“Determinants of Non-Performing Loans and Non-Performing Financing level: Evidence in Indonesia 2008-2021”

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DETERMINANTS OF NON-PERFORMING LOANS AND NON-PERFORMING FINANCING LEVEL: EVIDENCE IN INDONESIA 2008-2021

Abstract

Banking stability plays an important role as an intermediary in the economy. Both the economy and the banking sector affect each other. This study aims to investigate the effect and response of external variables and internal bank variables on Non-Performing Loans at Conventional Commercial Banks and Non-Performing Financing at Islamic Commercial Banks. This study uses macroeconomic variables such as economic growth and inflation, while a bank's internal variables include the Loan to Deposit Ratio, Financing to Deposit Ratio, and Capital Buffer. This study employs Vector Autoregressive Regression (VAR) to examine the time series data. The results showed that the variable Economic Growth at lag-1, Loan to Deposit Ratio at lag-1, and Capital Buffer at lag-2 significantly affect Non-Performing Loans. While the variable that has a significant effect on Non-Performing Financing is only Economic Growth at lag-1. In addition, as can be seen from the Impulse Response Function curve, Non-Performing Financing tends to be more stable toward shocks from the variables used than Non-Performing Loans. The findings suggest that banks are encouraged to be more selective in loan disbursement and maintain minimal capital adequacy by taking into account the principle of prudence and referring to the bank's health criteria.

Keywords banks, risk management, macroeconomics, loan to deposit ratio, financing to deposit ratio, capital buffer, vector autoregressive regression

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INTRODUCTION

The banking sector is one of the most important industries in a country's economy. Wijaya (2019) considered banks as the lifeblood of a country's economy, including Indonesia. Adeola and Ikpesu (2017) explain that the banking industry plays an important role in the financial system and economy. Therefore, it is essential to maintain economic and banking stability due to their correlation. Banks can become financial intermediaries (financial intermediaries) between parties who have excess funds (surplus of funds) and parties who lack funds (lack of funds) (Ahmadi et al., 2017). Therefore, banks are associated with various activities in various sectors of the economy.

Currently, supported by technological advances, banks have a more comprehensive and varied scope of activities with varying levels of complexity. Thus, banks must design policies that can prevent risk and help maximize revenue and market value (Qwader, 2019). One of the tools used to measure the level of banking risk is the ratio of Non-Performing Loans (NPL) for Conventional Commercial Banks and Non-Performing Financing (NPF) for Islamic Commercial Banks.

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In normal conditions, an increase in NPL and NPF at Conventional Commercial Banks and Islamic Commercial Banks can be influenced by various factors inside and outside the bank.

Hernando et al., (2020) and Prasetyo (2020) in their research stated that economic growth has a negative and significant effect on the NPL ratio. In contrast to the results of previous studies, Mahendra & Mahardika (2019) stated that GDP growth has a positive and insignificant effect on the NPL ratio. Another factor is inflation. Research by Naibaho & Rahayu (2018) concluded that inflation has a positive and significant effect on the NPL ratio.

Internal factors that can affect bank credit risk are LDR and FDR. Poetry & Sanrego (2011) concludes that LDR and FDR both negatively affect the bank's NPL and NPF. When the LDR rises the NPL will decrease. Just as the effect of LDR on NPL, an increase in FDR will reduce the value of NPF in Islamic banks. Another important factor is the Capital Buffer, which is the difference between the ratio of bank capital to the Minimum Capital Provision Adequacy ratio. A high bank capital ratio indicates a stronger capital position of the bank. That way the shocks in banking activities can be further resolved.

1. LITERATURE REVIEW

According to Financial Services Authority (OJK) Regulation No. 15/PJOK.03/2017 regarding the Status Determination and Follow-Up Supervision of Commercial Banks, NPL or NPF is credit that is substandard, doubtful, or bad (OJK, 2017). According to Naibaho and Rahayu (2018), the level of credit risk arises when creditors/customers cannot fulfill their obligations on time according to the agreement or do not fulfill their obligations at all. From this description, it can be concluded that NPL and NPF are ratios to measure the credit failure or financing disbursed by banks.

A bank is responsible for the credit risk level (Yusuf & Fakhruddin, 2016). The Financial Services Authority (OJK) Regulation No. 15/PJOK.03/2017 stated that the level of credit risk or non-performing financing is considered healthy if it is not more than 5% (OJK, 2017). Credit risk is a key factor in assessing bank performance (Hernando et al., 2020; Fianto et al., 2021). Therefore, further examination of the health of the credit risk level is necessary to prevent the increased risk of credit failure. The lower the level of non-performing loans, the better the bank's condition (Mahendra & Mahardika, 2019). On the other hand, an increase in NPL and NPF levels indicates the inability of banks to manage their business. The higher the debtor's credit failure rate, the smaller the spread base. This is related to credit and financing as the main activities of banks in generating returns (Firmansyah, 2015).

NPL and NPF can be affected by various factors, both inside and outside the bank, including macroeconomic factors (Dwihandayani, 2017; Yusuf & Fakhruddin, 2016; Fianto et al., 2021; Messai & Jouini, 2013; Waemustafa & Sukri, 2015; Abid, et al., 2014). Nkusu (2011) found a reciprocal relationship between NPL and macroeconomics. Prasetyo (2020) concluded that macroeconomic variables such as economic growth, credit interest rates, inflation, and unemployment significantly affect NPLs of Conventional Banks in ASEAN. GDP, effective interest rate, inflation rate, foreign exchange rate, type of bank, risk-taking behavior, ownership concentration, leverage, and credit quality are significant determinants of NPL in Chinese banks (Umar & Sun, 2018). NPL in the Greek banking system can be explained mainly by macroeconomic variables, including GDP, unemployment, interest rates, public debt, and management quality (Louzis et al., 2012). The same case was also found in the US (Ghosh, 2015). In addition, Amri and Harianti (2018) revealed several conclusions. Economic growth and interest rates have a positive and significant effect on NPL, while CPI has a negative effect on NPL. On the other hand, Muqorrobin et al. (2021) conclude that GDP has a negative and significant impact on NPF. Furthermore, Qwader's (2019) study concluded that there is a strong relationship between grants, loan interest rates, and GDP and NPL in both the long and short term. In line with Qwader, a study by Espinoza and Prasad (2010) also concluded that GDP growth (not oil) has a significant relationship to NPL. A decline in GDP growth (not oil) has

been shown to increase NPLs (Khemraj & Pasha, 2009). More specifically, Fofack (2005), Kang (2016), and Setiawan (2021) state that GDP growth and the market stock index have a significant and negative effect on NPL. Adeola and Ikpesu (2017) and Bhattarai (2017) find that economic growth has no significant effect on NPL. Meanwhile, the unemployment rate, exchange rate, and national debt have a significant and positive relationship to the NPL ratio. According to Anjom and Karin in Prasetyo (2020), an increase in economic growth describes an increase in people's income and profits. This will increase the ability of the individual and firm to pay their loan. It will lead to a decreasing level of NPL and NPF.

Inflation is defined as a continuous increase in general prices over a certain period, which affects individuals, entrepreneurs (private parties), and the government (Mishkin, 2013). The increase in these prices will raise public spending, reducing the debtor's ability to pay their obligations to the bank. High inflation causes non-performing loans (Badar et al., 2013). A number of studies conducted by Polat (2018), Naibaho and Rahayu (2018), Damanhur et al. (2018), and Adeola and Ikpesu (2017) concluded that inflation has a positive and significant effect on the NPL ratio. Different from previous research, Waemustafa and Sukri (2015) conclude that inflation has a negative and significant effect on credit risk for Conventional Commercial Banks and has a negative but not significant effect on credit risk for Islamic Commercial Banks.

Several studies have focused on the effect of factors from the internal bank on NPL and NPF. Prastowo and Usman (2021) concluded that NPF is only positively and significantly affected by FDR, and negatively and significantly affected by inflation, ROA, Operating Cost and Operating Income, and GDP. Meanwhile, NPL is positively and significantly affected by CAR, LDR, and BOPO, and negatively and significantly affected by inflation and ROA. Dwihandayani (2017) revealed that credit, inflation, Loan to Deposit Ratio, Loan to Asset Ratio, and BI rates strongly affect NPL. Another study by Munifatussa'idah (2020) concluded that partially FDR and KPPM had a negative and significant effect on NPF. Furthermore, Kang (2016) concluded that the debit scale and ratio positively and significantly affect NPL.

One of the factors expected to affect NPL and NPF is Capital Buffer. Capital Buffer is a mandatory capital owned by a bank beyond the minimum required capital. A capital buffer is a backup for banks when loan activity is low, or there is a credit failure. Capital buffers help banks to have a stronger system.

Capital buffers were initially mandated by reforming the Basel III regulations. Basel III was constructed in 2010 and started to be implemented in 2012. As an update to Basel II, Basel III focuses on bank specifications and risk systematics (Santos & Bernabe, 2012). In this regulation, banks must improve the quality and quantity of capital. Furthermore, it can be a backup for risks that may occur.

There is a research gap found in previous studies. The differences appear not only in conventional and Islamic bank models but also in comparing the two banks, as revealed in research by Imaduddin (2011). The study concluded that conventional banks have better performance in dealing with credit failures. The findings are different from Poetry and Sanrego's (2011) study, which concluded that NPF in Islamic banks is more stable against micro and macro variables shocks than NPL. Based on the research gap, this study aims to investigate the effect and response of internal and external factors on NPL and NPF.

The hypotheses of this study are as follows:

H1: Economic growth negatively affects NPL.

H2: Economic growth negatively affects NPF.

H3: Inflation positively affects NPL.

H4: Inflation positively affects NPF.

H5: Loan to Deposit Ratio negatively affects NPL.

H6: Financing to Deposit Ratio negatively affects NPF.

H7: Capital Buffer negatively affects NPL.

H8: Capital Buffer negatively affects NPF.

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2. METHODS

This study utilizes time series data from 2008Q1 to 2021Q2. The data were generated from Bank Indonesia, the Financial Services Authority, and the Central Bureau of Statistics Indonesia in the form of monthly and quarterly reports. This study employs a quantitative analysis approach with the Vector Autoregressive (VAR) regression model. The VAR model is one approach used to project variables consisting of time series data. This method explains that each variable in the model depends on the past movement of the variable itself and other variables related to that variable in an equation model. In addition, the VAR method can also analyze the dynamic impact of disturbances contained in the model.

Before preparing an estimation model, there are several stages that need to be performed. Stationary tests, optimal lag tests, and polynomial tests are employed to find out whether the VAR test can be continued. Furthermore, a co-integration test was executed to observe the extent of the balance of the relationship of each variable used in the long term. The next test is the Granger causality test. This test aims to analyze causality or reciprocity between observed variables. The IRF test is a test performed to estimate and identify the effect of shock on one of the variables in the model. It aims to determine the duration of the shock until the variable can find its equilibrium point.

The VAR model assumes that all economic variables are interdependent due to its endogenous trait. Therefore, several models can be utilized in one study. In general, the formulation of the model is as follows:

$$Yt = a1 + a2Yt-1 + a3Zt-1 + \\ + a4Yt-1 + a5Zt-1 + eyt, \quad (1)$$

$$Zt = a1 + a2Yt-1 + a3Zt-1 + \\ + a4Yt-1 + a5Zt-1 + eyt. \quad (2)$$

This study employed the following models:

- Conventional Bank Model

$$NPLt = a1 + a2NPLt-1 + a3EGt-1 + \\ + a4INFLASIt-1 + a5LDRt + \\ + a5CBt-1 + eyt, \quad (3)$$

$$EGt = a1 + a2EGt-1 + a3NPLt-1 + \\ + a4INFLASIt-1 + a5LDRt + \\ + a5CBt-1 + eyt, \quad (4)$$

$$INFLASIt = a1 + a2INFLASIt-1 + \\ + a3NPLt-1 + a4EGt-1 + \\ + a5LDRt + a5CBt-1 + eyt, \quad (5)$$

$$LDRt = a1 + a2LDRt-1 + \\ + a3NPLt-1 + a4EGt-1 + \\ + a5INFLASIt + a5CBt-1 + eyt, \quad (6)$$

$$CBt = a1 + a2CBt-1 + a3NPLt-1 + \\ + a4EGt-1 + a5INFLASIt + \\ + a5LDRt-1 + eyt. \quad (7)$$

- Islamic Bank Model

$$NPFt = a1 + a2NPFt-1 + \\ + a3EGt-1 + a4INFLASIt-1 + \\ + a5FDRt + a5CBt-1 + eyt, \quad (8)$$

$$EGt = a1 + a2EGt-1 + a3NPFt-1 + \\ + a4INFLASIt-1 + a5FDRt + \\ + a5CBt-1 + eyt, \quad (9)$$

$$INFLASIt = a1 + a2INFLASIt-1 + \\ + a3NPFt-1 + a4EGt-1 + \\ + a5FDRt + a5CBt-1 + eyt, \quad (10)$$

$$FDRt = a1 + a2FDRt-1 + \\ + a3NPFt-1 + a4EGt-1 + \\ + a5INFLASIt + a5CBt-1 + eyt, \quad (11)$$

$$CBt = a1 + a2CBt-1 + a3NPFt-1 + \\ + a4EGt-1 + a5INFLASIt + \\ + a5FDRt-1 + eyt. \quad (12)$$

where NPL = Non-Performing Loan; NPF = Non-Performing Financing; EG = Economic Growth; INFLASI = Inflation; LDR = Loan to Deposit Ratio; FDR = Financing to Deposit Ratio; and CB = Capital Buffer.

3. RESULT

Before running any regression, stationary tests are performed to see if there are root units in the model. As shown in Table A1 (Appendix A), the Phillips-Perron test revealed that no variable has a probability above alpha 5% (0.05). This means that all variables for conventional and Islamic Commercial Banks are stationary in the Phillips-Perron test at the first different level. Table A2 (Appendix A) shows the Optimum Lag results. The optimum lag test showed that the optimum lag length for Conventional Commercial Bank data is 4. This is indicated by the most asterisks being at lag 4, namely for LR, FPE, AIC, and HQ criteria. As for Islamic Commercial Bank data, the optimum lag length is 2. This is indicated by the most asterisks being at lag 2, namely for the LR, FPE, AIC, and HQ criteria. The result showed that the two models pass the Polynomial test. This can be seen from the modulus values of the two models not greater than 1 for Conventional Commercial Bank data with a lag of 4 and Islamic Commercial Banks with a lag of 2. This means that both models are stable (Table A3, Appendix A). The cointegration test employed the Maximum Eigenvalue and showed two conclusions. First, there is only one cointegration in the Conventional Commercial Bank data model. Second, there are two cointegrations in the Islamic Commercial Bank data model. This means that the VAR model can be applied to both Conventional and Islamic Commercial Banks (Table A4, Appendix A). Table A5 (Appendix A) shows that conventional banks, economic growth, LDR, and Capital Buffer are proven to affect NPL but not vice versa. In Islamic banks, only economic growth and inflation are proven to affect NPF in the form of a one-way relationship.

The estimation results in Tables A6 and A7 (Appendix A) show that the variables EG (–1), LDR (–1), and CB_BUK (–2) have a significant relationship to NPL. It is confirmed by the t-statistic value of each variable greater than the t-table value. Variables EG (–1) and LDR (–1) have a negative effect, while the variable CB_BUK (–2) has a positive effect on NPL. The result of R^2 estimation is relatively high, which is 0.962582. This means that the model's independent variable can explain the NPL by 96.26%. At the same time, the remaining 3.74% is explained by other variables outside the model.

The VAR estimation results of Islamic commercial banks are quite different from the estimation result of conventional commercial banks. Only the EG (–1) variable significantly affects the NPF variable. Variable EG (–1) has a negative effect on NPF. The estimation showed the coefficient determination (R^2) value of 0.802297. This means that the independent variable can explain the NPF of 80.23%. The remaining 19.77% is explained by other variables outside the model. From the VAR test, the models that can be built are as follows:

$$NPLt = 0.019 - 0.033NPL_{t-1} + \\ +2.513EG_{t-1} - 1.854INFLATION_{t-1} - \\ -0.398LDR_{t-1} + 0.735CB\_BUK_{t-1}, \quad (13)$$

$$NPFt = -0.003 + 0.399NPF_{t-1} + \\ +1.402EG_{t-1} - 0.321INFLATION_{t-1} + \\ +2.382FDR_{t-1} + 0.083CB\_BUF_{t-1}. \quad (14)$$

Table 1. IRF estimation results

Conventional Bank Model Response of NPL					
Period	**NPL**	**EG**	**Inflation**	**LDR**	**CB**
1	0.001318	0.000000	0.000000	0.000000	0.000000
2	0.001323	–0.00047	0.000234	–0.0004	8.29E–05
3	0.001529	–0.0005	0.000329	–0.00024	0.000155
4	0.001274	–0.00043	0.000829	–0.00019	6.87E–05
5	0.001243	0.000270	0.000976	–0.0002	0.000158
6	0.001199	–0.0003	0.000918	–7.76E–05	0.000367
7	0.001220	–0.00022	0.000766	1.09E–05	0.000184
8	0.000854	4.28E–05	0.000574	–5.07E–05	0.000258
9	0.000843	0.000383	0.000434	7.01E–05	0.000291
10	0.000714	–8.73E–05	0.000279	0.000175	0.000550
Islamic Bank Model Response of NPF					
Period	**NPF**	**EG**	**Inflation**	**FDR**	**CB**
1	0.004486	0.000000	0.000000	0.000000	0.000000
2	0.001935	–0.00123	0.000147	–0.00035	–0.00026
3	0.003336	–0.00064	0.001207	–0.00019	1.37E–06
4	0.002473	0.000316	0.001532	–0.00015	–0.00022
5	0.002219	0.000307	0.001882	–7.97E–05	–0.00016
6	0.001624	–0.00015	0.001776	–1.82E–05	–0.00044
7	0.001604	9.96E–05	0.001544	–1.99E–05	–0.00068
8	0.001378	0.000507	0.001308	–1.25E–05	–0.00071
9	0.001056	0.000347	0.001138	9.29E–05	–0.00062
10	0.000822	5.24E–05	0.000922	0.000226	–0.00065

Table 1 shows that the NPF graph tends to be more stable than the NPL curve. This means that shocks to economic growth have a more significant impact on NPLs than NPFs. This indicates that Islamic commercial banks are not too affected by shocks to economic growth.

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The IRF test showed that the NPF response curve on FDR has a graph that is relatively more stable than the NPL response curve on LDR. This means that shocks to the FDR do not greatly affect NPF. However, the NPL has a much more stable response than the NPF response in a longer period. The NPL response will stabilize faster in the forty-fifth period, while the NPF response will only stabilize in the seventy-fifth period.

The IRF test revealed that there is a difference in response on Capital Buffer between NPL and NPF in the short term. NPL gave a positive response, while NPF gave a negative response. This means that the Capital Buffer mechanism is more effectively applied to Islamic commercial banks compared to conventional commercial banks. In a longer period, the NPL still gave a positive and stable response in the fortieth period while the NPF gave a negative and stable response in the sixtieth period.

4. DISCUSSION

The VAR estimation result showed that economic growth has a negative effect on NPL and NPF. This is in line with the assumption that the variable economic growth will have a negative effect on the credit risk. An increase in economic growth indicates an increase in the personal financial capacity that leads to a higher probability of paying the loan. In the first lag, economic growth significantly negatively affects NPL and NPF. This is in line with Prasetyo (2020) and Messai and Jouini (2013) that economic growth negatively and significantly affects NPL. An increase in economic growth is assumed by increasing income. Thus, debtors can pay for bank loans. Yusuf and Fakhruddin (2016) also state that an increase in GDP has a negative and significant effect on NPL. This is due to an increase in GDP, which indicates an increase in economic activity. Increased economic activity will increase income which then increases the capacity of debtors to pay their loans. Muqorrobin et al. (2021) also said that GDP has a negative and significant effect on NPF. This means that an increase in GDP will reduce the level of NPF. Islamic banks are more prudent in disbursing credit in a state of economic boom or increased economic activity. Slightly different from previous research, Amri and Harianti (2018) stated that economic growth has a negative and insignificant relationship to NPL. In the study, it was stated that economic growth only showed an increase in personal income. Increased income does not necessarily indicate that the NPL will decrease. This is because the decision to pay credit lies in the will of the community, not absolutely on their income.

The VAR estimation showed that inflation has a positive and insignificant effect on NPL and NPF. Inflation has a negative effect on NPL in the fourth lag. It implies that inflation does not affect NPL and NPF. This shows that creditors commit to paying for the loans and financing despite inflation. The results of this study contradict the results of research conducted by Prastowo and Usman (2021), which stated that inflation has a negative and insignificant effect on NPL and NPF.

The VAR estimation showed that there are differences in results for conventional commercial banks and Islamic commercial banks to credit ratio. In conventional commercial banks, LDR negatively and significantly affects the first lag. In contrast, in Islamic commercial banks, FDR has a negative effect on the first lag and a positive effect on the second lag, but both are insignificant. This means that an increase in the distribution of funds to conventional commercial banks can significantly reduce the level of NPL. This is in line with Poetry and Sanrego's (2011) study, which states that LDR and FDR have a negative effect on NPL and NPF. Furthermore, the study added that the results indicate that credit and financing banks provide are of good quality. Thus, additional finance or expansion can increase returns and reduce credit failure rates. Another study by Yusuf and Fakhruddin (2016) also concluded that LDR negatively and significantly affected NPL. Research conducted by Mahendra and Mahardika (2019) has different results on the LDR effect. The study concluded that LDR had a positive and significant effect on NPL. This difference may be due to the utilization of different research methods.

The VAR estimation also showed that there are differences between the effects of Capital Buffer on the NPL and the NPF. Capital Buffer has a positive and significant effect on NPL in the second lag. While in NPF, Capital Buffer has a negative effect in the first lag and positive in the second lag, but both are not

significant. This means that an increase in Capital Buffer does not have a large impact on the level of financing failure of Islamic commercial banks. This is supported by Yusuf and Fakhruddin (2016) who conclude that CAR has a positive and significant effect on NPL. An increase in CAR will also increase the level of Capital Buffer. This means that the addition of capital actually increases the NPL ratio. This can happen when an increase in capital is not followed by an increase in Risk Weighted Assets (RWA). This will result in capital increases failing to absorb the rate of credit failure.

CONCLUSION

This study aims to investigate the effect of economic growth, inflation, Loan to Deposit Ratio, Financing to Deposit Ratio, and Capital Buffer on Non-Performing Loans and Non-Performing Financing of conventional commercial banks and Islamic commercial banks in Indonesia. In addition, this study also aims to investigate any other their responses to the independent variables.

The finding shows that fluctuations in economic growth affect the risk of bank failure of both conventional commercial banks and Islamic banks. Nevertheless, conventional commercial banks tend to be more responsive to shocks in economic growth. There is a different effect between LDR and FDR on risk of bank failure. The loan disbursement affects the decrease in bank failure of conventional banks more than Islamic banks. This means that additional loans made by conventional commercial banks are of better quality, which leads to significant risk of bank failure reduction. On the other hand, additional financing disbursed by Islamic commercial banks has not been able to reduce the level of NPF. This implies that the financing expansion has the potential to increase the credit failure rate in the long term. High and low capital buffers have a greater effect on reducing risk of bank failure in conventional commercial banks than Islamic banks. Nevertheless, in long run it is expected that capital buffer is more effectively applied by Islamic commercial banks compared to conventional commercial banks due to stable responses to reducing risk of bank failure.

The findings provide new insights that banks need to be more sensitive to economic conditions and apply prudential principle. Banks should be more attentive to sectors with good prospects such as health and food sectors, especially in the new era. In order for a capital buffer to reduce risk of bank failure, risk management must be not only safe, but also productive in terms of both real and financial investments. The principle of mudharobah and musyarokah can be applied to an Islamic commercial bank or joint venture to a conventional commercial bank. Thus, the risk of bank failure can be avoided.

AUTHOR CONTRIBUTIONS

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Formal analysis: Yolanda Oktaviani.
Funding acquisition: M. Safar Nasir.
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APPENDIX A

Table A1. Stationarity test result

Type banks	Variable	1st different	Summary
Conventional banks	NPL	0.000	Stasionary
	Growth	0.000	Stasionary
	Inflation	0.000	Stasionary
	LDR	0.000	Stasionary
Islamic banks	Capital Buffer	0.000	Stasionary
	NPL	0.000	Stasionary
	Growth	0.000	Stasionary
	Inflation	0.000	Stasionary
	FDR	0.000	Stasionary
	Capital Buffer	0.000	Stasionary

Table A2. Lag optimum test result

Type bank	Lag	LogL	LR	FPE	AIC	SC	HQ
Conventional	0	664.18	NA	2.44e–18	–26.37	–26.18	–26.29
	1	850.82	328.50	3.81e–21	–32.83	–31.69*	–32.40
	2	891.16	62.92	2.13e–21	–33.45	–31.34	–32.65
	3	918.31	36.92	2.11e–21	–33.53	–30.47	–32.37
	4	966.89	56.35*	9.67e–22*	–34.48*	–30.46	–32.95*
Islamic	0	579.51	NA	7.20e–17	–22.98	–22.79	–22.91
	1	720.69	248.47	6.95e–19	–27.63	–26.48*	–27.19
	2	757.77	57.85*	4.42e–19*	–28.11*	–26.01	–27.31*
	3	780.76	31.27	5.19e–19	–28.03	–24.97	–26.87
	4	807.45	30.95	5.69e–19	–28.10	–24.08	–26.57

Table A3. Polynomial test result (conventional)

Root	Modulus
0.012 + 0.976i	0.976
0.012 – 0.976i	0.976
0.752 – 0.612i	0.970
0.752 + 0.612i	0.970
–0.953	0.953
0.938 – 0.069i	0.941
0.938 + 0.069i	0.941
–0.486 – 0.631i	0.796
–0.486 + 0.631i	0.796
–0.126 + 0.745i	0.755
–0.126 – 0.745i	0.755
0.624 + 0.334i	0.708
0.624 – 0.334i	0.708
–0.706	0.706
–0.655 – 0.250i	0.701
–0.655 + 0.250i	0.701
0.270 – 0.534i	0.598
0.270 + 0.534i	0.598
0.490 + 0.085i	0.498
0.490 – 0.085i	0.498

Table A3. Polynomial test result (Islamic)

Root	Modulus
0.943	0.943
0.898	0.898
–0.025 – 0.862i	0.863
–0.025 + 0.862i	0.863
0.543 – 0.255i	0.600
0.543 + 0.255i	0.600
–0.510	0.510
0.329	0.329
0.155 – 0.111i	0.191
0.155 + 0.111i	0.191

Table A4. Cointegration test result

Type bank	Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
Conventional	None*	0.545	38.597	33.877	0.013
	At most 1	0.426	27.227	27.584	0.056
	At most 2	0.324	19.216	21.132	0.091
	At most 3	0.119	6.232	14.265	0.584
	At most 4*	0.088	4.484	3.842	0.034
Islamic	None*	0.657	54.559	33.877	0.000
	At most 1	0.552	40.969	27.584	0.001
	At most 2	0.235	13.655	21.132	0.394
	At most 3	0.150	8.300	14.265	0.349
	At most 4*	0.016	0.833	3.842	0.361

Table A5. Granger causality test result

Type bank	Null Hypothesis	Obs	F-Statistic	Prob.
Conventional	EG does not Granger Cause NPL_BUK	50	11.127	3.E-06
	NPL_BUK does not Granger Cause EG		1.891	0.130
	INFLATION does not Granger Cause NPL_BUK	50	0.930	0.456
	NPL_BUK does not Granger Cause INFLASI		2.870	0.035
	LDR does not Granger Cause NPL_BUK	50	4.251	0.006
	NPL BUK does not Granger Cause LDR		2.166	0.090
	CB_BUK does not Granger Cause NPL_BUK	50	4.500	0.004
	NPL BUK does not Granger Cause CB_BUK		1.748	0.158
Syariah	EG does not Granger Cause NPF_BUS	52	3.528	0.037
	NPF_BUS does not Granger Cause EG		2.026	0.143
	INFLATION does not Granger Cause NPF_BUS	52	4.389	0.018
	NPL_BUK does not Granger Cause INFLASI		0.410	0.666
	FDR does not Granger Cause NPF_BUS	52	1.342	0.271
	NPF_BUS does not Granger Cause FDR		3.382	0.042
	CB_BUK does not Granger Cause NPF_BUS	52	0.357	0.702
	NPF_BUS does not Granger Cause CB_BUS		1.752	0.185

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Table A6. VAR estimation result (conventional)

Variables	NPL_BUK	EG	INFLATION	LDR	CB_BUK
	0.778	–2.442	–2.767	–1.809	0.011
NPL_BUK(–1)	(0.173)	(1.780)	(1.497)	(1.563)	(0.938)
	[4.502]	[–1.372]	[–1.848]	[–1.158]	[0.011]
	0.217	0.795	2.184	–1.788	–0.415
NPL_BUK(–2)	(0.205)	(2.108)	(1.773)	(1.851)	(1.111)
	[1.061]	[0.377]	[1.232]	[–0.966]	[–0.374]
	–0.261	–3.437	1.801	–1.448	–0.590
NPL_BUK(–3)	(0.178)	(1.830)	(1.539)	(1.606)	(0.964)
	[–1.468]	[–1.878]	[1.171]	[–0.901]	[–0.612]
	–0.033	2.513	–1.854	–0.398	0.735
NPL_BUK(–4)	(0.201)	(2.075)	(1.745)	(1.821)	(1.093)
	[–0.163]	[1.211]	[–1.063]	[–0.219]	[0.672]
	–0.046	–0.221	0.131	0.798	–0.117
EG(–1)	(0.017)	(0.177)	(0.149)	(0.155)	(0.093)
	[–2.699]	[–1.247]	[0.881]	[5.141]	[–1.251]
	0.002	–0.456	0.048	0.625	–0.016
EG(–2)	(0.021)	(0.221)	(0.186)	(0.194)	(0.116)
	[0.113]	[–2.065]	[0.259]	[3.225]	[–0.133]
	–0.004	–0.270	0.065	0.555	–0.082
EG(–3)	(0.018)	(0.187)	(0.158)	(0.164)	(0.099)
	[–0.235]	[–1.441]	[0.409]	[3.375]	[–0.829]
	0.023	0.359	0.185	0.754	–0.122
EG(–4)	(0.024)	(0.247)	(0.208)	(0.217)	(0.130)
	[0.955]	[1.450]	[0.890]	[3.474]	[–0.934]
	0.026	0.150	0.521	0.032	0.0497
INFLATION(–1)	(0.020)	(0.209)	(0.176)	(0.184)	(0.110)
	[1.262]	[0.717]	[2.967]	[0.175]	[0.452]
	0.009	–0.106	0.311	–0.107	–0.118
INFLATION (–2)	(0.022)	(0.230)	(0.193)	(0.202)	(0.121)
	[0.395]	[–0.461]	[1.607]	[–0.531]	[–0.976]
	0.022	0.027	–0.102	–0.193	–0.031
INFLATION (–3)	(0.022)	(0.230)	(0.193)	(0.201)	(0.121)
	[0.970]	[0.117]	[–0.526]	[–0.958]	[–0.256]
	–0.004	0.273	–0.249	0.447	0.193
INFLATION (–4)	(0.019)	(0.199)	(0.168)	(0.175)	(0.105)
	[–0.179]	[1.369]	[–1.484]	[2.552]	[1.834]
	–0.038	–0.071	–0.088	0.479	–0.052
LDR(–1)	(0.018)	(0.188)	(0.158)	(0.165)	(0.099)
	[–2.093]	[–0.378]	[–0.561]	[2.907]	[–0.527]
	0.021	0.039	–0.011	0.087	0.039
LDR(–2)	(0.019)	(0.194)	(0.163)	(0.170)	(0.102)
	[1.133]	[0.202]	[–0.069]	[0.513]	[0.382]
	0.018	–0.255	0.176	–0.166	0.037
LDR(–3)	(0.018)	(0.186)	(0.156)	(0.163)	(0.098)
	[1.021]	[–1.376]	[1.127]	[–1.017]	[0.377]
	–0.035	–0.124	–0.090	–0.054	0.027
LDR(–4)	(0.019)	(0.196)	(0.165)	(0.172)	(0.104)
	[–1.755]	[–0.632]	[–0.547]	[–0.311]	[0.263]
	0.014	1.336	0.081	1.091	0.425
CB_BUK(–1)	(0.037)	(0.378)	(0.317)	(0.332)	(0.199)
	[0.378]	[3.540]	[0.256]	[3.290]	[2.135]
	0.111	–0.254	–0.036	–0.274	0.093
CB_BUK(–2)	(0.038)	(0.387)	(0.325)	(0.339)	(0.204)
	[2.946]	[–0.658]	[–0.111]	[–0.806]	[0.454]

Table A6 (cont.). VAR estimation result (conventional)

Variables	NPL_BUK	EG	INFLATION	LDR	CB_BUK
CB_BUK(–3)	–0.026	0.308	0.156	0.367	0.094
	(0.042)	(0.431)	(0.363)	(0.379)	(0.227)
	[–0.611]	[0.713]	[0.431]	[0.969]	[0.413]
CB_BUK(–4)	0.016	–0.275	–0.375	0.449	0.288
	(0.037)	(0.383)	(0.322)	(0.336)	(0.202)
	[0.446]	[–0.719]	[–1.166]	[1.338]	[1.428]
C	0.019	0.284	0.068	0.466	–0.023
	(0.017)	(0.178)	(0.150)	(0.157)	(0.094)
	[1.093]	[1.591]	[0.453]	[2.980]	[–0.239]

Table A7. VAR estimation result (Islamic)

Variables	NPF_BUS	EG	INFLATION	FDR	CB_BUS
NPF_BUS(–1)	0.509	–1.140	–0.313	–4.925	–0.635
	(0.144)	(0.628)	(0.376)	(1.753)	(0.327)
	[3.531]	[–1.815]	[–0.835]	[–2.810]	[–1.938]
NPF_BUS(–2)	0.399	1.402	–0.321	2.383	0.083
	(0.160)	(0.699)	(0.418)	(1.950)	(0.365)
	[2.486]	[2.005]	[–0.768]	[1.222]	[0.227]
EG(–1)	–0.065	–0.064	0.008	–0.593	0.071
	(0.026)	(0.115)	(0.069)	(0.321)	(0.060)
	[–2.443]	[–0.557]	[0.121]	[–1.845]	[1.175]
EG(–2)	–0.017	–0.829	0.070	–0.352	0.034
	(0.028)	(0.123)	(0.074)	(0.344)	(0.064)
	[–0.592]	[–6.721]	[0.951]	[–1.024]	[0.522]
INFLATION (–1)	0.015	0.012	0.813	–0.224	0.055
	(0.053)	(0.233)	(0.139)	(0.650)	(0.121)
	[0.285]	[0.050]	[5.838]	[–0.344]	[0.451]
INFLATION (–2)	0.084	–0.000	–0.167	0.251	–0.065
	(0.050)	(0.217)	(0.130)	(0.605)	(0.113)
	[1.686]	[–0.001]	[–1.287]	[0.414]	[–0.579]
FDR(–1)	–0.008	0.027	0.012	0.904	–0.033
	(0.014)	(0.060)	(0.036)	(0.166)	(0.031)
	[–0.614]	[0.449]	[0.339]	[5.440]	[–1.071]
FDR(–2)	0.009	0.006	–0.040	–0.135	–0.030
	(0.013)	(0.058)	(0.035)	(0.161)	(0.030)
	[0.666]	[0.100]	[–1.141]	[–0.840]	[–0.997]
CB_BUS(–1)	–0.029	0.280	–0.461	–0.981	0.846
	(0.070)	(0.305)	(0.182)	(0.850)	(0.159)
	[–0.418]	[0.920]	[–2.534]	[–1.155]	[5.325]
CB_BUS(–2)	0.057	–0.336	0.174	0.141	–0.101
	(0.070)	(0.305)	(0.183)	(0.852)	(0.159)
	[0.807]	[–1.099]	[0.952]	[0.166]	[–0.636]
C	–0.003	–0.015	0.089	0.387	0.103
	(0.019)	(0.081)	(0.048)	(0.225)	(0.042)
	[–0.172]	[–0.187]	[1.842]	[1.717]	[2.446]

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