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Dynamic Models: Analysis of Macroeconomic Variables and Islamic Banks Performance in Indonesia

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ABSTRACT

The purpose of this study is to identify the most appropriate variable to use as the dependent variable and to examine the short- and long-term relationships between macroeconomic shocks and the performance of Islamic banks, utilizing a sample of Indonesian Islamic commercial banks between 2020.1 and 2022.4. The VECM and The VAR analysis (Impulse Response Function, Variance Decomposition, and Granger Causality Test) are the technique employed. The study's findings indicated that the following variables are related in both the short and long terms: interest, inflation, non-performing financing, and capital adequacy ratio. NPF is the ideal variable to utilize as a dependent variable. Long-term influences on NPF include ROA, NOM, CAR, FDR, IPI, INF, and INT. NPF is affected by NPF lag 1, CAR lag 1, inflation lag 1, and interest lag 1 in the short run. the results of the Granger Causality test, INF and INT are the variables that show a two-way link. IRF According to the, there is a negative shock from NOM, OEOI, and ER towards NPF and a positive shock from ROA, CAR, FDR, IPI, INF, and INT towards NPF.

Keywords : Islamic Bank Performance; Macroeconomiccs; VECM; IRF; VD

ABSTRAK

Penelitian ini bertujuan untuk menganalisis hubungan antara goncangan makroekonomi dan kinerja bank syariah, baik jangka pendek maupun jangka panjang, serta untuk menentukan variabel mana yang merupakan pilihan terbaik sebagai variabel dependen, dengan sampel bank umum syariah di Indonesia tahun 2020.1 – 2022.4. Metode yang digunakan adalah VECM dan Analisis VAR (Granger Causality Test, Variance Decomposition, dan Impulse Response Function). Hasil penelitian menyimpulkan bahwa variabel yang memiliki hubungan jangka panjang dan jangka pendek adalah Non-Performing Finance, Capital Adequacy Ratio, interest, inflasi. Variabel yang terbaik dijadikan variabel dependen adalah Non-Performing Finance (NPF). Dalam jangka panjang, NPF dipengaruhi oleh ROA, NOM, CAR, FDR, IPI, INF, INT. Dalam jangka pendek, NPF dipengaruhi oleh NPF lag 1, CAR lag 1, inflasi lag 1, dan interest lag 1. Granger Causality test menyimpulkan bahwa variabel yang memiliki hubungan dua arah adalah INF dan INT. Impulse Response Function menunjukkan bahwa shock arah positif dari ROA, CAR, FDR, IPI, INF, INT terhadap NPF dan shock arah negatif dari NOM, OEOI, dan ER terhadap NPF.

Kata Kunci : Kinerja Bank Syariah; Makroekonomi; VECM; IRF; VD

INTRODUCTION

Banking financial performance serves as a gauge for how well a company is using its financial resources, or, put another way, how well its management has done in assisting the community through the usage of its financial services (Alper & Anbar, 2011). Macroeconomic or external factors will have an impact on a bank's performance (Cekrezi, 2015) economic issues that a nation is dealing with, such as economic expansion, inflation, currency exchange rates, interest rates, or the global financial crisis.

The Capital Adequacy Ratio (CAR), also known as the minimum capital requirement, is a ratio that is used to assess whether a bank has enough capital to cover all potential risks associated with its productive assets. Capital factor is one of the metrics used to measure the performance of banks. (Narmeen et al., 2018) The ability of sharia bank productive assets to generate profits is measured by bank profitability, which is proxied by Net Operating Margin (NOM) (Prasetiyo, n.d.); The Finance Deposit Ratio (FDR), which is the value of financing to third parties against third party funds, can be used to determine Islamic bank liquidity (BI, 2013); Operating Expenses to Operating Income (OEOI) is a metric used to assess bank management's ability to control operating costs relative to operating income. Another metric used to assess bank efficiency is Non-Performing Finance (NPF), which displays the size of the financing problem relative to the total amount of financing provided to the community (Kuswahariani et al., 2020).

Among the external or macroeconomic variables that might affect the performance of banks are those that are proxied by economic growth (IPI), which is defined as a nation's continuous rise in output volume or its gross domestic product (Ivic, 2015); According to (Djazuli & Candera, 2021), inflation (INF) is the pace at which prices generally grow. It is a broad term that can refer to both an overall increase in prices as well as an increase in the cost of living in a nation (Adu et al., 2016); The price paid for money utilized over a specific length of time is referred to as the cost of capital, or interest rates (INT) (Afzal & Mirza, 2012); The value of a country's currency in relation to the exchange rate (ER) of another foreign currency is known as the exchange rate (Hofmann et al., 2022).

Numerous research that addresses how shocks to macroeconomic variables affect the performance of Sharia banks have produced contradictory findings. Previous studies' findings indicate that shocks to macroeconomic factors have an impact on banking performance over the long and short terms. (Olokoyo et al., 2019); (Ali et al., 2018); (Nursyamsiah, n.d.); (Islam et al., 2022); (Maisuroh & Adam, 2022); (Ikramina & Sukmaningrum, 2021); (Lyimo & Hussein, 2022); (Halim & Masih, 2016). Numerous studies (Tabash & Dhankar, 2014); (Boukhatem & Ben Moussa, 2018); (Shabir et al., 2023) have assessed the relationship between a nation's banking sector and all macroeconomic variables. These studies collectively propose that the significance of the relationship is a dynamic concept rather than a static parameter.

There are discrepancies in the research findings from different studies. For example, while some studies (Ashraful, Ashraful Mobin, et al., 2014), (Maisuroh & Adam, 2022), (Nursyamsiah, n.d.), (Panorama, 2017), and (Le et al., 2021)claim that inflation affects bank performance, another study (Islam et al., 2022) finds no such relationship. Another difference discovered was that whereas (Islam et al., 2022), (Le et al., 2021) (Yudha et al., 2021), and (Olokoyo et al., 2019), all claim that economic growth has an impact on bank performance, (Ashraful, Ashraful Mobin, et al., 2014) disagree. Research has shown that interest rates have an impact on bank performance (Olokoyo et al., 2019) ; (Yudha et al., 2021); (Nursyamsiah, n.d.); however, interest rates only have a short-term negative impact on performance (Panorama, 2017). (Panorama, 2017) and (Yudha et al.,

2021) claim that while the exchange rate variable has a negative short-term impact on bank performance, it has a positive long-term impact.

The rationale for conducting this investigation during a different period—the Covid-19 period—is the presence of gaps in the findings of earlier studies. This research is novel in that it looks at both macroeconomic and Islamic bank performance variables as non-structural variables. Initially, it doesn't matter which variables are dependent or independent; instead, the Vector Error Correction Model's output determines which variable is chosen to be the dependent variable. Because the research's findings can accurately represent the phenomenon of macroeconomic variable shocks on bank performance, they may be a more reliable source of information. Utilizing economic statistical tools, quantitative data were used in this study. Associative research, or a research strategy pertaining to two or more variables, is the kind of research that will be employed.

RESEARCH METHOD

The statistics on the financial performance of Islamic Commercial Banks and information on macroeconomic indicators for the years 2020.1–2022.4 make up the secondary data used in this study. The Central Bureau of Statistics, Bank Indonesia, and the Financial Services Authority's official websites were used to gather the data. Time series data were utilized. The quantitative method was used as the research methodology.

The Vector Autoregression (VAR) model was employed in this investigation. A non-theoretical times series econometric model is the VAR model. In order to effectively represent economic realities, this model was developed with the idea of minimizing the theoretical approach. According to Widarjono (2016), the VAR model can also be referred to as a non-structural model. The dependent (endogenous) and independent (exogenous) variables do not need to be separated in the VAR model. The inertia of the variables is important to capture the influence of these variables on other variables in the model and to see the relationship between the variables in the VAR. The Ordinary Least Square (OLS) approach makes it simple to estimate the VAR model. In general, the VAR model with *n* endogenous variables can be written as formula 1.

$$\boldsymbol{Y_{nt}} = \boldsymbol{\beta_{01}} + \sum_{i=1}^{p} \boldsymbol{\beta_{in}}\ \boldsymbol{Y_{1t-i}} + \sum_{i=1}^{p} \boldsymbol{\alpha_{in}}\ \boldsymbol{Y_{2t-i}} + \ \dots\ + \sum_{i=1}^{p} \boldsymbol{\eta_{in}}\ \boldsymbol{Y_{nt-i}} + \boldsymbol{e_{nt}} \qquad \textbf{(1)}$$

To determine if the data is stationary at the level, first differences, or second differences, the unit root test or data stationarity test using the Augmented Dickey Fuller (ADF) unit root test will be used to estimate the formation of the VAR model. The ADF test is shown in formula 2.

$$\Delta \boldsymbol{Y_t} = \boldsymbol{\alpha_0} + \boldsymbol{\alpha_1 T} + \boldsymbol{\gamma Y_{t-1}} + \sum_{i=2}^{p} \boldsymbol{\beta_i}\ \Delta \boldsymbol{Y_{t-i+1}} + \boldsymbol{e_t} \qquad \textbf{(2)}$$

Y observed variable; $\Delta Y_{t-1} = Y_t - Y_{t-1}$; T = time trend

The ordinary VAR model (unrestricted VAR) is used if the data are stationary at the level level; however, if the data are stationary at the level of the first or second differences and the data are not cointegrated, the model employed is VAR in the form of differences. However, if the data are cointegrated, the Vector Error Correction Model (VECM) is used. This means that if there is a deviation from the long-term balance, it will be gradually corrected through short-term partial adjustments.

The VECM specification limits the long-term relationship between existing variables so that it converges into a cointegration relationship while still allowing dynamic changes in the short term, which is known as error correction. progressive (Widarjono, 2016). The formula 3 can be stated as follows if there is a cointegration relationship:

$$\Delta \boldsymbol{Y_t} = \boldsymbol{\alpha\beta'}\, \boldsymbol{y_{t-1}} + \sum_{i=1}^{p-1} \Gamma_i\, \Delta \boldsymbol{y_{t-1}} + \boldsymbol{\mu_t} \quad \textbf{(3)}$$

Where $\beta'\, y_{t-1}$ = ecm_{t-1} is an error correction that reflects the long-term equilibrium relationship between variables, so the VECM formula 4 can be written as formula 4:

$$\Delta \boldsymbol{Y_t} = \boldsymbol{\alpha}\, \boldsymbol{ecm_{t-1}} + \sum_{i=1}^{p-1} \Gamma_i\, \Delta \boldsymbol{y_{t-1}} + \boldsymbol{\mu_t} \quad \textbf{(4)}$$

Finding the right lag duration to utilize while estimating the VAR model is the second step. The third step, the VAR stability test, aims to continue the Impulse Response Function (IRF) and Variance Decomposition (VD) analysis because if the model is unstable then the IRF and VD analysis becomes invalid. This is done by examining the probability result value and determining whether the VAR estimation that will be combined with the error correction model is stable or not.

The cointegration test, which is the third phase, uses the cointegration test from the Johansen Trace Statistic Test to ascertain whether the set of variables that are not stationary at that level match the requirements of the integration process. Estimating the VAR model regression is the fourth stage. The Granger Causality Test, which is the following phase, is used to determine whether the performance of Islamic banks and macroeconomic conditions are endogenous variables that are related in any way. Other analyses required for the VAR model include Impulse reaction, which tracks how endogenous variables respond to shocks or modifications in disturbance variable (e), or how Islamic banks perform in reaction to shocks to macroeconomic variables; To forecast the percentage variance of each variable's contribution to changes in other variables (macroeconomics) in the VAR system, the Variance Decomposition method is used.

RESULTS AND DISCUSSION

The unit root test, also known as the data stationarity test, is used to determine if the data is stationary at the level, first difference, or second difference using the Augmented Dickey Fuller (ADF) test. The findings are displayed in table 1 below and are used to estimate the construction of the VAR model.

Table 1. Augmented Dickey Fuller Test

No.	Variabel	Level	First Differences	Second Differences
1	IPI	0.1962	0.0000	
2	INF	0.1791	0.6490	0.0000
3	INT	0.7012	0.0941	0.0000
4	ER	0.0638	0.0004	
5	CAR	0.4491	0.0000	
6	ROA	0.5482	0.0000	
7	NOM	0.7941	0.0000	
8	FDR	0.5028	0.0000	
9	OEOI	0.6671	0.0000	

Source: The results of data processing, 2023

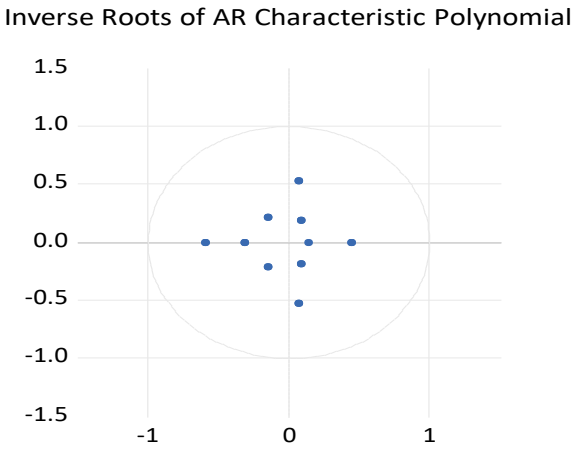
Based on table 1. the results of the ADF test at the first level, all probabilities of all variables are more than 5%, indicating that none of the variables evaluated are stationary. The next test is at first degree differences, and the findings show that 8 variable probability values are less than 5%. This demonstrates that all eight variables are stationary, and that the inflation and interest rate variables are stationary at the second difference as well.

The results of the VAR Lag Order Selection Criteria from the stationary variable data indicate that lag 1 is the proper lag length. Next, choose the suitable lag for the estimate of the VAR model. Following stability testing (table 2.), the following are the outcomes of the Inverse and Roots of Characteristic Polynomial (Figure 1).

Table 2. Stability Test

Root	Modulus
-0.586239	0586239
0.070535 – 0.531080i	0.535743
0.070535 + 0.531080i	0.535743
0.447407	0.447407
-0.310693	0.310693
-0.139557b- 0.214779i	0.256137
-0.1395557 + 0.214779i	0.256137
0.087704 _ 0.185221i	0.204936
0.087704 + 0.185221i	0.204936
0.147499	0.147499

No root lies outside the unit circle, VAR satisfies the stability condition
Source: The results of data processing, 2023



Source: The results of data processing, 2023

Figure 1. Inverse Roots

Given table 2. Stability test that the modulus value is less than 1 and figure 1. the inverse roots' value points are located inside the circle, it is possible to infer that the VAR model that was created is in a stable condition.

Since the variables are not stationary in a level degree, the cointegration test is the next stage in determining whether there is a relationship between short term and long term. The results of the cointegration test are as follows at table 3.

Table 3. Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.973552	417.4756	239.2354	0.0000
At most 1 *	0.898848	286.7033	297.3709	0.0000
At most 2 *	0.826309	204.2227	159.5297	0.0000
At most 3 *	0.694315	141.2056	125.6154	0.0040
At most 4 *	0.587395	98.53842	95.75366	0.0317
At most 5 *	0.411200	66.66893	69.81889	0.0869
At most 6 *	0.357352	47.60082	47.85613	0.0528
At most 7 *	0.308238	31.68311	29.79707	0.0300
At most 8 *	0.253276	18.41663	15.49471	0.0176
At most 9 *	0.197090	7.902465	3.841465	0.0049

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level
*denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Source: The results of data processing, 2023

The table 3. of cointegration results, it can be inferred that there are 5 cointegrating variables. Since it is assumed that there is a short-term imbalance, cointegrating variables have a long-term balance relationship, necessitating the use of the Vector Error Correction Model (VECM) as the estimation model.

The results of data processing for Vector Error Correction Model (VECM) estimation can be seen in the following table 4 and table 5

Table 4. Error Correction Result

Error Correction	D(ROA)	D(NOM)	D(CAR)	D(NPF)	D(FDR)
CointEq1	0.093422	0.177232	-1.354491	0.098683	0.233138
	(0.06863)	(0.09860)	(0.44250)	(0.03455)	(0.57174)
	[1.36133]	[1.79740]	[-3.06098]	[2.85666]	[0.40777]

Source: The results of data processing, 2023

Table 5. Error Correction Result

Error Correction	D(OEOI)	D(IPI)	D(INF,2)	D(INT,2)	D(LOG(ER)
CointEq1	0.432459	-0.230950	-0.518494	0.134236	-0.004450
	(0.99797)	(3.58127)	(0.19112)	(0.06062)	(0.00803)
	[0.43334]	[-0.06449]	[-2.712296]	[2.21423]	[-0.55434]

Source: The results of data processing, 2023

According to table 4 and table 5, CAR, NPF, INF, and INT variables show significant ECM values at the level of 0.05, indicating that these variables have both short- and long-term associations, or when there are numerous short-term dynamic fluctuations that can constrain behavior. This is consistent with the findings of studies conducted by (Olokoyo et al., 2019); (Ali et al., 2018); (Nursyamsiah, n.d.); (Islam et al., 2022); (Maisuroh & Adam, 2022); (Ikramina & Sukmaningrum, 2021); (Lyimo & Hussein, 2022); (Halim & Masih, 2016). (Tabash & Dhankar, 2014); (Boukhatem & Ben Moussa, 2018); (Shabir et al., 2023). These variables also point to the possibility of using the CAR, NPF, INF, and INT variables as dependent variables for the VECM model in the long run. The Non-Performing Finance (NPF) variable is chosen as the dependent variable for this study because it meets the criteria for a positive ECM coefficient with a high R^2 value.

Based on the results of VECM processing, the long-term equation for Non-Performing Finance (NPF) is as follows formula 5 and formula 6:

$$NPF(-1) = 22{,}53327 - 0{,}406096ROA(-1)^{***} + 0{,}409975NOM(-1)^{***} - 0{,}115409CAR(-1)^{***} - 0{,}158070FDR(-1)^{***} - 0{,}071505OEOI(-1)^{***} - 0{,}007280IPI(-1)^{***} - 0{,}946803INF(-1)^{***} + 0{,}642128INT(-1)^{***} - 0{,}522633LOGER(-1) \quad (5)$$

***sign at α = 0,01 (1%)

The results of Formula 5 indicate that the Non-Performing Loan has a lag of one quarter before it is influenced by the following: Return On Assets, Nett Operation Margin, Capital Adequacy Ratio, Finance to Deposit Ratio, Operation Expense to Operation Income, Economic growth (IPI), inflation, and interest rate. Also, the Non-Performing Loan has a lag of one quarter before it is influenced by these factors.

According to the regression coefficients: The constant value of 22.53327 indicates that the value of NPF (lag 1) is 22.53327 when the values of ROA (lag 1), NOM (lag 1), CAR (lag 1), FDR (lag 1), OEOI (lag 1), IPI (lag 1), INF (lag 1), INT (lag 1), and ER (lag 1) are zero.

-0.406096 means that NPL lag 1 will rise (fall) by 0.406096 units for every unit that ROA lag 1 decrease (rise).

NPL lag 1 will rise (fall) by 0.409975 units for every unit that NOM lag 1 rises (falls).

-0.115409 means that NPL lag 1 will rise (decline) by 0.115409 units for every unit that CAR lag 1 falling (rises). -0.158070 means that NPL lag 1 will rise or fall by 0.158070 units for every unit that FDR lag 1 falling (increases). -0.0715050 means that NPL lag 1 will climb or drop by 0.0715050 units for every unit that OEOI lag 1 falling (increases). -0.007280 means that NPL lag 1 will rise or fall by 0.007280 units for every unit that IPI lag 1 falling (increases).

The value of 0.946831 shows that NPL lag 1 will rise or decrease by 0.946831 units when INF lag 1 rises or lowers by one unit.

According to 0.642128, NPL lag 1 will rise (fall) by 0.642128 units for every unit that INT lag 1 rises (falling).

$$NPF = -0{,}024419 + 0{,}572813NPF(-1)^{***} + 0{,}235256ROA(-1) - 0{,}068054NOM(-1) + 0{,}047535CAR(-1)^{**} - 0{,}023944FDR(-1) - 0{,}001690OEOI(-1) - 0{,}003500IPI(-1) - 0{,}101581INF(-1)^{*} + 0{,}237336INT(-1)^{*} - 0{,}277645LOGER(-1) \quad (6)$$

*sign at α = 0,05 (5%), ** sign at α = 0,02 (2%), *** sign at α = 0,01 (1%)

According to Formula 6, non-performing loans are affected by the following factors: interest rate (one quarter before), inflation, capital adequacy ratio, and non-performing loans (one quarter before).

According to the regression coefficients, The constant number, -0.024419, indicates that the NPF is -0.024419 when any of the following values are zero: ROA (lag 1), NOM (lag 1), CAR (lag 1), FDR (lag 1), OEOI (lag 1), IPI (lag 1), INF (lag 1), INT (lag 1), and ER (lag 1).

According to 0.572813, the NPL will increase (reduce) by 0.572813 units whenever NPF lag 1 increases (decreases) by one unit.

According to 0.047535, the NPL will rise (fall) by 0.047535 units when CAR lag 1 increases (falling) by one unit. -0.101581 means that the NPL will rise or fall by 0.0.101581 units for every unit reduction or decrease in INF lag 1.

NPL will climb (fall) by 0.237336 units when INT lag 1 rises (falling) by one unit, according to 0.237336.

The findings of the aforementioned study are consistent with (Prasetiyo, n.d.) research, which found that Net Operating Margin affects Non Performing Finance (NPF). According to Umar (Umar, 2014), (Olokoyo et al., 2019), and (Nursyamsiah, n.d.) research findings, the Industrial Production Index has an impact on NPF. According to studies by (Ashraful, Ashraful Mobin, et al., 2014), (Panorama, 2017), (Nursyamsiah, n.d.), (Husnayeni Nahar et al., 2020), and (Saputri et al., 2020) inflation has an effect on non-performing finance. According to studies done by (Olokoyo et al., 2019), (Nursyamsiah, n.d.), (Panorama, 2017), and (Maisuroh & Adam, 2022), (Saputri et al., 2020) interest rates have an impact on NPF. According to research by (Kuswahariani et al., 2020), the ratio of operating expenses to operating income affects NPF.

The Granger Causality Test was conducted to see the causal relationship between variables, and the results show that Return On Assets (ROA) is influenced by the variables Net Operating Margin (NOM), Non Performing Financial (NPF), and Finance Deposit Ratio (FDR); while ROA itself affects Operational Expenses on Operational Income (OEOI), Interest (INT), Exchange Rate (ER) ; the NOM variable is influenced by the NPF and FDR variables, while the NOM affects OEOI, Inflation (INF) and interest (INT); The Industrial Production Index (IPI) is influenced by the Capital Adequency Ratio (CAR); OEOI is affected by inflation this is consistent with the findings of studies conducted by (Nursyamsiah, n.d.), (Panorama, 2017), and (Maisuroh & Adam, 2022); Exchange Rate (ER) is influenced by OEOI and Inflation; while inflation is influenced by Non Performing Finance (NPF), FDR, Interest (INT); and finally interest (INT) is influenced by CAR, NPF, OEOI, IPI, INF, ER.

According to the overall Granger test results, interest (INT) and inflation (INF) are the only variables that have a two-way link, meaning that interest is impacted by inflation and inflation is influenced by interest, this aligns with the results of research carried out by (Panorama, 2017). All other variables only have a one-way relationship.

The prediction of the percentage variant of the NPF variable's contribution to changes in the variables that affect it (ROA, NOM, CAR, FDR, OEOI, IPI, INF, INT, ER) is another analysis carried out in VECM. The output of the Variance Decomposition (VD) is derived as follow at tabel 6 and table 7.

Table 6. Variance Decomposition

Period	S.E.	NPF	ROA	NOM	CAR	FDR
1	0.072340	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.125358	73.88894	11.75809	3.199634	2.060231	0.383984
3	0.169199	63.44440	17.08415	3.335872	4.600217	0.276929
4	0.206650	59.09082	18.44655	4.120082	6.927078	0.208756
5	0.241799	55.76523	19.63382	4.938522	7.570498	0.155704
6	0.272421	53.57721	20.56242	5.156070	8.072093	0.130382
7	0.299386	52.35361	20.99886	5.339495	8.599370	0.108060
8	0.324555	51.45040	21.31938	5.542348	8.870609	0.092124
9	0.348021	50.70763	21.61840	5.656009	9.043593	0.081634
10	0.369813	50.17091	21.82322	5.731455	9.223557	0.072553

Source: The results of data processing, 2023

Table 7. Variance Decomposition of NPF

Period	S.E.	OEOI	IPI	D(INF)	D(INT)	LOG(ER)
1	0.072340	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.125358	0.904502	0.670623	6.845053	0.266330	0.022613
3	0.169199	2.061915	0.403682	8.352458	0.391839	0.048538
4	0.206650	2.039545	0.278623	8.062110	0.547227	0.279209
5	0.241799	2.050573	0.252106	8.632943	0.596149	0.404459
6	0.272421	2.197310	0.203333	9.048933	0.619528	0.432725
7	0.299386	2.225664	0.168773	9.081409	0.649928	0.474830
8	0.324555	2.228241	0.151464	9.165652	0.669341	0.510434
9	0.348021	2.260756	0.136774	9.288680	0.679835	0.526688
10	0.369813	2.282234	0.122973	9.341248	0.690088	0.541760

Source: The results of data processing, 2023

According to the Variance Decompotition (VD) at table 6 and table 7, the NPF variant was completely explained by the variable itself in the first period and completely explained by the variable itself in the second period before being influenced by the ROA by 11.76%, INF by 6.94%, NOM by 3.199%, CAR by 2.06%, and other variables. In period 10, the percentage of the NPF variant described by the NPF variable itself declined to 50.17%, while the contributions from ROA, INF, CAR, and other factors grew to 9.34%, 9.34%, 9.34%, and 9.22%, respectively.

In Table 8 and table 9, Impulse Response Function (IRF) analysis is also carried out to track the response of the NPF variable in the VAR system due to shocks or changes in the disturbance variable (e).

Table 8. Impulse Response Function

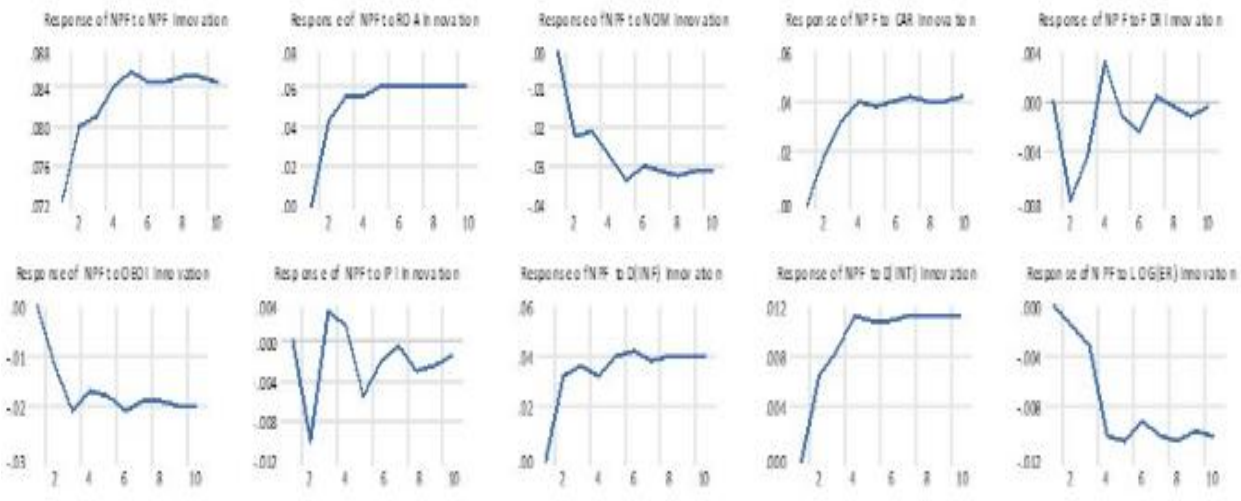
Period	NPF	ROA	NOM	CAR	FDR
1	0.072340	0.000000	0.000000	0.000000	0.000000
2	0.079864	0.042985	-0.022423	0.017993	-0.007768
3	0.080943	0.055165	-0.021265	0.031515	-0.004352
4	0.084090	0.054849	-0.028363	0.040511	0.003141
5	0.085849	0.060015	-0.033585	0.038316	-0.001374
6	0.084601	0.061488	-0.030645	0.039552	-0.002393
7	0.084642	0.059880	-0.030974	0.041440	0.000310
8	0.085264	0.060292	-0.032437	0.040449	-0.000428
9	0.084975	0.061049	-0.031818	0.040119	-0.001354
10	0.084841	0.060513	-0.031431	0.040753	-0.000592

Source: The results of data processing, 2023

Table 9. Impulse Response Function

Period	OEOI	IPI	D(INF)	D(INT)	LOG(ER)
1	0.000000	0.000000	0.000000	0.000000	0.000000
2	-0.011922	-0.010266	0.032797	0.006489	-0.001885
3	-0.021170	0.003191	0.036270	0.008386	-0.003216
4	-0.016753	0.001848	0.032430	0.011023	-0.010263
5	-0.018109	-0.005331	0.040842	0.010717	-0.010828
6	-0.020780	-0.001871	0.037741	0.010546	-0.009201
7	-0.019084	-0.000613	0.038921	0.011080	-0.010221
8	-0.018768	-0.002876	0.038921	0.011068	-0.010586
9	-0.019775	-0.002472	0.039945	0.010879	-0.010012
10	-0.019571	-0.039050	0.039050	0.010971	-0.010149

Source: The results of data processing, 2023



Source: The results of data processing, 2023

Figure 2. Impulse Response Fuction Graph

Based on table 8 (Impulse Responses Function), Table 9 (Impulse Responses Function) and Figure 2 (Impulse Responses Function Graph) the reaction of the NPF variable to shocks from other variables is explained by the IRF table and graph above. When a shock ROA is present, NPF rises at the beginning of the period, continues to climb through period 6, through period 8, rises through period 9, and then declines once more through period 10.

NOM shock results in a decrease trend or experience in NPF. The NPF initially increased due to the CAR shock until period 4, then decreased in period 5, and finally increased. The NPF fluctuated as a result of the FDR shock, but first there was a fall and subsequently an increase. NPF first decreased as a result of the OEOI shock before fluctuating with a flat trend later on.

The NPF fluctuates with an increasing trend as a result of the IPI shock. The NPF increased significantly at the start of the period as a result of the INF shock and thereafter varied with an ascending trend. The NPF increased significantly as a result of the INT shock up until period 4, after which it decreased and then rose. The shock from the ER also caused the NPF to drop sharply at the beginning of the period before fluctuating with a flat trend.

Additional research (Umar, 2014), (Tabash & Dhankar, 2014), (Halim & Masih, 2016), (Boukhatem & Ben Moussa, 2018), (Olokoyo et al., 2019), (Lyimo & Hussein, 2022); (Shabir et al., 2023) demonstrates that the variable that most significantly influences the NPF itself is the DV of NPF in the first period, which declines until the 10th period. According to the IRF results, shocks to the interest rate, currency rate, and inflation all respond favorably to the NPF. According to a different result, the NPL, NIM, and CAR variables responded to the fall in the exchange rate.

CONCLUSION

The VECM model, which exhibits a long-term balance relationship and raises the suspicion of a short-term imbalance, was chosen to investigate the relationship between Islamic bank performance and macroeconomic variables from the VAR model. The NPF variable was chosen to be the dependent variable in the VECM model based on the results

of the data processing for the CAR, NPF, INF, and INT variables, which have a long-term and short-term relationship. The results showed that all dependent variables (ROA, NOM, CAR, FDR, IPI, INF, INT), with the exception of ER, have an impact on NPF over the long term.

NPF is impacted by NPF lag 1, CAR lag 1, inflation lag 1, and interest lag 1 in the short run. The Granger Causality test findings show that INF and INT are the only variables with a two-way link; all other variables are one-way relationships. According to the Variance Decomposition results, the variable itself contributes to the first stage of the NPF variant's explanation, and after that, other contributions, particularly from ROA, cause the contribution to decline. The Impulse Response Function data demonstrate that the shock is positive from ROA, CAR, FDR, IPI, INF, INT to NPF. NOM, OEOI, and ER are the sources of the NPF's negative direction shock.

RECOMMENDATION

Based on the findings of the analysis performed in this study, non-performing finance is a variable that needs to be given more weight than others. As a result, when formulating policies to influence changes in non-performing finance (NPF), several recommendations can be made to policy makers in both the Islamic banking industry and Islamic boards, advising them to pay more attention to the profitability value of ROA, capital adequacy (CAR), and liquidity (FDR) when releasing policies to influence changes in non-performing finance (NPF), while the macroeconomic variables are production growth (IPI), inflation (INF), and interest rate (INT).

The use of time series data from the average value of all Islamic commercial banks in Indonesia as the data source for this study has the drawback that it prevents the results from demonstrating how macroeconomic factors affect the performance of Islamic commercial banks on an individual basis. Thus, bank performance data will be useful to scholars in the future. from every single sharia commercial bank, hence panel data must be used for sampling, and the VECM panel is used by the analyst. In addition, you can use other factors like bank size, firm size, profitability metrics like ROE, the caliber of productive assets, and others when analyzing bank performance.

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