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The effect of macroeconomics variables to Net Asset Value (NAV) growth of sharia mutual funds in Indonesia

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Abstract

Purpose – This study aims to perform the short-term and long-term relationships between net asset value of Islamic mutual funds within macroeconomic variables, to analyze responses towards the economic shock, and to analyze the composition of the net asset value of Islamic mutual funds within selected macroeconomic variables.

Methodology – Monthly data over the 2015-2019 period were analyzed using the Vector Error Correction Model (VECM), impulse response test, and variance decomposition test.

Findings – The results show that inflation, money supply, and gross domestic products had a positive and significant effect on the net asset value of Islamic mutual funds, on the other hand, the rupiah exchange rate had a negative thus insignificant effect on the net asset value of Islamic mutual funds.

Research limitation/implication – The main limitation of this research is the lack of a variable that represents the Islamicity index, which can differentiate the driven factors of FDI in Muslim and non-Muslim organization countries.

Practical implication – This study suggests that the society and the government should collaborate to maintain the stability of the rupiah exchange rate by buying domestic products, strengthening the real sector.

Originality – Here we provide an update data of macroeconomics variables dynamics (e.g. GDP, inflation, exchange rate, and money supply) and its implication to Islamic mutual funds – i.e. net asset value over 2015-2019. We used a novel timeseries analytical approach (VECM) to estimate the magnitude of macroeconomics effects to Islamic mutual funds in Indonesia.

Introduction

One of the capital market instruments is mutual funds. Mutual funds play the important role to community-finance management then will be distributed to investment media, both in the property, space market, and capital market. Mutual funds are designed as a means to raise funds from investors, eager to invest their money, but only have limited time and knowledge. Along with the development of mutual funds in Indonesia, sharia mutual funds currently exist as the preferred solution for someone who is hesitant to invest in conventional mutual funds. According to the (Otoritas Jasa Keuangan, 2019a), Islamic mutual funds was not similar to conventional mutual funds. The distinct of those found in the selection of investment instruments and investment mechanisms that always follow the rules and sharia principles

(Abdelsalam et al., 2014). Other differences are in the process of portfolio management in the aggregate, screening, and cleansing (Boo et al., 2017).

The history of the existence of Islamic mutual funds in Indonesia began with the publication of Islamic mutual funds by PT Danareksa Investment Management on July 3, 1997. Furthermore, the Indonesia Stock Exchange in collaboration with PT. Danareksa Investment Management launched the Jakarta Islamic Index on July 3, 2000 which aims to direct investors who want to invest their funds in sharia principles. The National Sharia Council of the Indonesian Ulema Council (DSN-MUI) issued a fatwa relating directly to the capital market, which is Fatwa No. 20/DSN-MUI/IV/2001 concerning Guidelines for Investment Implementation for Sharia Mutual Funds (Otoritas Jasa Keuangan, 2020)

The development of Islamic mutual funds depends on the underlying factors. To measure the development of sharia mutual funds, it can be seen from the movement of the total net asset value (NAV) of sharia mutual funds nationally. According to (Otoritas Jasa Keuangan, 2019a), Net asset value (NAV) is the fair market value of the accumulation of Securities and other assets from an Investment Fund minus all of its liabilities. NAV reflects the growth of Islamic mutual funds because NAV is in harmony with the mobility of the value of securities included in the compilation of sharia mutual fund portfolios.
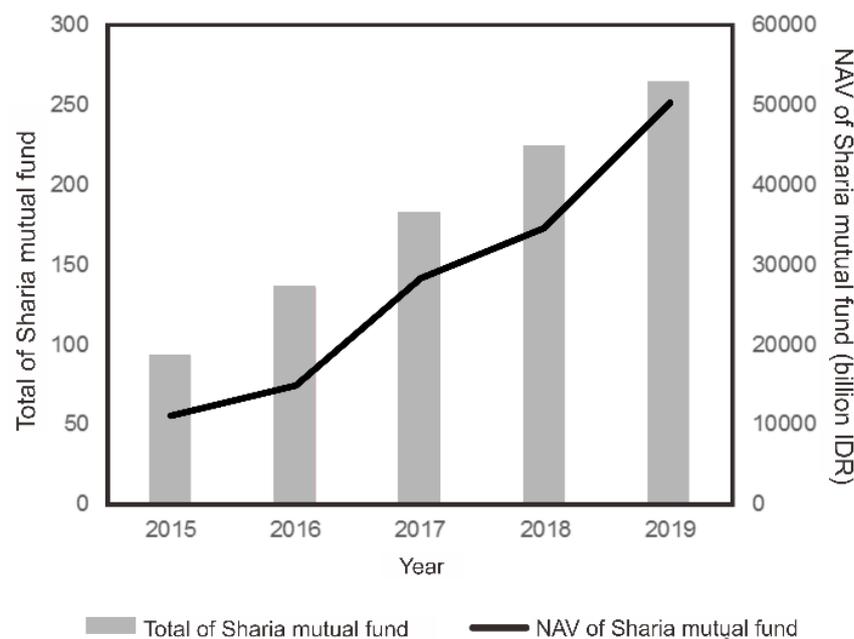
Figure 1. Growth in Sharia Mutual Funds Amount and NAV in Indonesia
Source: (Otoritas Jasa Keuangan, 2019c, 2019b)

Figure 1 explains the development of Islamic mutual funds as seen from the growth in the number of Islamic mutual funds and the increase in the net asset value (NAV) of Islamic mutual funds. In 2019, NAV of sharia mutual funds reach 55,300.47 billion rupiah with 264 units of sharia mutual funds. The growth of Islamic mutual funds represents relatively good investment conditions in Indonesia. In the recent years, the digital economy era has greatly influenced Indonesian economy. There was some evidence that shows significant contribution to Indonesia's economic growth due to digital economy – thus, implies that well-managed digital economy in Indonesia has very promising prospects (Basri, 2002; Ristekdikti, 2018). However, since 2013 the digital economy and several mutual fund platforms in Indonesia start to emerge and greatly affect macroeconomic growth, but the actual growth of sharia mutual funds in Indonesia did not much better than another countries, such as Malaysia (Pangestu & Dewi, 2018; Wahyuningtyas, 2016). Whereas, several e-commerce platforms that offer mutual fund on it are grown rapidly in Indonesia to oversee investors in investing their money, for example, Bareksa, Bibit, Tokopedia, and others. According to (Ascarya & Yumanita, 2009; Rodoni et al., 2017), the

NAV of sharia mutual funds in Indonesia (of about 2 billion US $) has less than Malaysia (of about 28.4 billion US $ in 2017), even though Malaysian population is just about 31 million people, while Indonesia is about 264.6 million people with the largest moslem population of the world. Then, the growth of Islamic mutual funds in Indonesia should be greater than current conditions.

The development of Islamic mutual funds is closely related to the climate of investment (Abedifar et al., 2015; Huda, 2012). A good investment climate affects investors' interest to allocate their money to Islamic mutual funds (The World Bank & Climate Investment Funds, 2013). According to (Donovan et al., 2011; Karim et al., 2016), a good conditions of investment is supported by many factors, such as political conditions, regulations, law enforcement, land issues for business land, infrastructure, and macroeconomic factors. One factor that creates a conducive investment climate is macroeconomic factors. Macroeconomic conditions are very important for investment, because macroeconomic changes will affect the amount of return obtained by investors. Currently according to the (Alfirman, 2019; Muhammad & Triharyono, 2019), the global economic turmoil is pushing to tighten liquidity & fluctuations in the financial markets of developing countries. Currently the global economy is still full of uncertainties, including a trade war, fluctuations in world oil prices, and political tension.

According to the World Bank in (Li et al., 2018), the Indonesian economy will continue to slow down due to low productivity and slowing labor growth. The global economic slowdown due to a trade war between the United States (US) and China that has affected commodity prices will further hamper Indonesia's economic growth. Macroeconomics is one of the most importance indicator for determining investment climate quality (The World Bank & Climate Investment Funds, 2013). Moreover, macroeconomics also represents the return dynamics that influence the investors to invest their money in Islamic mutual funds. Therefore, understanding relationships between macroeconomics variables and NAV of Islamic mutual funds is important (El-Masry et al., 2016; Mansor & Bhatti, 2011; Siswantoro, 2012). With the current macroeconomic situation in Indonesia, the purpose of this study is to analyze the macroeconomic factors that influence the growth of Sharia mutual fund NAVs in Indonesia in the 2015-2019 period, analyze the NAV response to macroeconomic variable shocks, and analyze the contribution of macroeconomic variable shocks to explain the growth of NAV. Prior study shows the importance of impact evaluation of macroeconomics effects to Islamic mutual funds to increase the growth of Islamic investment (Dewandaru et al., 2017; El-Masry et al., 2016; Mansor & Bhatti, 2011). We also elaborate the analysis with a relevant macroeconomics theory such as the effects of Fisher equation (Mankiw, 2010) and national income accounts identity theory related to GDP dynamics (Mankiw, 2006). Here we present an update of macroeconomics variables dynamics (e.g. GDP, inflation, exchange rate, and money supply) and its implication to Islamic mutual funds – i.e. net asset value over 2015 – 2019. We used a novel timeseries analytical approach i.e. Vector Error Correction Model (Gomes & Paz, 2013; Komariah et al., 2020) to estimate the magnitude of macroeconomics effects to Islamic mutual funds in Indonesia.

Methods

Generally, this research performs the time series modelling (i.e. statistical analysis) using vector error correction model between net asset value of Islamic mutual funds and various macroeconomics variables. The types of data used in this study are entirely secondary data obtained from the website of Bank Indonesia (BI), the Financial Services Authority (OJK), and the Central Statistics Agency (BPS). We used monthly time series data from January 2015 to December 2019 for representing recent update of macroeconomics dynamics and also to capture the development of digital economics in Indonesia (Pangestu & Dewi, 2018). The data used are data on net asset value of sharia mutual funds retrieved from OJK (Otoritas Jasa Keuangan, 2019c, 2019b), inflation data, rupiah exchange rate, money supply (M2) retrieved from Bank Indonesia (Bank Indonesia, 2019a, 2019b, 2020), and Gross Domestic Product obtained from BPS (Badan Pusat Statistik, 2020).

To analyze the macroeconomic variables on the growth of Sharia mutual fund NAV in this study, quantitative analysis will be used. Quantitative analysis is a form of analysis used to determine the magnitude of the influence of each independent variable on the growth of Sharia mutual fund NAV. The quantitative method used is the Vector Autoregression (VAR) method if the data is stationary at the level of level, if the data has cointegration then the Vector Error Correction Model (VECM) method is used. VECM has been widely used to analyze relationships between multi-variables data – including macroeconomics data and its fluctuations (Asad & Siddiqui, 2019; Mukherjee & Naka, 1995; Panagiotidis & Printzis, 2016; Pradhan & Bagchi, 2013; Shahbaz et al, 2013; Suyyinah & Affandi, 2018). The analytical tool used for this research was EViews 10 software and Microsoft Excel 2010.

Pre-Estimation Test (Unit Root Test)

Data stationarity test with unit root test is the first step in processing data using the VAR/VECM method. According to (Gujarati, 2004), stationary data will have a tendency to approach the average value and fluctuate around the average value. Time series economic data are generally stochastic (have non-stationary trends/these data have unit roots). If the data has a unit root, then the value will tend to fluctuate not around the average value, making it difficult to estimate a model.

Optimum Lag Test

VAR estimates are very sensitive to the lag length used. Determination of the number of lags (orders) that will be used in the VAR model can be determined based on the Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) or Hannan Quinnon (HQ) criteria. In addition, the optimal lag length testing is very useful to eliminate the autocorrelation problem in the VAR system, so that by using the optimal lag it is expected that autocorrelation problems will no longer appear (Nugroho, 2009).

VAR Stability Test

VAR stability test is done by calculating the roots of polynomial functions or called the roots of polynomial characteristics. If the roots of the polynomial function have an absolute value smaller than one or are inside the unit circle, it can be said that the VAR model is stable so that the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) generated can be considered valid (Firdaus, 2011).

Johansen's Cointegration Test

Cointegration test is conducted to determine the existence of relationships between variables, especially in the long run. If there is a cointegration of the variables used in the model, it can be ensured that there is a long-term relationship between the variables. The method that can be used in testing the existence of this cointegration is the Johansen Cointegration method.

Vector Error Correction Model

Vector Error Correction Model or VECM is a form of VAR which is the most restricted (Firdaus, 2011). This additional restriction must be given because of the existence of data forms that are not stationary at the level, but are cointegrated. VECM then utilizes the cointegration restriction information into its specifications. Therefore, VECM is often referred to as a VAR design for non-stationary series that has a cointegration relationship (Firdaus, 2011). The VECM model is used to find dynamic relationships in a cointegrated system. The VECM model can estimate the short-term and long-term relationships between the variables used.

Impulse Response Function (IRF)

Impulse Response Function (IRF) shows how the response of each endogenous variable over time to shocks in the variable itself and other endogenous variables. The function of this impulse

response is first, to determine the effect of a variable on a particular variable in the event of a variable shock or shock. The second function is to find out the value of the shock to the variable that exists.

Forecast Error Variance Decomposition (FEVD)

The method was used to analyze how an endogenous variable would alter due to the influence of other variables as indicated by changes in the error variance of these variables. The FEVD method shows the strengths and weaknesses of each variable in influencing endogenous variables over a certain period of time. The FEVD method characterizes a dynamic structure in the VAR/VECM model.

Basically, the following equation describes how inter-relationships between macroeconomics indicators (i.e. inflation, exchange rate, GDP, and money supply) and net asset value of Islamic mutual fund vice versa. Prior study used similar methods to capture the effect of those variables, but with different macroeconomics indicators (Acikalin et al., 2008; Iriani & Yuliadi, 2015; Mukherjee & Naka, 1995). Thus, this research provides a novel approach to understand the effects of NAV with the following macroeconomics indicators.

The model used in this study is as follows:

$$
\begin{bmatrix} \Delta Ln\_NAB \\ \Delta INF \\ \Delta Ln\_KURS \\ \Delta Ln\_M2 \\ \Delta Ln\_GDP \end{bmatrix} = \begin{bmatrix} ao \\ bo \\ co \\ do \\ eo \end{bmatrix} + \begin{bmatrix} a11 & a12 & \dots\dots\dots\dots & a15 \\ a21 & a22 & \dots\dots\dots\dots & a25 \\ a31 & & : & : \\ a41 & & . & . \\ a51 & a52 & \dots\dots\dots\dots & a55 \end{bmatrix} \begin{bmatrix} \Delta LN\_NABt-1 \\ \Delta INFt-1 \\ \Delta LN\_KURSt-1 \\ \Delta LN\_M2t-1 \\ \Delta LN\_GDPt-1 \end{bmatrix} + \begin{bmatrix} e1t \\ e2t \\ e3t \\ e4t \\ e5t \end{bmatrix}
$$

Where Ln_NAB represents Net Asset Value of Sharia Mutual Funds (Billion rupiahs), INF represents Inflation Rate (Percent), Ln_KURS represents Exchange Rate (Rp/US $), Ln_M2 represents Money Supply (Billion Rupiahs), and Ln_GFP represents Gross Domestic Product (Billion Rupiahs). We performed natural logarithmic transformation to NAB, KURS, M2, and GDP variables to reduce the residuals error from its raw data. A hypothesis is a proposed explanation made on the basis of limited evidence as a starting point for further investigation. Regarding to this research, we generate four hypotheses based on macroeconomics theory and econometrics as well as follows: 1) Inflation has a negative effect to NAV of Islamic mutual fund (Brown, Sotes-Paladino, Wang, & Yao, 2017; Chu, 2011); 2) exchange rates has a negative effect to NAV of Islamic mutual fund (Aisiyah & Khoiroh, 2015; Ardana, 2016a, 2016b; Rachmawati & Laila, 2015); 3) money supply of M2 has a positive correlation with the development of NAV Islamic mutual fund (Chu, 2011; Hasan et al., 2015); and 4) GDP has a positive effect to NAV of Islamic mutual fund (Abdullah et al., 2007; Hoepner et al, 2011; Jamaludin et al, 2012).

Results and Discussion

The initial step in processing this data is to conduct a stationarity test. Data stationarity test uses a unit root test which is to see a variable stationary or not stationary. This test was developed by Dickey and Fuller, using the Augmented Dickey Fuller Test (ADF).

The results of time series data stationary processing in EViews are shown in Table 1 which shows that there are no stationary variables at the level. The ADF statistics of Sharia mutual fund NAV variable, inflation, Gross Domestic Product, money supply, and Bank Indonesia rupiah exchange rate is greater than Mac Kinnon critical value which means all of the variables were not in stationary conditions, it should be stationary if the ADF statistics value is less than Mac Kinnon critical value (p value $<\alpha$).

Table 1 shows unit root test results with no stationary variables at the level. Stationarity test is continued by using the first difference of each variables.

Table 1. Unit root test results at level

Variables	ADF Statistics	Mac Kinnon's Critical Value			Information
		1%	5%	10%	
Ln_NAB	0.341474	-3.5461	-2.91173	-2.59355	Not Stationer
Inflation	-2.045194	-3.546099	-2.911730	-2.593551	Not Stationer
Ln_GDP	-1.799371	-3.548208	-2.912631	-2.594027	Not Stationer
Ln_M2	- 0.67906	-3.56002	-2.91765	-2.59669	Not Stationer
Ln_KURS	-2.269833	-3.546099	-2.911730	-2.593551	Not Stationer

Table 2. Unit Root Test Results On First Difference

Variables	ADF Statistics	Mac Kinnon Critical Value			Information
		1%	5%	10%	
dLn_NAB	-7.9369	-3.54821	-2.91263	-2.59403	Stationer
dInflation	-5.55146	-3.5504	-2.91355	-2.59452	Stationer
dLn_GDP	-8.427986	-3.574446	-2.923780	-2.599925	Stationer
dLn_M2	-3.11396	-3.56002	-2.91765	-2.59669	Stationer
dLn_KURS	-7.020374	-3.548208	-2.912631	-2.594027	Stationer

Based on the stationarity test results using the unit root test at first difference, the ADF statistics of the NAV variable of sharia mutual funds, inflation, Gross Domestic Product, the money supply, and the rupiah exchange rate less than Mac Kinnon Critical Value. This provides enough evidence that the first difference result data no longer contains unit (stationary) roots so that we can continue our analysis to the optimum lag selection.

Optimum Lag Test

Testing the optimal lag length is very useful to eliminate the autocorrelation problem in the VAR system which is used as a VAR stability analysis. So with the use of optimal lag, it is hoped that autocorrelation problems will not appear again. The optimal lag length will be searched using the available information criteria. Some of the selected lags are lag length according to the criteria for Likehood Ratio (LR), Final Prediction Error (FPE), Akaike Information Crition (AIC), Schwarz Information Crition (SC), and Hannan-Quin Crition (HQ). Determination of the optimal lag in this study is based on the SC criteria.

Table 3. Optimum lag calculation results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	538.1744	NA	2.61E-15	-19.3882	-19.2057	-19.3176
1	820.2049	502.5271	2.29E-19	-28.7347	-27.63982*	-28.3113
2	856.0708	57.38544*	1.58e-19*	-29.1299	-27.1225	-28.35360*
3	878.902	32.37878	1.81E-19	-29.051	-26.1312	-27.9219
4	907.0829	34.84183	1.82E-19	-29.16665*	-25.3345	-27.6847
5	924.4374	18.30113	2.94E-19	-28.8886	-24.144	-27.0539

Based on Table 3, it appears that the value containing an asterisk (*) is the smallest value contained in lag 1 with the SC criteria, so the lag at that value is the most optimum lag.

VAR Stability Test

VAR stability needs to be tested because if the results of estimation of VAR stability are not stable then the IRF and FEVD analyzes become invalid. Based on the test results, a VAR system is said to be stable if all the roots or roots have a modulus smaller than one. In this study, based on the VAR stability test shown in Table 4, it can be concluded that the estimated VAR stability that will be used for IRF and FEVD analysis has been stable because the modulus range <1.

Table 4. VAR Stability Calculation Results

Root	Modulus
0.992221	0.992221
0.898220 - 0.124493i	0.906806
0.898220 + 0.124493i	0.906806
0.703059 - 0.429565i	0.823904
0.703059 + 0.429565i	0.823904
0.290109 - 0.442407i	0.529044
0.290109 + 0.442407i	0.529044
-0.234746 - 0.096125i	0.253665
-0.234746 + 0.096125i	0.253665
0.151772	0.151772

Cointegration Test

The purpose of the cointegration test in this study is to determine whether groups of variables that are not stationary at these levels meet the requirements of the integration process, ie where all variables have been stationary to the same degree, namely degree 1. Cointegration testing in this study uses the cointegration test method from Johansen Trace Statistics test. Long-term information is obtained by first determining the cointegration rank to find out how many systems of equations can explain the whole existing system. Cointegration testing criteria in this study are based on trace statistics. If the trace statistic value is greater than the critical value of 5 percent, then an alternative hypothesis stating the amount of cointegration is accepted so that it can be seen how many equations are cointegrated in the system. This test is to find out whether or not there is a long-term influence for the variables we will examine. If it is proven that there is cointegration, the VECM stage can be continued.

Table 5. Cointegration test results

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.398767	74.74135	69.81889	0.0192
At most 1	0.264617	45.23255	47.85613	0.0864
At most 2	0.238385	27.40544	29.79707	0.0921
At most 3	0.171664	11.61122	15.49471	0.1766
At most 4	0.011788	0.687745	3.841466	0.4069

Based on the above table, it can be seen that the value of trace statistic and maximum eigenvalue is greater than the critical value with a significance level of 5% (r = 1). This means that H_0 which states that there is no cointegration is rejected and the alternative hypothesis (H_a) which states that there is cointegration cannot be rejected. Based on the econometric analysis above, it can be seen that among the four variables in this study, there was one cointegration at a significance level of 5%. Therefore, the results of the cointegration test indicate that among the movements of Sharia Mutual Fund NAV variables, inflation, Gross Domestic Product, world oil prices, money supply and the rupiah exchange rate have a stability/balance relationship and the similarity of movements in the long run. Therefore, the VECM estimation in this study can be used, and proceed to the next stage, namely the vector error correction model estimation test.

Vector Error Correction Model Estimation Results

Cointegration test results are sufficient evidence that there is cointegration in the model so that the model will be estimated using the VECM method. The real level used in this study was five percent, based on the t-table the statistical value at the five percent real level was 1.96, so the test results would be significant if the t-statistic was greater than the t-table of 1.96. VECM estimation results for analyzing the short-term and long-term effects of the dependent variable on the independent variables can be seen in Tables 6 and 7.

Table 6. Short-term VECM estimation results

Short-term			
Variables	Coefficient	Standard Error	T-statistics
CointEq1	-0.184414	-0.0626	[-2.94595]*
D(LN_NAB(-1))	-0.037143	-0.12707	[-0.29232]
D(LN_M2(-1))	0.849589	-1.1829	[0.71823]
D(LN_KURS(-1))	-0.700902	-0.72624	[-0.96511]
D(LN_GDP(-1))	-0.804712	-1.06526	[-0.75542]
D(INFLASI(-1))	-3.795765	-2.62617	[-1.44536]

Note: the sign (*) is significant at the five percent level

Based on Table 6 it can be explained that in the short term that there are no significant variables. This happens because there is time (lag) for a variable to react to the influence given by other variables and in general the reaction of a variable to other variables occurs in the long run. The variable of error correction is significant to the total NAV of Islamic mutual funds, which is -0.184 units. This means that there is an adjustment from the short-term equation to the long-term equation of -0.169 units. It can also be interpreted as a correction made every month by 0.169 percent towards a long-term balance.

Table 7. Estimated results of Vector Error Correction Model (VECM)

Long-term			
Variables	Coefficient	Standard Error	T-statistics
LN_M2(-1)	4.435374	-1.2972	[-3.41918]*
LN_KURS(-1)	-0.447605	-1.18471	[0.37782]
LN_GDP(-1)	3.692895	-1.81774	[-2.03159]*
INFLASI(-1)	16.78453	-3.41393	[-4.91647]*

Note: the sign (*) is significant at the five percent level

Based on Table 7, the results of a long-term VECM test found that inflation, money supply (Ln_M2), and gross domestic product (Ln_GDP) statistically have a significant effect on the Sharia mutual fund NAV in the long run. While the rupiah exchange rate variable (Ln_KURS) has no significant effect on the total NAV of sharia mutual funds in the long run.

The rupiah exchange rate (Ln_KURS) has a negative and not significant effect on the growth of sharia mutual fund NAV in Indonesia. This explains that if there is an increase in the rupiah exchange rate of 1 unit, it will reduce the NAV of sharia mutual funds in Indonesia by -0.448 units.

The variable gross domestic product (Ln_GDP) has a positive and significant effect on the NAV of sharia mutual funds in Indonesia in the long run. If gross domestic product rises by 1 unit, the NAV of Islamic mutual funds in Indonesia will increase by 3.693 units.

Variable money supply (Ln_M2) has a positive and significant effect on the NAV of sharia mutual funds in Indonesia in the long run. If the money supply increases by 1 unit, the NAV of Islamic mutual funds increases by 4.435 units.

Inflation variable has a positive and significant effect on NAV of sharia mutual funds in Indonesia in the long term and short term. If inflation rises by 1 unit, it will increase the NAV of Islamic mutual funds by 16.785 units.

Impulse Response Function Test Results

The Impulse Response Function test phase is useful for looking at long-term dynamic responses in each equation. IRF is used to observe the growth and response between variables in the current period and forecast the condition of variables if shocks occur in one standard deviation unit. IRF describes the shape of the response of the dependent variable to the shock of an independent variable and the length of time given to return to the equilibrium point.

In this research, the IRF explains the response of the Sharia mutual fund NAV in Indonesia (dependent variable) due to shocks from the Sharia mutual fund NAV variable itself, inflation, Gross Domestic Product (GDP), the money supply, and the rupiah exchange rate (independent variable) for the next 36 periods. IRF test in this study uses the Cholesky Decomposition standard by taking an analysis of the growth period of the NAV of Islamic mutual funds over the next 48 periods. This study uses monthly data, then 1 period is equal to 1 month.
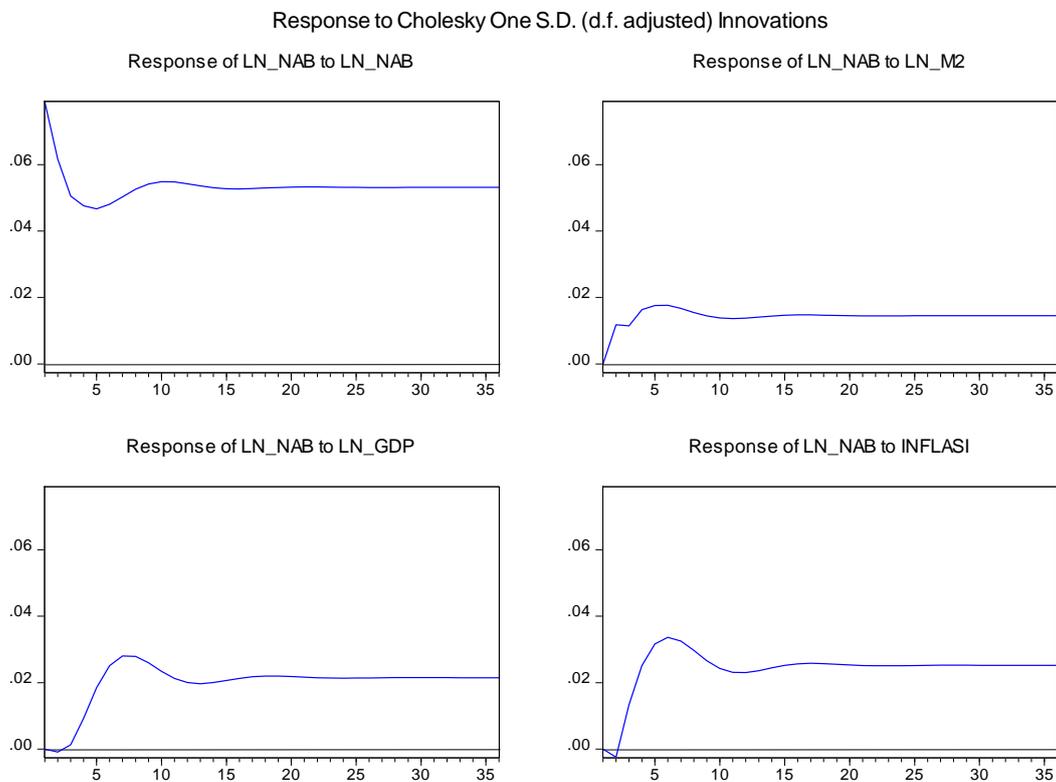
Figure 2. Impulse Response Function (IRF) Estimation Results

The results of the plot of IRF can be seen in Figure 2. In Figure 2 it can be seen that there are 5 IRF plots for the next 36 months, which explains visually the response (response) of a variable that arises due to shocks (shock/impulse) of 1 standard deviation from either itself or other variables.

The response of shocks to the sharia mutual fund NAV variable to the sharia mutual fund NAV itself in detail, in the first month of shocks of one standard deviation of the total sharia mutual fund NAV, will cause an increase in the sharia mutual fund NAV itself by 0.079 percent. But in the fourth month got a negative response from the previous response, which amounted to 0.048 percent which was the lowest point. Then there was a positive response to the Sharia mutual fund NAV. The increase continued to occur from month 5 of 0.047 percent to the 10th month, namely the response of shocks of 0.05 percent. Furthermore, there is stability or equilibrium just like before the shock of the NAV of sharia mutual funds in the 20th month, which amounted to 0.053 percent, and continued until the 36th month. With this, when there is a shock on the total NAV of sharia mutual funds, it takes 20 months for the total NAV of sharia mutual funds to reach its equilibrium point. The positive response given by the number of Sharia mutual fund NAVs to shocks from the variable Sharia mutual fund NAV itself is due to an increase in the number of sharia mutual fund NAVs indicating that investment in sharia mutual funds is progressing. Therefore, investors will choose to invest in Islamic mutual funds and in the long run the number of NAVs of Islamic mutual funds will increase.

Response of variable shocks to sharia mutual fund NAVs to the money supply in detail, in the first month of shocks of one standard deviation of the money supply has not been responded to by the amount of sharia mutual funds NAV but shocks to the variable money

supply responded positively by sharia mutual funds NAV the second period was 0.012 percent. There was an increase to the highest point in the 6th month of 0.018 percent. Then there is a decrease towards the stability of positive responses in the 21st month with a value of 0.014 percent continuing until the end of the period. The positive response given by the number of Sharia mutual fund NAVs to the money supply has the similar results research with (Wu et al, 2016) which results in a significant positive effect on the amount of sharia mutual fund NAV. This result occurs due to the community has a motive in holding money, one of which is to obtain profits, with the increase in the amount of money will encourage people to meet the needs of them including future needs through investment in Islamic mutual fund products. This result is different from the results of research from (Borgers et al., 2015) that the money supply has a significant negative effect on the total NAV of Islamic mutual funds.

Response of variable shocks to sharia mutual fund NAVs to gross domestic product in detail, in the first month shocks of one standard deviation of gross domestic product have not been responded to by the number of sharia mutual fund NAVs but shocks to gross domestic product variables have been negatively responded to by Sharia mutual fund NAVs in the first month the second period of -0.001 percent (lowest point). Then there was an increase towards the stability of positive responses in the 23rd month of 0.021 percent, continuing into the final period. The positive response given by the total NAV of sharia mutual funds to gross domestic product, namely the variable of gross domestic product (Ln_GDP), has a positive and significant effect on the NAV of sharia mutual funds in Indonesia in the long run. These results accordance with the income identity equation (Mankiw, 2006, 2010).

Based on the income identity equations, investment moves pro-cyclically with GDP, if GDP rises then investment will also increase. This is in line with the results of research from (Boukhatem & Ben Moussa, 2018) that the value of the regression coefficient of GDP growth has a positive value which indicates a direct relationship with yields, meaning that when GDP growth rises, the returns of Islamic mutual funds obtained will also increase. This happens because an increase in GDP will increase people's income. The increase in income will be used to make investments. When viewed from the theory of demand, rising GDP characterizes increased corporate revenue. Increased company income will have implications for the increase in investors who invest in Islamic mutual funds.

Response of variable shocks to sharia mutual fund NAVs to inflation in detail, in the first month shocks of one standard deviation of the rupiah exchange rate have not been responded to by the amount of sharia mutual fund NAVs but shocks to inflation variable are responded negatively by sharia mutual fund NAVs in the second period of -0.008 percent (lowest point). Then there was an increase towards the stability of the positive response in the 26th month by 0.019 percent, continuing into the final period. The positive response given by the total NAV of Islamic mutual funds to inflation is in line with the results of research from (Gusni, Silviana, & Hamdani, 2018) whose results based on statistics have a positive response to the performance of mutual funds, the performance of sharia mutual funds is one of the factors that can increase the total NAV of sharia mutual funds. The same result was also obtained by (Nandari, 2017) that inflation had a significant positive effect on the NAV of Islamic mutual funds. Inflation in Indonesia has only been responded to briefly by investors. Stable and mild inflation has a positive impact on community economic activity. Improvements in the national economy provide positive winds for investors in the investment movement in Indonesia.

This contradicts the existing investment theory, where inflation is negatively correlated to Islamic mutual funds. However, if observed further, the decline in returns on Islamic mutual funds due to inflation only occurred in the initial month of an increase in inflation. In the following month, mutual funds again experienced significant growth, although inflation continued to rise. This is supported by the results of this study and (Sujoko, 2009).

Forecast Error Variance Decomposition Test Results

Forecast Error Variance Decomposition Test aims to measure the contribution or composition of the effect of each independent variable on the dependent variable. This FEVD methods shows the

strengths and weaknesses of each variable in influencing other variables over a long time period. The results of the FEVD analysis in this study will explain how much the contribution of each of the Domestic Product Product shocks (Ln_GDP), inflation (INFLATION), the rupiah exchange rate (LN_KURS) and the money supply (Ln_M2) in influencing the growth of the Net Asset Value (NAV) Islamic mutual funds in Indonesia. The time period used is the next four years consisting of 48 months.

The variability of sharia mutual fund NAV is dominantly influenced by the sharia mutual fund NAV itself, which in the first month reached 100 percent. The ability of sharia mutual funds NAV to affect itself in the following months continued to decline until the 36th month of 69.311 percent. The contribution of independent variables began to increase in the second month to the 36th month. In the second month, the variable money supply (Ln_M2) and the rupiah exchange rate variable (Ln_KURS) became the dominant variable with a value of 1.348 percent and 1.155 percent among other variables, namely inflation and gross domestic product with a value of 0.059 percent and 0.007 percent.

In the 36th month (year 3), the variable NAV of sharia mutual funds still contributed significantly to the growth of the sharia mutual fund NAV itself by 69.311 percent. The contribution of the inflation variable became the dominant independent variable contribution to the growth of sharia mutual fund NAV of 14.954 percent. The dominant contribution is also owned by the gross domestic product variable (Ln_GDP) which is 10.422 percent. Furthermore, the contribution of the independent variable is also given by the variable money supply (Ln_M2), and the rupiah exchange rate (Ln_KURS) respectively at 5 percent and 0.313 percent.

Conclusion

Based on the results of the VECM estimation, it can be seen that in the short term there are no variables that significantly influence the NAV growth of Islamic mutual funds in Indonesia, this occurs because of the time (lag) for a variable to react to the influence given by other variables. In the long-term period, it was found that the inflation variable, the money supply (Ln_M2), and the gross domestic product (Ln_GDP) statistically had a significant effect on the NAV of sharia mutual funds in the long run. While the rupiah exchange rate variable (Ln_KURS) has no significant effect on the total NAV of sharia mutual funds in the long-term period.

The IRF estimation result shows that shocks occur on the NAV of the sharia mutual fund itself, the money supply, gross domestic product and inflation are responded positively by the number of sharia mutual fund NAVs in Indonesia and will be constantly stable in the long-term. The rupiah exchange rate variable is responded negatively by the number of NAVs of sharia mutual funds in Indonesia and will be stable in the long-term.

The FEVD estimation results show that the contribution of gross domestic product and inflation has increased and has the most dominant macroeconomic variables in explaining the growth of Sharia mutual fund NAV for the long-term apart from the total NAV of the mutual fund itself.

Referring to this research about the analysis of the effect of domestic product products (Ln_GDP), inflation, rupiah exchange rate (Ln_KURS), and the money supply (Ln_M2) on the growth of Sharia mutual fund NAV in Indonesia, there are several recommendations both practical and theoretical. Firstly, the government needs to strengthen the coordination of monetary authorities with financial authorities. The government and the public need to work together in maintaining the stability of the rupiah exchange rate against the US Dollar by buying Indonesian-owned domestic products rather than buying foreign products. Besides, investment managers are advised to pay close attention to macro-economic factors such as inflation, the rupiah exchange rate and the BI rate. In order to invest in Islamic mutual funds, they can create a maximum profit contribution.

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