



# Profitability Analysis of Sharia Commercial Banks in Indonesia

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**Abstract.** This research aims to analysis the influence of the Capital Adequacy Ratio (CAR), Financing to Deposit Ratio (FDR), Non-Performing Financing (NPF), and Operational Costs and Operating Income (BOPO) on Return On Assets (ROA) that represent the Profitability of Sharia Commercial Banks between the period 2016 to 2020. The method of analysis was employed VECM (Vector Error Correction Model). The results of data analysis show that in the short-term estimation only the Capital Adequacy Ratio and Non-Performing Financing variables significantly affect the ROA of Sharia Banks. On the other hand, other independent variables such as Financing to Deposit Ratio and operating expenses operating income do not significantly affect the ROA of Sharia banks. The results of the long-term estimation of the CAR, NPF, and BOPO variables have a significant effect on the ROA of Sharia commercial banks, and only the FDR variable does not show a significant influence on the ROA of Sharia commercial banks. Furthermore, in the results of the Impulse Response Function in Islamic commercial banks, profitability represented by ROA responds to shocks from the CAR, FDR, NPF, and BOPO variables positively and the Variance Decomposition results in the observation period show that the more dominant in the first period is the ROA variable itself which affect the development of ROA and in the next period is influenced by variations in the dependent variable and other independent variables.

**Keywords:** Return on Asset · Capital Adequacy Ratio · Financing to Deposit Ratio · Non-Performing Financing · Vector Error Correction Model

## 1 Introduction

The transition of economic activity is marked by the application of digital technology in transactions. Digital technology has led to a leap into the future that will soon seize opportunities in education, the economy, and business. Economic ecosystems have experienced significant developments in strengthening the existence and sustainability of economic activities. Sectors of economic activity can grow in the use of resources and increase the added value of the economy.

There were volatility condition in global macroeconomic. Inflation, economic growth and interest rate have volatility in response the condition. Bank Indonesia (BI) has an important role in maintaining the stability of the national economy. Research by

Medyawati and Yunanto (2022) have shown that the industrial sector has a positive response to the shock of the BI interest rate variable.

Industrial Banking is currently considered the most influential sector in the economy of a nation. Banks that are currently operating are expected to guarantee public confidence, by maximizing efficiency, guaranteeing liquidity, and achieving maximum profitability. In general, Indonesia's operational system uses conventional and sharia systems. Currently, many conventional banks have been converted to Islamic banks to attract the attention of large numbers of customers such as BCASyariah, Maybank Syariah, BNISyariah, Bank Mandiri Syariah (BSM), Bank Danamon Syariah, BRISyariah, and others. According to OJK, in 2020 Islamic Commercial Banks (BUS) showed fairly well-maintained stability when compared to Conventional Commercial Banks (BUK) despite being in a COVID-19 pandemic situation. In terms of capital, the CAR of Islamic Commercial Banks showed good and positive growth even though the figures shown were below those of Conventional Commercial Banks. At the end of 2020, the BUS CAR figure was 21.64 percent, an increase of 105 bps from the previous year. The increase in BUS CAR was influenced by the slowdown in financing growth and banks were also increasingly cautious in disbursing financing. On the other hand, the profitability of Islamic banking which was affected by the slowdown in financing was shown by the decline in the ROA BUS ratio in 2020 by 1.40 compared to the previous year of 1.73 percent.

In a situation like this, Islamic banking is required to have good performance to participate in competing for the share of the banking market in Indonesia. The performance of a sharia bank is the most important factor for customers in determining their choice. Performance in terms of finance is a certain situation and condition including fund collection and distribution of funds that can be measured from capital adequacy, liquidity, and profitability in a certain period, this is done by analysis to see how banks operate financial rules properly and correctly. Thus, it is expected that the bank will always have a healthy performance so that it will not harm the people associated with the bank. Profitability is considered as one of the things that indicate correctly for measuring the performance bank, performance can be described as the condition and situation of the bank in a certain period which also includes the condition and financial situation of the bank (Ardana, 2018). One of the main factors that affect profitability is bank characteristics, in this case, each bank must have different characteristics that make the level of profitability of each existing bank will not be the same.

Astohar and Setiawan (2009) explained that the bank characteristic variable contains the bank's financial ratios, namely in terms of capital, overall financing, liquidity, bank activities carried out, productive assets, and operational efficiency which also influence the profitability of the bank. Ubaidillah (2016) in his research explains that the profitability ratio in measuring the ability of a bank to create profits at the level of sales, assets, capital and shares, and so on has three ratios that are often discussed, namely Return On Assets (ROA), profit margin, and Return on Equity (ROE). In determining the health condition and performance of a bank, Bank Indonesia (BI) as a supervisory bank refers more to ROA than ROE. In this case, BI considers ROA to be more representative of the measurement of banking profitability because it prioritizes profitability

which is calculated from assets, most of which come from public savings funds (Avrita and Pangestuti, 2016).

ROA is a ratio to take into account bank management in obtaining operating profit, a higher ROA is considered to increase profits at a bank so that banks are considered to be better at managing their assets (Moorcy, 2020). Therefore, this study uses ROA as the profitability ratio of Islamic commercial banks. Bank profitability can be determined by factors that can be controlled by management such as bank policies and decisions, fundraising, capital management, liquidity management, and cost management. There are also factors outside of management, one of which is environmental factors. The other ratios that will be used in this research consist of the Capital Adequacy Ratio (CAR), Financing To Deposit Ratio (FDR), Non-Performing Financing (NPF), and Operating Costs per Operating Income (BOPO).

Based on Table 1, the average CAR of Sharia commercial banks in Indonesia between 2016 and 2020 continues to increase. In 2020, there was an increase of 21.64 percent, but the Return on Assets decreased to 1.40. This is not following the theory that states that when the CAR increases, the ROA should also increase. The average FDR of Sharia commercial banks has decreased between 2016 to 2020. FDR in 2018 decreased to 78.53 but the percentage of ROA increased to 1.73 this is not following the theory. When FDR increases, ROA also increases. The average NPF of Sharia commercial banks fluctuated the between 2016 to 2020 period. in 2020 it decreased to 3.13 and the average value of ROA also decreased to 1.4 which means that the data above is not following the theory which states that if the NPF value decreases, the ROA value should increase. The average BOPO of Sharia commercial banks between the 2016 to 2020 period fluctuated. In 2020, BOPO increased to 85.55 and the average ROA value also decreased to 1.4, which means that the data above is not following the theory that states that if the BOPO value increases, the ROA value should decrease.

Profitability at a bank is also reflected in the financial performance ratio, namely the CAR (Capital Adequacy Ratio). The use of this ratio is to assess the safety and health of the company in terms of its capital ownership. The bigger the CAR percentage, the stronger the ability of a bank to bear all risks on each credit or productive asset. It can be interpreted that the bigger the level of capital adequacy owned to bear the risk of existing bad loans, thus the bank's performance will improve as well. It can increase

**Table 1.** Development of ROA, CAR, FDR, NPF, and BOPO of Islamic Commercial Banks 2016 to 2020.

Variables	2016	2017	2018	2019	2020
ROA	0.63	0.63	1.73	1.73	1.4
CAR	16.63	17.91	20.39	20.59	21.64
FDR	85.99	79.61	78.53	77.91	76.36
NPF	4.42	4.76	3.31	3.23	3.13
BOPO	96.22	94.99	89.18	84.55	85.55

Source: Financial Services Authority, 2021

public confidence in the bank which results in increased profitability (Ubaidillah, 2016). The results of the research explain that CAR affects the profitability (ROA) of Islamic banking (Fitriana and Oetomo, (2016); Sitompul and Nasution (2019) and Ubaidillah (2016)). In his research Lemiyana and Litriani (2016) also explained that CAR does not harm ROA. However, research by Munir (2018) and Lutfi and Santosa (2021) explained that CAR does not have a significant impact on the ROA of sharia banks in Indonesia.

In terms of liquidity, it is reflected in the ratio of Financing To Deposit Ratio (FDR). FDR is a ratio to take into account the percentage of bank liquidity so can show the bank fulfilling credit requests by using all the assets owned by the bank (Dendawijaya, 2009). If the percentage of FDR is increasing, it can indicate that the liquidity capacity of an Islamic bank will be lower. Thus, it can be concluded that if the percentage of liquidity decreases, will be related to the increase in the percentage of profitability (Almunawwaroh and Marliana, 2018). The results of the research from Purbaningsih and Fatimah (2014); Syakhrun et al., (2019); Sitompul and Nasution (2019) and Ardana (2018) explained that FDR showed a significant impact on the profitability of Sharia banking, in this case, is ROA. On the other hand, research conducted by Purwasih and Wibowo (2021); Munir (2018); Lutfi and Santosa (2021) and Lemiyana and Litriani (2016) explained that FDR showed have not significant influence on ROA.

In the next aspect, asset quality is reflected in the level of risk borne by a bank in providing several credits. Asset quality is proxied by NPF (Non-Performing Financing). NPF is intended to calculate and see the percentage of non-performing financing faced by Islamic banks. The higher this ratio will be considered to reduce the level of profit earned because banks that are unable to raise financing funds result in banks being unable to finance other productive assets. So that it can cause bank profits to decline and the percentage of bank profitability is disrupted and NPF is considered to harm profitability. In his research Ubaidillah (2016) and Syakhrun et al., (2019) explains that NPF harms ROA. However, research by Purwasih and Wibowo (2021); Munir (2018); Syah (2018); Sitompul and Nasution (2019) and Haryati et al., (2019) explained that NPF showed a significant influence on the Return On Asset of sharia banks.

One of the other factors that influence profitability is BOPO (operating costs to operating income). Bank activities as a whole will certainly require costs. Spending inefficient costs will reduce profits and vice versa. if the profit is higher than the cost it will increase the profit. Thus, it is very important to pay attention to the BOPO ratio to achieve the maximum level of efficiency. When operating costs are high, it is considered that it will reduce the profits obtained at a bank which can also have an impact on decreasing the level of profitability, so BOPO is considered to harm banking profitability (Ubaidillah, 2016). Similar to the results of research (Lemiyana and Litriani (2016) and Syakhrun et al., (2019) which conclude that BOPO does not show significant results on ROA of Sharia banks. However, different things are shown that BOPO shows significantly impact the ROA of Sharia Banks (Purwasih and Wibowo (2021); Nuha and Mulazid, (2018); Syah (2018); Sitompul and Nasution (2019) and Raharjo et al., (2020)).

With the phenomenon of Sharia banks and there are gaps and differences in the results of previous studies between studies conducted with one another regarding its effect on profitability. Thus, This research aims to analysis the influence of the independent variable, namely the Capital Adequacy Ratio (CAR), Financing To Deposit Ratio

(FDR), Non-Performing Financing (NPF), and Operational Costs and Operating Income (BOPO) on the dependent variable, namely Return On Assets (ROA) to represent the Profitability of Sharia Commercial Banks between the period 2016 to 2020.

## 2 Method

This study uses a quantitative approach. The type of data that will be used in this research is secondary data using monthly Time series data starting from the 2016 to 2020 period which was obtained directly from the official website of the Otoritas Jasa Keuangan (OJK). This research uses a population in the form of sharia Commercial Banks registered with OJK from 2016 to 2020, namely as many as 13 Islamic Commercial Banks that will be sampled in this research. The method of data collection in this research uses the documentation method, namely by recording, collecting, and reviewing existing secondary data in the form of monthly financial statements of Sharia commercial banks from the official website of the Otoritas Jasa Keuangan Indonesia (OJK).

This study describes the independent variables consisting of the Capital Adequacy Ratio, Financing To Deposit Ratio, Non-Performing Financing, and Operational Costs and Operating Income to be analyzed and see their effect on the dependent variable, namely return on assets which will represent the profitability of Islamic commercial banks., then the researcher uses the VECM (Vector Error Correction Models) analysis model to see the short-term and long-term relationship using EViews Version 10 software. In this study, several steps must be done first,

1. This research begins with the first stage, namely the stationarity test using the unit root test to examine the non-stationary data, the data will be considered non-stationary if it is found that the average value of the variation is not constant. The root test was used by looking at the value of the Augmented Dickey-Fuller (ADF-Test) result. Using the following formula:

$$\Delta Y_t = \alpha_0 + Z_t + \alpha_1 Y_t + \sum_{i=1}^p \alpha_i \Delta Y_{t-i} + \epsilon_t$$

Where  $\alpha_0$  is a constant,  $t$  is a deterministic trend,  $\epsilon$  is an error term. When the autoregressive of  $Y$  ( $Y_t = 1$ ) contains a unit root, then the ratio  $t$  for  $\alpha_1$  should be consistent with the hypothesis  $\alpha_1 = 0$ .

2. Cointegration Test, namely by using the Johannes cointegration test to determine the number of group cointegrations. The cointegration concept aims to see the long-term relationship between the variables to be observed. A cointegration test is performed to see the stationary residual in the equation. If there is cointegration in the variable,

it will be continued with the fifth stage, namely the VECM model test. The Johansen cointegration test uses the following formula:

$$\begin{aligned} \lambda_t(r) &= -T \sum_{i=r+1}^g \ln(1 - \lambda_i) \\ \lambda_m(r, r+1) &= T \ln(1 - \lambda_{r+1}) \end{aligned}$$

3. Estimation of the VECM model, this model can be used if a cointegration relationship is found between variables and can be shown through the response of the dependent variables to shocks in the variable itself or other variables. VECM uses the following formula:

$$\Delta Y_t = \alpha e_{t-1} + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \dots + \beta_p \Delta y_{t-p+1} + \varepsilon_t$$

where

$$e_{t-1} = y_{t-1} - (\emptyset + wX_{t-1})$$

$$e_{t-1} = y_{t-1} - (\emptyset + wX_{t-1})$$

4. Impulse Response Function which aims to determine the existence of shocks or changes in the independent variable and Variance Decomposition test which aims to measure how much contribution the variable influences independent of the dependent variable.

### 3 Result and Discussion

#### 3.1 Data Stationarity Test

To find out whether the data in this study is stationary or not, a unit root test is carried out, be seen at the size of the Augmented Dickey-Fuller Test (ADF-Test) value with the same degree for each variable. In this case, the data will be considered stationary if the probability value is less than 5% or 0.05 and the critical value is greater than the ADF-Test t-statistics (Mukhlis and Pratama, 2021).

Table 2 explains that all variables using the ADF-Test at the level have a value greater than the probability number of 0.05 and the critical value is smaller than the t-statistic which means that all variables at the non-stationary level. Thus, the next step that needs to be done is the ADF-Test at the first different level. From Table 2, it can be seen that at the first different level all variables have a value less than the probability number of 0.05 and the critical value has a greater number than t-statistics. Thus, it can be seen that all variables are stationary in the ADF-Test at the first different level.

**Table 2.** Unit Root Test Results for

Variable.		Prob.	T-Statistic	Critical Value 5%	Conclusion
ROA	Lv	0.4456	-1.660786	-2.91173	Non Stationery
	Diff1	0.0000	-9.248808	-2.912631	Stationary
CAR	Lv	0.7680	-0.941714	-2.91173	Non Stationery
	Diff1	0.0000	-7.282302	-2.912631	Stationary
FDR	Lv	0.5838	-1.384482	-2.912631	Non Stationery
	Diff1	0.0000	-10.06818	-2.912631	Stationary
NPF	Lv	0.2580	-2.068162	-2.915522	Non Stationery
	Diff1	0.0005	-4.576649	-2.915522	Stationary
BOPO	Lv	0.6726	-1.191446	-2.91173	Non Stationery
	Diff1	0.0000	-8.154257	-2.912631	Stationary

### 3.2 Cointegration Test

According to Basuki and Prawoto (2016), the cointegration test stage can show the long-term relationship of all the variables to be studied. The next stage will be a cointegration test using the Johansen Cointegration Test which aims to see whether data from the variables used are cointegrated or not. The Johansen Cointegration Test uses the rule that the Trace Statistics value must be higher than the Critical Value value of 0,05. Thus, if it is proven to have cointegration, the VECM stage can be continued. Below are the results of Johansen's cointegration test in this research (Table 3).

The data uses None Intercept and No Trend (2), indicating that there are 5 cointegration equations or relationships based on the Trace Statistics value which is bigger than the Critical Value of 0.05 and the Max-Eigen Statistic value is lower than the Critical Value of 0.05. Thus, it can be concluded that ROA, CAR, FDR, NPF, and BOPO in this study have a balanced relationship and equation of motion in the long term. Thus this study can be continued to the VECM stage.

**Table 3.** Johansen Cointegration Test

Hypothesized No. of CE(s).	Eigen value.	Max-Eigen Statistic	Trace Statistic.	Critical Value 5%	Prob.**
None *	0.593846	51.35829	161.5375	76.97277	0.0000
At most 1 *	0.535927	43.75969	110.1792	54.07904	0.0000
At most 2 *	0.397521	28.88206	66.41949	35.19275	0.0000
At most 3 *	0.348015	24.38086	37.53743	20.26184	0.0001
At most 4 *	0.206115	13.15656	13.15656	9.164546	0.0084

### 3.3 Vector Error Correction Model (VECM)

After performing the cointegration test, the next step is to estimate the Vector Error Correction Model (VECM) using the optimum lag 2. If the value of the t-statistics and f-statistics is smaller than the t-table and f-table values with a level of 0.05 ( $\alpha < 5$  percent) it is concluded that this study has insignificant results in both long-term and short-term relationships, and vice versa. Thus can be seen the effect of the dependent variable on the independent variable with the following results:

The VECM model estimation results can be written as follows:  $D(ROA) = -0.263091 (ECT) + -0.168575 (CAR(-1)) + -0.031787 (FDR(-1)) + 0.597294 (NPF(-1)) + -0.091255 (BOPO(-1)) + -0.356729 (ROA(-1)) + -0.324500 (ROA(-2)) + -0.068820 (CAR(-1)) + 0.133119 (CAR(-2)) + -0.006835 (FDR(-1)) + 0.000465 (FDR(-2)) + 0.293916(NPF(-1)) + 0.210451(NPF(-2)) + -0.079245 (BOPO(-1)) + -0.070312 (BOPO(-2)) + 0.005519$ .

**Table 4.** VECM. Test Estimation Results

Variables	Coefficient.	T-statistic.	Description
Long-Term			
CAR	-0.168575	[-2.02843]	Sig
FDR	-0.031787	[-1.01747]	Not-Significant
NPF	0.597294	[ 2.83238]	Significant
BOPO	-0.091255	[-2.20309]	Significant
Short-Term			
CointEq1	-0.263091	[-3.40659]	Significant
D(ROA (-1))	-0.356729	[-0.92137]	Not-Significant
D(ROA (-2))	-0.324500	[-0.94972]	Not-Significant
D(CAR (-1))	-0.068820	[-1.52455]	Not-Significant
D(CAR (-2))	0.133119	[ 2.86984]	Significant
D(FDR (-1))	-0.006835	[-0.37366]	Not-Significant
D(FDR (-2))	0.000465	[ 0.02532]	Not-Significant
D(NPF (-1))	0.293916	[ 3.19616]	Significant
D(NPF (-2))	0.210451	[ 2.36401]	Significant
D(BOPO (-1))	-0.079245	[-1.44641]	Not-Significant
D(BOPO (-2))	-0.070312	[-1.54940]	Not-Significant
C	0.005519	[ 0.23039]	Not-Significant
R.squared.	0.427918		
Adj. R-squared.	0.288076		
F.statistic	3.060008		Significant

In the estimation results in Table 4, the ECT coefficient is -0.263091 and the t-statistic is -3.40659 indicating that this value is higher than t- the table is 1.99773 which means that the model specifications are significant in showing the short and long term. Table 4 shows that in the short term the estimation results from lag 1 to lag 2 which has a significant impact on Sharia bank ROA are only CAR which is at lag 2 and NPF is at lag 1 and 2, so two variables affect profitability. on the other hand, the remaining 2 variables, namely FDR and BOPO from lag 1 to lag 2, do not explain a significant impact on the profitability of Sharia banks.

The results of the short-term estimation show that CAR at lag 2 has a positive impact and shows significant results on the ROA of sharia banks, which is 2.86984 which means that when CAR has increased by 1 percent in the previous year, it will also increase the ROA value of Sharia banks by 2.86984 in the next two years. In the short-term estimation, the next variable is NPF which shows that NPF at lag 1 and lag 2 has a positive effect and shows significant results on the ROA of Sharia banks of 3.19616 and 2.36401, which means when there is an increase in the percentage of the NPF ratio by one percent in the previous year then will also increase the ROA level of Sharia commercial banks in the following year until the second year by 3.19616 and 2.36401.

In the long-term estimation that has a significant impact on the ROA is the variable CAR, NPF, and BOPO so three variables have an influence on the profitability of Sharia commercial banks in the long term. while FDR does not show significant results in the long-term estimation. The long-term estimation results show that the CAR variable shows a significant effect on the ROA of Sharia banks with a t-statistic value higher than the t-table, which is -2.02843, which means that when there is an increase in the percentage of the CAR ratio by one percent in the previous year, it will decrease ROA percentage in the current year -2.02843.

In the long-term estimation, the NPF variable which has a positive influence and shows significant results on the ROA of Sharia banks is 2.83238 which can be interpreted when there is an increase in NPF of 1 percent in the previous year, the ROA of Sharia commercial banks will also increase in the current year by 2.83238. In the long-term estimation, the last variable is BOPO which shows a harmful effect and shows significant results on the ROA of Sharia commercial banks of -2.20309 which means that if there is an increase in BOPO of 1 percent in the previous year it will reduce ROA by -2.20309 in the current year.

Based on this research, it is concluded that CAR (Capital Adequacy Ratio) has a positive effect and shows significant results in the short term. Different from the long-term case, CAR has a harmful effect and shows significant results on ROA which represents the profitability of sharia banks. The test results in this research indicate that Sharia banks that have sufficient capital and are considered to be able to allocate their capital appropriately, effectively, and efficiently to earn a profit then the capital owned will have a significant effect on the profitability of the bank. The results of this research are the same as research (Fitriana and Oetomo, 2016) which states that CAR has a significant effect on ROA. The CAR at sharia commercial banks between 2016 and 2020 has a value of 21% which is considered to exceed the stipulation of Bank Indonesia, which is 8%. This is due to the addition of capital to provide anticipation

in the development of business scale in the form of expanding the amount of financing (Ubaidillah, 2016).

In this study, it was found that the FDR (Financing to Deposit Ratio) in the long and short term did not show any effect on ROA. These results are the same as research (Lemiyana and Litriani, 2016) which states that FDR harms effect on ROA and partially FDR does not show a significant effect on ROA. Research (Purwasih and Wibowo, 2021) also states that in the long term FDR does not show its effect on ROA. Research (Haryati et al., 2019) and (Lutfi and Santosa, 2021) also show that FDR has no significant effect on ROA which explains that a higher percentage of FDR will be accompanied by a smaller level of profit distribution, this is because the bigger the percentage of FDR, the Sharia bank does not have sufficient liquidity to cover its obligations to DPK. So that it can be interpreted that any financing provided does not influence the profits of the bank because the bank is not able to channel credit or financing properly, but on the other hand, the funds collected are quite large, this is considered to be causing losses to the bank so that the financing that occurs is less effective.

In this study, it is explained that the NPF (Non-Performing Financing) variable in the long term and short term shows a positive influence and shows significant results on ROA. Similar to the results of research (Sitompul and Nasution, 2019) which explains that there is no negative relationship between NPF and ROA of Islamic banks. The same thing was found in the results of the research (Munir, 2018) which showed that NPF had a positive impact and showed significant results on the profitability of Sharia banks. Financing can be said as income at a bank if in the distribution of funds or financing the precautionary principle, in this case, means that it is right on target both for the bank and the object being financed and can be said as a disaster if the financing is not carried out objectively or carefully and even violates maximum conditions.

In this study, it was found that the BOPO variable in the long term showed a harmful effect and showed significant results on Sharia commercial banks, while in the short term, the BOPO did not show any influence on the ROA of Sharia banks. The estimation results are in line with research (Purwasih and Wibowo, 2021), (Nuha and Mulazid, 2018), (Syah, 2018), (Sitompul and Nasution, 2019), and (Raharjo et al., 2020) which concludes that BOPO shows significant results on the ROA of Islamic banks. Research (Ubaidillah, 2016) also explains that there is a negative impact between BOPO and ROA of Sharia banks. This result is following the previous theory which explains that when the BOPO increases, the ROA will decrease. The bigger the percentage of the BOPO, the bank is considered less efficient in controlling its operational costs so that it can have an impact on decreasing the income generated by the bank (Syakhrun et al., 2019).

An increase in operational costs can occur if the existing capital is not used for productive bank business activities, this means that the increase in costs that occur can reduce the bank's ability to determine its profitability (Mukhlis, 2012). So it is expected that bank management can minimize or avoid possible problems by paying attention to details regarding cost control. An inefficient bank will result in an inability to compete in distributing funds to people who need business capital. However, if the bank is run efficiently, especially in terms of cost efficiency, it will obtain maximum profit, increase the number of funds disbursed, and improve banking health. To more clearly see the relationship between CAR, FDR, NPF, and BOPO with ROA, it is shown

by the next stage, namely the analysis of Impulse Response Function (IRF) and Variance Decomposition (VD).

### 3.4 Impulse Response Function (IRF)

The next stage is the analysis of the Impulse Response Function which is an important analysis in the VECM method. This IRF analysis is intended to track the response of endogenous variables in the VAR model due to changes or shocks from the disturbance variable. The shock given is usually one standard deviation of the variable or often referred to as innovation (Septindo et al., 2016).

Seen from the results of the Impulse Response Function in Fig. 1 show that the ROA response experienced a decrease in shocks to ROA until the 5th period. Since that period the chart tends to move steadily in a positive position. It can be seen that overall it moved in a positive position until the end of the period with the lowest response in the 5th period of 4.43% and the highest response being in the first period of 15.75%. The first variable used to see the ROA response to shocks is CAR. There was an increase in the ROA response to CAR shocks until the 7th period. Since that period the chart tends to move steadily in a positive position. Overall, it can be seen that the graph tends to move in a positive position but touched a negative position in the 2nd period with the lowest response in the 2nd period of -1.84% and the highest response in the 7th period of 8.02%.

The next variable used to see the ROA response to shocks is FDR. There is an increase in the ROA response to FDR shocks until the 4th period. Since that period the chart tends to move steadily in a positive position. Overall, it can be seen that the graph tends to move in a positive position until the end of the period with the lowest response in the 3rd period of 1.46% and the highest response in the 7th period of 3.47%. The next variable used to see the ROA response to shocks is NPF. There are fluctuations in the ROA response to NPF shocks until the 3rd period. Since that period the chart tends to move steadily in a negative position. Overall, it can be seen that the graph tends to move in a negative position but touched a positive position in the first three periods, the lowest response in the 5th period was -0.07% and the highest response in the 2nd period was 2.20%.

The last variable used to see the ROA response to shocks is BOPO. There are fluctuations in the ROA response to the BOPO shock until the 5th period. Since that period the chart tends to move steadily in a positive position. Overall, it can be seen that the graph tends to move in a positive position but touched a negative position in the 2nd period with the lowest response in the 2nd period of -1.68% and the highest response in

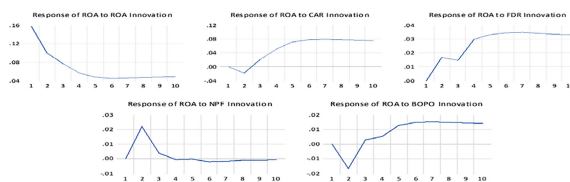


Fig. 1. Impulse Response Function (IRF) Results

the 7th period of 1.53%. Judging from the results of the IRF analysis in Fig. 1, it was found that overall the ROA variable responded to the shock of the CAR, FDR, NPF, and BOPO variables positively.

### 3.5 Variance Decomposition (VD)

The Variance Decomposition stage is a series similar to IRF which aims to see if there are shocks between variables (Basuki and Prawoto, 2016). This Variance Decomposition is expected to be able to estimate the contribution and influence of the independent variables, namely CAR, FDR, NPF, and BOPO on the dependent variable, namely ROA. This research uses monthly data taken from January 2016 to December 2020. Thus, in this period it is sufficient to explain the variables CAR, FDR, NPF, and BOPO to ROA which represents profitability. Below are the results of the VD analysis in Table 5:

Table 5 shows that in the first period ROA is strongly influenced by ROAD itself by 100 percent. On the other hand, in the first period the CAR, FDR, NPF, and BOPO variables have not affected ROA. In the second period, the CAR variable contributed 0.943606 and always increased until the 10th period of 36.67575. a significant increase in the CAR variable can be seen in each period. The FDR variable in the second period started to contribute 0.775999 and continued to increase its contribution until the 10th period was 7.788279. Thus, it can be concluded that there is a significant increase in the FDR variable each period. Furthermore, the NPF variable in the second period contributed 1.345371 and experienced a fluctuating contribution value up to the 10th period of 0.481521. in the last variable, BOPO contributed in the second period of 0.780847 and continued to increase until the 10th period of 1.481278. A significant increase in the BOPO variable can be seen in each period.

**Table 5.** Results of Variance Decomposition

Period	S.E.	ROA	CAR	FDR	NPF	BOPO
1	0.157566	100.0000	0.000000	0.000000	0.000000	0.0000
2	0.190166	96.15418	0.943606	0.775999	1.345371	0.78089
3	0.206672	95.11504	1.871323	1.158694	1.177036	0.6779
4	0.222541	88.50641	7.017308	2.817207	1.016413	0.6426
5	0.241300	79.20126	14.82443	4.279116	0.864710	0.8305
6	0.260464	70.87181	21.90750	5.432663	0.748479	1.0395
7	0.278928	64.45898	27.38388	6.292818	0.655883	1.2085
8	0.295919	59.77872	31.38464	6.921208	0.584113	1.3313
9	0.311628	56.29175	34.36123	7.401454	0.527529	1.4180
10	0.326340	53.57317	36.67575	7.788279	0.481521	1.4813

## 4 Conclusion

Based on the data analysis and discussion, there were conclusion;

1. In the initial stage, the Stationarity test was carried out on the first level difference. Then in determining the optimum lag, we get the optimum lag 1, followed by a cointegration test which results in all variables in this study being cointegrated so that we can continue to estimate VECM.
2. In the short-term estimation results of VECM, the first variable CAR have a positive influence and shows significant results while in the long term, CAR has a negative effect and shows significant results on the ROA of Islamic commercial banks for the period 2016 to 2020.
3. The estimation result of the second variable is FDR (Financing to Deposit Ratio) in the short and long term, which shows no significant effect on the ROA of Sharia commercial banks for the period 2016 to 2020.
4. The result of the estimation of the next variable is NPF (Non-Performing Financing) which shows that in the short and long term it has a positive influence and shows significant results on the ROA of Islamic commercial banks for the period 2016 to 2020.
5. The results of the last variable estimation are Operating Costs and Operating Income (BOPO) which show that in the short term there is no significant result or it can be interpreted that BOPO does not affect the ROA of Islamic banks in the short term, while in the long term BOPO shows negative and significant results. Which means BOPO affects the ROA of Sharia commercial banks.
6. The results of Impulse Response Function in Islamic commercial banks, profitability represented by ROA responded to the shock of the CAR, FDR, NPF, and BOPO variables positively. The implications of CAR, FDR, NPF, and BOPO on ROA based on Variance Decompositions show that ROA is strongly influenced by ROA itself in the first period, in the next period the variables are CAR (Capital Adequacy Ratio), FDR (Financing To Deposit Ratio), BOPO (Operational Costs). And Operating Income) contributed and continued to increase until the 10th period, while the Non-Performing Financing (NPF) variable also contributed but fluctuated in each period.

For Islamic commercial banks, it is necessary to provide education to the public about the business processes and products owned by Islamic banking so that they are more interested in Islamic banks. Improved performance that is better as well as effective and efficient is expected to be able to make the financial sector better and continue to improve from time to time. Researchers are expected to continue and extend the research period, as well as add new variables that are more varied, not only about the financial performance of Sharia banks but also other economic variables that need to be included as a determinant of the ROA level so that it will create new things and can provide results. better research.

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