 58.30. The calculated F exceeds the Upper bound I (1) value at α = 1% so that a long-run link between the explanatory and the dependent variables is found.

Figure 2

CUSUM and CUSUM-Squares for the NARDL Model



Source: Authors' estimation.

The next evaluation is to test the asymmetric relationship between the dependent variable and the explanatory variable. This test follows the F distribution. Because there are two explanatory variables, there are two asymmetric tests. The first is an asymmetric test for the Murabaha financing rate (Mr). The calculated F value is 4.1845, with a probability of 0.0427. This probability value is smaller than α=5% so we reject the

null hypothesis. This finding indicates that the Murabaha financing rate has an asymmetric effect on Murabaha financing. The rise and fall in the Murabaha rate have different effects on Murabaha financing. The second asymmetric test is for the Industrial Production Index. The probability of the F test is 0.0308, with a computed F value of 4.761. We reject the null hypothesis because this probability is less than α=5%. This finding suggests that the Industrial Production Index has an asymmetric effect on Murabaha financing. Murabaha financing has a different response to an increase and decrease in the Industrial Production Index.

After conducting the asymmetric test, the last step is to test the effect of increases and decreases in the Murabaha financing rate and Industrial Production Index on Murabaha financing in the long run condition by using the t-test. The middle part of Table 4 shows the effect of asymmetric explanatory variables in the long run. An increase in the Murabaha financing rate (Mr_t^+) is negative and significant at α=5%. Meanwhile, a decrease in the Murabaha financing rate (Mr_t^-) is positive but not significant. These findings show that when the Murabaha financing rate increases, Murabaha financing will decrease. However, when the Murabaha financing rate decreases, Murabaha financing is not affected.

The Industrial Production Index also has an asymmetric effect on Murabaha financing. A rise in the Industrial Production Index $(LIPI_t^+)$ is positive and significant at α=5%. Meanwhile, a fall in Industrial Production Index$(LIPI_t^-)$ is negative and not significant. These results illustrate that Murabaha financing will increase when the Industrial Production Index increases but Murabaha financing does not change when the Industrial Production Index decreases.

The long-term coefficient shows that the variable (Mr_t^+) has a negative effect on Murabaha financing but the variable (Mr_t^-) has no effect on Murabaha financing. These results indicate that an increase in the cost of borrowing will reduce Murabaha financing. There are two reasons. First, the high Murabaha rate causes the cost of borrowing to be expensive so customers will reduce their financing. Second, Sharia bank customers have alternative sources of financing from conventional banks. Studies document that Sharia bank customers are rational agents based on profit-driven motives in dual banking systems such as Indonesia (Widarjono et al., 2022). Sharia bank customers will switch to conventional banks if the price for Murabaha financing from Sharia banks is expensive (Saeed et al., 2021). This finding is in line with research from Šeho et al. (2020) on the cases of 77 Sharia banks from 13 countries. Murabaha financing has decreased because consumers have switched to conventional banks, which offer lower financing prices.

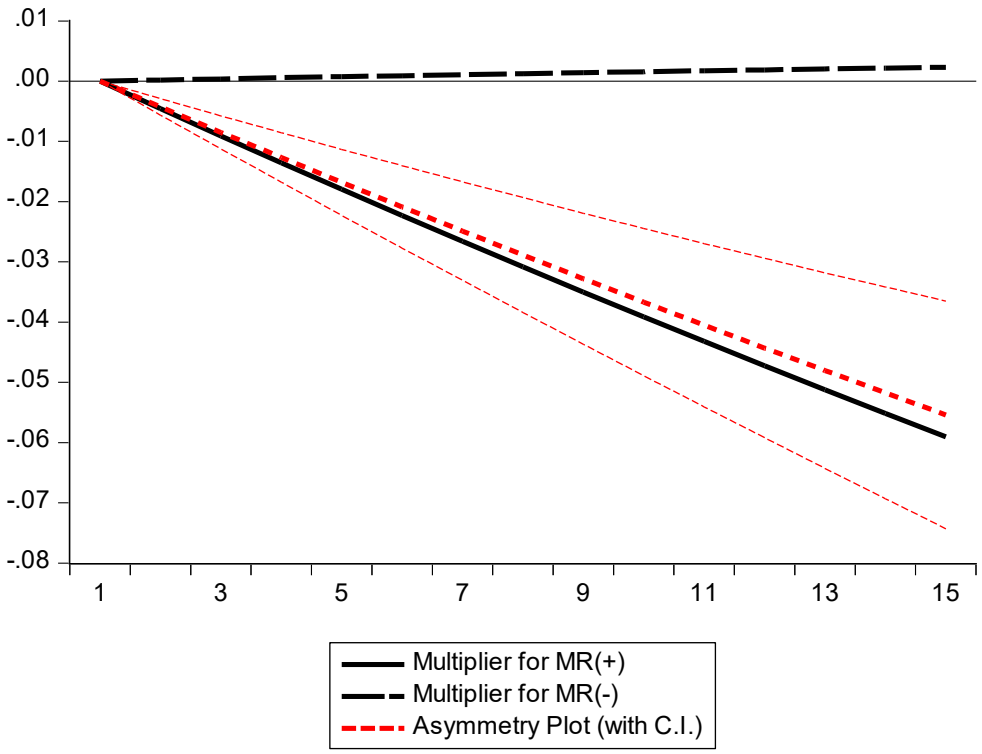
Furthermore, the $LIPI_t^+$ has a positive effect on Murabaha financing, but the $LIPI_t^-$ has no effect on Murabaha financing. The economic boom leads to producing goods and services, so entrepreneurs need additional funds to finance their activities. This increase in investment is marked by an increase in Sharia bank financing. This study confirms a previous study on Malaysia's Sharia banking, where GDP positively affects Sharia banks' financing (Rashid et al., 2020). However, with the economic slowdown, Sharia bank financing is not affected. This implies that Sharia banks are resilient

against economic shocks. This finding is in line with the findings of Ibrahim (2016) and Karim et al. (2017) where Sharia banks have less pro-cycle to the business cycle than conventional banks.

The final evaluation is the dynamic multiplier effect of the increase and decrease in the Murabaha financing rate and Industrial Production Index on Murabaha financing. Figure 3 depicts the multiplier effect of the Murabaha financing rate on Murabaha financing. Murabaha financing is greatly influenced by the increase in the Murabaha financing rate. The increase in the Murabaha rate causes a drastic decrease in Murabaha financing, but the decrease in the Murabaha financing rate does not have an impact on Murabaha financing. The multiplier effect of the Industrial Production Index on Murabaha financing is illustrated in Figure 4. Economic upturns cause an increase in Murabaha financing, while economic downturns reduce Murabaha financing. More interestingly, the decrease in financing is smaller than the increase in financing if an external shock occurs due to the business cycle. This figure shows that Sharia banks are resilient in the event of an economic shock, which reinforces previous findings.

Figure 3

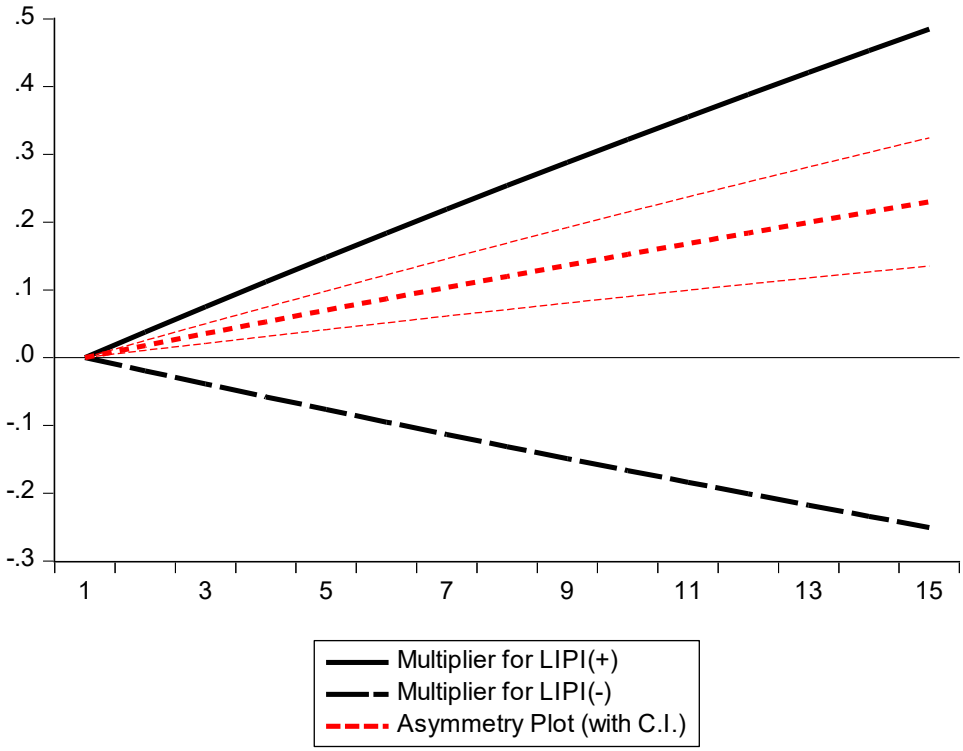
Multiplier Effect of Murabaha Financing Rate on Murabaha Financing



Source: Authors' estimation.

Figure 4

Multiplier Effect of Industrial Production Index on Murabaha Financing



Source: Authors' estimation.

Robustness Test

We conduct a robustness test by using an alternate method in estimating the NARDL model. This study utilizes the Schwarz Information Criterion (SIC) method with robust standard error to select the optimal lag. Table 5 presents the findings. The long-term coefficient of Mr_t^+ negatively influences Murabaha financing but Mr_t^- has no impact on Murabaha financing. The coefficient of $LIPI_t^+$ positively affects Murabaha financing but the $LIPI_t^-$ does not affect Murabaha financing. Our findings suggest that a rise in the cost of borrowing lowers Murabaha financing and economic upturns persistently increase Murabaha financing. These results are consistent with previous findings using the Akaike Information Criterion (SIC).

Table 5

NARDL Results: Schwarz Criterion (SIC)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NARDL				
$LMUR_{t-1}$	0.9874***	0.0047	209.1444	0.0000
Mr_t^+	-0.0045***	0.0010	-4.4991	0.0000
Mr_t^-	-0.0002	0.0008	-0.2738	0.7846
$LIPI_t^+$	0.0368**	0.0171	2.1492	0.0334

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$LIPI_t^-$	0.0190	0.0158	1.1992	0.2325
$Const.$	0.1685***	0.0499	3.3752	0.0010
Long run				
Mr_t^+	-0.3582**	0.1779	-2.0133	0.0230
Mr_t^-	-0.0176	0.0635	-0.2770	0.3911
$LIPI_t^+$	2.9158**	1.6336	1.7849	0.0383
$LIPI_t^-$	1.5028	1.2912	1.1639	0.1233
$Const$	13.3641***	1.0619	12.5845	0.0000
R-squared				
Diagnostic test				
LM test	0.7915	0.3737		
ARCH test	0.0492	0.9757		
CUSUM	Stable			
CUSUM Squares	Stable			
Cointegration test	58.3012***			
Asymmetric test				
Mr.	3.7711*	0.0542		
LIPI	4.9865**	0.0272		

Source: Authors' estimation.

Note**: ***, **, *** reject the null hypothesis at 1%, 5%, and 10%.

CONCLUSION

This study investigates Murabaha financing, which is the largest portion of Sharia banking financing in Indonesia. The determinants of Murabaha financing consist of the Murabaha financing rate as the cost of borrowing money and the Industrial Production Index, which represents macroeconomic conditions. The method is the symmetric and asymmetric approach. The findings suggest that the Murabaha financing rate negatively affects Murabaha financing, but the Industrial Production Index has no effect on Murabaha financing. More importantly, according to asymmetric analysis, an increase in the Murabaha financing rate reduces Murabaha financing, but Murabaha financing has no response to a decrease in the Murabaha financing rate. Economic boom fosters the growth of Murabaha financing but Murabaha financing is not affected by economic downfall.

Our findings have important implications for Sharia banks. Sharia bank financing rates are higher than conventional bank loan interest rates (Widarjono & Rafik, 2023). The increase in the Murabaha financing rate reduced the Murabaha financing quite drastically. Sharia bank consumers are profit-driven so an increase in the Murabaha

financing rate causes consumers to switch to conventional banks. One way to reduce the Murabaha financing rate is to reduce operating efficiency. By increasing the bank size, Islamic banks can achieve economies of scale and accordingly can lower average costs.

This study focuses on Murabaha financing as a type of non-PLS financing. There are several types of Sharia bank financing, consisting of Musyaraka, Mudharaba, Istisna, Ijarah, and Qard. Therefore, further research can be carried out for all types of Sharia bank financing to be able to capture the behavior of each financing, especially Musyaraka, which is the second largest portion of Sharia bank financing and one of the Sharia bank's core businesses.

Author Contributions

Conceptualization	A.W. & M.M.	Resources	A.W. & M.M.
Data curation	A.W. & M.M.	Software	A.W. & M.M.
Formal analysis	A.W. & M.M.	Supervision	A.W. & M.M.
Funding acquisition	A.W. & M.M.	Validation	A.W. & M.M.
Investigation	A.W. & M.M.	Visualization	A.W. & M.M.
Methodology	A.W. & M.M.	Writing – original draft	A.W. & M.M.
Project administration	A.W. & M.M.	Writing – review & editing	A.W. & M.M.

All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement

Informed consent was not required for this study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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Conflicts of Interest

The authors declare no conflicts of interest.

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