“The impact of inflation on Islamic banks’ home financing risk: Before and during the COVID-19 outbreak”

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THE IMPACT OF INFLATION ON ISLAMIC BANKS' HOME FINANCING RISK: BEFORE AND DURING THE COVID-19 OUTBREAK

Abstract

The COVID-19 outbreak has had a severe impact on nearly all industries, including Islamic banking, which plays a significant role but is exposed to higher risk. This study aims to evaluate the credit risk that Islamic banks in Indonesia have been exposed to related to home financing before and during the COVID-19 outbreak. Panel data are employed covering the period January 2016 to September 2020 on a monthly basis. The data were analyzed using a dynamic panel approach to present a distinct picture of Sharia-compliant property financing before and during the COVID-19 outbreak. In general, the findings show that the macroeconomic variable reflected by regional inflation has had a different influence in the two periods, with Islamic banks having had much more exposure to macroeconomic risk, specifically in home financing, during the epidemic. In addition, the different influences are also shown by the study results, which show that provinces on Java Island face less risk exposure than those outside Java. In terms of impulse response factors and variance decompositions' result, before the outbreak, the response of home financing risk to inflation tended to be more stable. However, during the outbreak, the movement has tended to fluctuate more, especially outside Java Island. The same result for variance decompositions shows a similar trend, with inflation tending to have a larger impact during the outbreak.

Keywords credit risk, Islamic banks, sharia-compliant property financing, dynamic panel, regional inflation

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INTRODUCTION

Since March 2020, the COVID-19 outbreak has badly hit every country around the world, including Indonesia. This severe impact of COVID-19 means society has lost its purchasing power and has significantly shifted the demand and supply equilibrium. Ultimately, it has caused Indonesia to experience a dramatic change in several macroeconomic indicators, including inflation, which has dropped to its lowest rate in the past two decades (Statistics Indonesia, 2020). The dramatic change in inflation is also reflected in the GDP growth rate of the country.

According to a report released by Statistics Indonesia (2020), the lowest growth of the Indonesian economy since the last crisis of 1998 has been recorded, at – 5.32% (yoy). Despite declining growth in nearly all sectors, a capital-extensive sector with a huge multiplier effect on more than 170 sub-sectors has continued to contribute a positive growth of 2.3% to the national economy (Statistics Indonesia, 2020). However, this does not mean that the sector has been free of challenges during the outbreak.

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The lockdown order, which has forced businesses in cities to close and employees to work from home, will inevitably reduce demand for office and retail space, but increase demand for housing/flats/apartments. Furthermore, the physical distancing and travel restrictions have resulted in a sharp decline in revenue for many businesses. In some highly affected sectors such as restaurants and hotels, the occupancy rate has dropped significantly to 40% (Kompas, 2020). As a consequence, there is a growing risk of default, as businesses may not be able to pay their rents or mortgage loans. If the situation is not planned for well, there might be an unmanageable risk, leading to a recurrence of the 2008 financial crisis.

Moreover, in Indonesia, the most populated Muslim country, the demand for Sharia-compliant property financing is increasing (Firmansyah & Gunardi, 2018). It is therefore important to examine the significant role played by Islamic banks, which account for 35% of total Islamic finance assets in the country (IFSB, 2020). Islamic banks are defined as financial institutions operating on Sharia (Islamic) principles set by the Indonesian *Ulama* Council. According to a report released by the Indonesia Financial Services Authority (2020), Islamic banks in Indonesia comprise 14 Islamic Commercial Banks (BUS) and 20 Islamic Business Units (UUS), which have channeled funds to 18 industrial sectors in Indonesia, including the property sector.

During the outbreak, the role of Islamic banks is becoming more relevant and significant, as major industries need faster and easier access to capital. On the other hand, the banks need to take care of their own risk exposure to maintain their financial performance. Therefore, they need to adhere closely to their prudential banking principles, in particular with regard to home financing, as COVID-19 presents the biggest challenge to global mortgage markets since the 2008 financial crisis (Deloitte, 2020).

To the best of the author's knowledge, there are very few studies which analyze the effect of COVID-19 on property financing, particularly using the financial reports of Islamic banks. Second, the regional perspective provided in this study could help make a more relevant analysis of the current financing condition of Indonesian Islamic banks. And third, the use of the dynamic panel approach will present a picture of Sharia-compliant property financing before and during the COVID-19 outbreak.

Based on the background discussed above, this study aims to evaluate Islamic banks' credit risk related to home financing before and during the COVID-19 outbreak. The paper begins with the introduction and literature review, followed by a discussion of the methodology used. The results of the statistical test are then provided, together with an explanation of the details of the research results. The study ends with a conclusion and recommendations for particular stakeholders.

1. LITERATURE REVIEW AND HYPOTHESES

The study of the credit risk of Islamic banks has emerged recently and will remain an interesting topic discussed by global academia due to its significance and urgency. Credit risk is one of the crucial issues in the banking industry, as it measures banks' ability to acquire financing and to handle potential losses arising from financing activities (Wiseman & Catanach, 1997). The failure to manage credit caused the collapse of big institutions such as Lehman Brothers, has led to a great financial crisis of 2008 (Friedland, 2009). Therefore, the management of credit risk is primarily required to achieve healthy banking performance, both for Islamic banks and their conventional counterparts. In this regard, Alsyahrin et al. (2018) found a better credit risk management practice in Islamic banks, compared to conventional ones.

The management of credit risk in Islamic banks is mainly related to their non-performing financing (NPF), which is one of the main activities of such banks. Imprudent distribution of financing, without proper risk assessment or a supportive environment on the national scale, could bring an increase in non-performing financing (Ibrahim

& Rahmati, 2017). Iriani and Yuliadi (2015) found that bank performance in the form of the non-performing financing ratio was significantly affected by bank behaviors and macroeconomic indicators. One such indicator that can be used as an indicator in managing non-performing financing is inflation. Among the first studies to discuss this issue was that of Friedman (1977), who defined anticipated inflation as the perceived average rate of price change, which was initially studied in terms of its effect on the rate of unemployment.

Over time, studies related to inflation have grown rapidly due to its significance in reflecting current economic conditions (Claeys, 2020). The real market condition can be captured by the rate of inflation, as any increase in the price of goods/services will be reflected by an increase in inflation (Bohl & Siklos, 2018). Reflecting on what happened during the 1998 Asian financial crisis and the 2008global crisis, here has been a sharp rise in inflation, reflecting rising prices in the market due to higher costs of production, usually known as cost-pull inflation (Mishkin, 1999). With particular reference to the housing sector, Cheng et al. (2019) found that skyrocketing housing prices during the subprime mortgage crisis would make housing less affordable, hence resulting in the slowdown of trading activities and disrupted business cycles in the global market.

Reflecting on the current circumstances, Sukharev (2020) states that the effect of COVID-19 on the real and financial sectors has tended to bring the inflation rate down to levels never expected before. A fall in the inflation rate indicates that customers are losing their purchasing power, as they are more likely to make careful consideration of non-essential spending. At the macro level, there would be a significant change in the production of non-primary goods, ultimately causing a supply shock in the market (Claeys, 2020).

In the context of the financial market, the inflation rate experienced by a nation will have an effect both on the performance and the risks of financing activities (Lin et al., 2016). However, in a dual banking system such as in Indonesia, it has been found that there are different responses between conventional and Islamic banks, with the former believed to have more exposure to interest rates (Fakhrunnas et al., 2018). The study further emphasizes that over a long period of time, macroeconomic variables can have an effect on banks' risk-taking behavior. Considering the significant roles played by inflation and credit risk, previous studies (Abid et al., 2014; Erdinç & Gurov, 2016; Firmansyah & Gunardi, 2018; Klein, 2013) have attempted to establish the effect of the two variables. However, they obtained varying results, depending on the particular background conditions.

Firmansyah (2015) examined the performance of Indonesian Islamic banks and found a significant negative effect of inflation on NPF. A high rate of inflation was found to reduce society's purchasing power, which ultimately weakens people's ability to fulfil the obligations arising from loans (Erdinç & Gurov, 2016; Nkusu, 2011). In line with these findings, Fofack (2005) and Warue (2013) revealed that high inflation rates will also lead to higher nominal interest rates, which in turn will reduce real money balances. This situation would make society reluctant to save, which means that third party funds collected and distributed will decrease. The decline in total financing will minimize non-performing financing (Touny & Shehab, 2015).

On the other hand, inflation can be seen to have a positive effect on the NPF ratio, as evidenced by Abid et al. (2014) and Klein (2013), who found that low inflation rates could affect the financial condition of borrowers, allowing them to repay their loans. For individual homeowners, home financing is one of their biggest personal liabilities and has a significant effect on their financial stability. On the other hand, residential mortgage receivables are considered one of the most valuable assets affecting the liquidity of property companies; Ahmed (2010) explains that imprudent mortgage financing may result in a higher risk of financial crisis to the banks.

As the unprecedented crisis has been faced by all economic players (Donthu & Gustafsson, 2020; Kirk & Rifkin, 2020; Pantano, et al., 2020), some experts even compared the occurrence of today's crisis to that happened in 2008 (Tang & Aruga, 2021). However, on the other hand, in several countries, there is a sign of recovery in banks' performance and financial stability starting from the second quarter of 2020 (Elnahass et al., 2021).

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Therefore, this study aims to investigate any different credit risk impact faced by Islamic banks related to home loans before and during the COVID-19 outbreak in different regions of Indonesia.

1.1. Study hypotheses

According to the literature review discussed above, there are three hypotheses formulated as follows:

$H0_1$: *There is no difference in the credit risk of home financing before and during COVID-19 on Java Island.*

$H0_2$: *There is no difference in credit risk of home financing before and during COVID-19 outside Java Island.*

$H0_3$: *There is no difference in credit risk of home financing before and during COVID-19 on Java Island and outside Java Island.*

2. METHODS

To examine the impact of the COVID-19 outbreak on Islamic banks' performance in home financing, the study uses panel data from January 2016 to September 2020 on a monthly basis. The banking data were retrieved from the Indonesian Financial Service Authority (FSA), and the inflation data from Statistics Indonesia. Besides being on a monthly basis, the data were also at a province level. As Indonesia has 33 provinces, there were 1,881 observation periods in total. To understand the impact of the COVID-19 outbreak, the data were then divided into two sets, reflecting the period before the outbreak occurred in Indonesia (before March 2020) and that during the outbreak (March 2020 onwards).

The general model of the study is as expressed below:

$$HF_{it} = \beta_0 + \beta_1 INF_{it} + \beta_2 FDR_{it} + \\ + \beta_3 Ln\_FIN_{it} + \beta_4 Ln\_ASSET_{it} + \varepsilon_{it}, \quad (1)$$

where HF_{it} – percentage of Islamic banks' credit risk for home financing in period t and province i; INF_{it} – inflation rate percentage in period t and province i; FDR_{it} – ratio of total financing to total funding of Islamic banks in period t and province i; Ln_FIN_{it} – log of total financing of Islamic banks in period t and province i; Ln_ASSET_{it} – log of total assets of Islamic banks in period t and province i; β_0 – constant; ε_{it} – error term in period t and province i.

To specifically measure the bad home financing loans, *HF* is categorized based on the types of financing, namely *NPREU* (percentage of financing default for real estate, rental business and company services of Islamic banks); *NPRT* (percentage of financing default for personal residential ownership of Islamic banks); and *NPR* (percentage of financing default for personal business shop ownership of Islamic banks).

In addition, the study adopted panel vector autoregression (PVAR), as suggested by Holtz-Eakin et al. (1988). The advantages of applying PVAR are that, first, the analysis tool provides a time-series effect in panel data form. Second, unobserved individual heterogeneity is permitted, so it also addresses the endogeneity issue. Anarfo et al. (2019) and Fakhrunnas (2020) also explain that PVAR enables measurement of impulse response factors (IFRs) and variance decompositions (VDs), with both analytical tools being able to examine multivariate causalities among the observed variables.

Following Love and Zicchino (2006), the general model for PVAR is as follows:

$$Y_{it} = \tau_1 Y_{it-1} + f_i + d_t + \varepsilon_{it}, \quad (2)$$

where Y_{it} – the observed variables in the PVAR analysis; f_i – a fixed effect for unobservable time invariant effects specific to each province; d_t – a time dummy in each province; and e_{it} – a random error term i.i.d.

The formulation highlighted above was able to generate a general PVAR model for the study, as shown below:

$$HF_{it} = \sum_{j=1}^{p} \varnothing_{1j} HF_{it-j} + \sum_{j=1}^{p} \varnothing_{2j} INF_{it-j} + \\ + \sum_{j=1}^{p} \varnothing_{3j} FDR_{it-j} + \sum_{j=1}^{p} \varnothing_{4j} Ln\_FIN_{it-j} + \quad (3) \\ + \sum_{j=1}^{p} \varnothing_{5j} Ln\_ASSET_{it-j} + f_i + d_t + \varepsilon_{it}.$$

According to Pedroni (2000, 2004), to first analyze PVAR, a panel unit root test must be conducted, as suggested by Pesaran (2012). PVAR analysis can then be made, with lag selection criteria performed as the next step, following Qu and Perron's (2007)'approach. The final step is to conduct VD and IRF analysis.

3. RESULTS

Table 1 describes the data used in the study. It can be seen that the bad loan rate for all types of home financing in Islamic banks was on average 3.9% to 7.9% per month from January 2016 to September 2020. In addition, during the study period, the highest level of inflation was 4.2% occurring in certain provinces and months, while the lowest rate was –3.03%, thus confirming the existence of deflation in certain provinces and months. For FDR, the maximum percentage was 256.60%, which means that there were Islamic banks in certain provinces and months that had financing 2.565 times higher than the funds collected from third parties. For financing and assets, the biggest Islamic bank in Indonesia had assets worth IDR 403,995 bln, with the highest financing activities of IDR 158,743 in certain provinces and months.

Moreover, as the first step in conducting PVAR analysis, Appendix A shows the unit root test results for all the variables. The test shows that several benchmarks were used to check whether the variables were stationary at level or at the first level, as measured with the Augmented Dickey-Fuller (ADF) and Philip-Perron (PP) tests, and also shows the intercept, trend and intercept, and none that will also assess the data which rely on the data type. According to Table A1, the results of the unit root test showed that all variables were stationary at the first level, with a level of significance of 1-5%. This finding confirms that the requirement for all variables to be stationary at level in order to perform PVAR analysis was fulfilled.

Appendix B delineates the impact of the COVID-19 outbreak, reflected by the condition prior to and during the outbreak, on the credit risk of Islamic banks in home financing activities. The regional effect is also explained in Table B1 by differentiating between the provinces located on Java Island as the epicenter of COVID-19 outbreak and which also controls around 60% of Indonesian economic activities, and the provinces located outside Java. The PVAR results indicate that all the models were appropriate, as indicated by the significance level of the F-statistic values, which were in the range of 1% to 10%. In addition, the ability of the independent variables to explain the dependent variables is depicted by the adjusted R-squared scores, which were 3-97% in each model. As the representation of the economic situations before and during the COVID-19 outbreak, inflation had a significant influence on the percentage of financing default for real estate, rental business and company services in Islamic banks prior to the outbreak. According to its coefficient, a 1% increase in the inflation rate will raise the NPREU bad loans by 0.01%, specifically outside Java Island.

Moreover, the impulse response factors (IRFs) in Appendix C show less fluctuation prior to the outbreak. When considering Java and outside Java, there is a slightly different movement of bad loans of Islamic banks for home financing in each category in response to inflation. The provinces on Java Island experience more fluctuation than those outside the island. Regarding the variance decomposition (VD) results in Appendix D, NPR is the variable most affected by inflation rate. Its value can be reduced to 1.4% due to inflation at the end of the observation period, which is different to the others that are generally less than 1%.

Table 1. Data description

Variable	Mean	Median	Maximum	Minimum	Std. dev.
NPREU	7.9 %	3.6%	198.7%	0%	12.9%
NPRT	3.9%	2.9%	47.6%	0%	03.4%
NPR	5.1%	3.2%	71.3%	0%	6.8%
INF	0.317%	0.25%	4.2 %	–3.03%	0.705%
FDR	111.91%	103.36%	256.60%	26.7 %	0.424%
FIN	IDR 8,416 bln	IDR 2,985 bln	IDR 158,743 bln	IDR 93.12 bln	IDR 21,938 bln
ASSET	IDR 16,292 bln	IDR 3,745 bln	IDR 403,995 bln	IDR 171.3 bln	IDR 541,920 bln

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During the outbreak, the impact of inflation has been more significant on the bad loans of Islamic banks' home financing. The provinces on Java Island have been influenced by inflation rate; a rise in the rate increases bad loans of NPRT caused by a positive relationship between the variables. Furthermore, the provinces outside Java Island have more exposure to default risk in Islamic bank home financing, with the inflation rate having a positive and significance influence on NPREU and NPR. In terms of the IRF results, the response of home financing during the outbreak to inflation fluctuates more than before the outbreak, with the provinces outside Java Island surprisingly experiencing greater fluctuations. The VD results explain that NPREU on Java Island is the most affected sector in home financing activities performed by Islamic banks. It is shown that inflation during the observation period could influence the value of NPREU by 23.9%. Compared to the provinces on Java Island, the influence of inflation on Islamic bank home financing in each category is smaller, by less than 3%.

4. DISCUSSION

Islamic banks have a similar function to conventional ones, acting as intermediary institutions, although each bank has different principles. They collect funds from third parties, then distribute these to others in need of financing. In this paper, the distribution process focuses on home financing activities, specifically divided into NPREU, NPRT and NPR. The regional effect is also considered when measuring whether there is a difference between Java Island, the center of Indonesian economy and the outbreak, and the outside Java Island, which is contributing little to Indonesia's economic growth and also has suspicion of COVID-19.

Prior to the COVID-19 outbreak, inflation, as a measurement of monthly macroeconomic factors, did not affect the number of bad home financing loans in Java. This means that before the outbreak, the risk management of Islamic banks performed better in tackling macroeconomic risk such as inflation. Prudent risk management will lead banks to take more care in the face of macroeconomic risk exposure (Ibrahim & Rahmati, 2017). In contrast, inflation positively and significantly influences the percentage of financing default for real estate, rental business and company services. As a form of home financing in business activity, a rise in the inflation rate will increase NPREU. This means that Islamic banks will not be able to manage risk and will potentially suffer a higher default rate when inflation is higher. Iriani and Yuliadi (2015) emphasize that the inability to manage risk might endanger banking operations and affect banks' financial soundness.

In addition, during the COVID-19 outbreak, the exposure of banks to macroeconomic variable shocks such as inflation has risen. On Java Island, Islamic banks face macroeconomic variable risks in financing for personal residential ownership. NPRT is a type of personal financing whose purposes are not intended for business activity. During the outbreak, as inflation has risen, banks possibly lose real income because of the diminishing value of money. On the other hand, from the Islamic bank customer side, Claeys (2020) and Cheng et al. (2019) state that an increase in inflation means that customers face less affordable goods and services and that living costs increase. Because of this, the ability of the customer to return money lent by Islamic banks becomes lower. A similar situation has occurred outside Java Island, where inflation has had a positive and significant impact on the bad loan rate of Islamic banks' home financing for real estate, rental business company services and personal business shop ownership. A positive relationship between inflation and bad loans possibly increases the difficulty for customers to repay money from the banks (Abid et al., 2014; Klein, 2013).

Different IFR and VD results have been obtained for the periods before and during the COVID-19 outbreak. Before the outbreak, the response of home financing risk to inflation tended to be more stable. However, during the outbreak, the movement has tended to fluctuate more, especially outside Java Island. The same result for VDs shows a similar trend, with inflation tending to have more of an affect during the outbreak. The higher fluctuation dur-

ing the outbreak shows that Islamic banks have more exposure to external shocks such as inflation than in normal financial circumstances. Instability of macroeconomic conditions can lead to default of an Islamic bank; if this happens continuously, mortgage default, as was the case during the 2008 crisis, may well recur. This argument is in line with Cheng et al. (2019) who capture that the financial turmoil during the 2008 crisis, triggered by mortgage default, was exacerbated by unsteady macroeconomic condition.

CONCLUSION

The COVID-19 outbreak has influenced the economic situation in Indonesia, not only affecting the financial sector, but also the real sector. Islamic banks, being one type of financial institutions in Indonesia's financial ecosystem, cannot avoid the impact. Therefore, it is considered important to study any other credit risk impact that Islamic banks face in relation to home loans before and during the COVID-19 outbreak in different regions of Indonesia.

According to the findings, it can be concluded that the macroeconomic variable reflected by regional inflation has had a different influence before and during the outbreak. During it, Islamic banks had much more exposure to macroeconomic risk, specifically in home financing. In addition, different influences are also shown by the finding that the provinces on Java Island have faced less risk exposure than those outside the island. However, in terms of personal residential ownership financing, the provinces on Java Island have evidently been influenced by inflation, while those outside have tended to have higher default risk for real estate, rental business, company services and personal business shop ownership.

The findings provide new insights into how Islamic banks' home financing has reacted before and during the outbreak. Therefore, to mitigate the worst scenario during the financial turmoil, the financial authorities need to anticipate Islamic bank performance from the perspective of home financing risk. If it is too late, it is quite possible that mortgage default will recur, as happened in 2008. This prediction is not exaggerated, as banks face a higher possibility of a contagious effect than other financial institutions. Finally, further research on Islamic banks' home financing risk requires a wider study scope with a larger sample to examine the impact of the COVID-19 outbreak not only in Indonesia, but also in other countries. This will provide additional information to assess the resilience of Islamic banks during the COVID-19 outbreak.

AUTHOR CONTRIBUTIONS

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Writing – reviewing & editing: Yunice Karina Tumewang.

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APPENDIX A

Table 1A. Panel unit root test results

Variable	Intercept				Trend and intercept				None			
	At level		First difference		At level		First difference		At level		First difference	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP	ADF	PP
NPREU	297.9***	435.0***	952.3***	1132.6***	226.3***	358.8***	814.0***	1039.4***	265.7***	413.6***	2036.7***	6277.8***
NPRT	301.7***	522.0***	1130.4***	1206.6***	245.7***	485.6***	986.1***	1071.6***	136.0***	195.2***	2770.1***	7885.8***
NPR	225.4***	353.7***	967.8***	1170.7***	202.5***	355.0***	825.8***	1072.9***	199.1***	300.1***	1933.9***	5867.8***
INF	781.0***	1350.7***	984.4***	712.4***	674.2***	1102.1***	1205.***	949.5***	712.5***	1087.1***	4567.8***	8170.9***
FDR	154.0***	192.7***	839.7***	1280.1***	129.1***	165.9***	697.2***	1154.5***	51.8841	56.7315	1406.2***	4140.9***
Ln_Fin	92.4***	101.5**	679.2***	1147.6***	67.85***	81.5***	545.7***	1031.8***	15.1099	14.7441	994.3***	2547.8***
Ln_Asset	106.8***	149.4***	780.7***	1220.2***	81.4**	126.2***	644.3***	1093.7***	12.0781	10.7297	1215.4***	3130.2***

Note: ***, ** and * indicate levels of significance of 1%, 5% and 10%, respectively.

APPENDIX B

Table 1B. PVAR results

Variable	Prior to the COVID-19 outbreak						During the COVID-19 outbreak					
	Java Island			Outside Java Island			Java Island			Outside Java Island		
	NPREU	NPRT	NPR	NPREU	NPRT	NPR	NPREU	NPRT	NPR	NPREU	NPRT	NPR
HF(–1)	0.29*** [4.60]	0.11** [1.83]	0.12** [1.89]	0.48*** [17.01]	0.42*** [14.90]	0.37*** [13.09]	0.14 [0.77]	0.71*** [4.53]	0.85** [2.20]	0.35*** [3.36]	0.48*** [4.43]	0.97*** [10.51]
HF(–2)	0.18*** [2.85]	0.10* [1.62]	0.08* [1.30]	0.07** [2.31]	0.21*** [7.04]	0.19*** [6.47]	0.27 [1.15]	0.07 [0.36]	0.30 [0.73]	0.50*** [4.12]	0.29** [1.81]	–0.03 [–0.22]
HF(–3)	0.06 [0.94]	0.09* [1.45]	0.06 [0.90]	0.07*** [2.42]	0.15*** [5.31]	0.09*** [3.07]	–0.02 [–0.13]	0.17 [0.96]	0.02 [0.11]	–0.10 [–0.81]	0.14 [1.11]	–0.01 [–0.15]
INF(–1)	0.00 [0.47]	0.00 [1.02]	0.00 [0.77]	0.01** [1.76]	0.00 [0.77]	0.00 [–0.88]	0.00 [0.63]	0.01** [1.94]	–0.01 [–0.52]	0.02 [0.74]	0.00 [0.67]	0.01** [2.02]
INF(–2)	0.00 [–0.03]	0.00 [0.87]	0.00 [–0.29]	0.00 [–0.49]	0.00 [0.46]	0.00 [–1.06]	0.01 [0.87]	0.00 [1.02]	0.00 [–0.00]	–0.03 [–1.08]	0.00 [–0.95]	0.00** [–1.70]
INF(–3)	–0.01 [–0.97]	0.00 [–0.87]	0.00 [–0.71]	0.00 [0.06]	0.00 [0.37]	0.00 [0.06]	0.01 [0.75]	0.00 [–0.43]	–0.02 [–0.90]	0.04** [2.01]	0.00 [–0.07]	0.00 [–0.22]
FDR(–1)	0.04 [1.12]	0.00 [0.39]	–0.01 [–0.42]	–0.07** [–1.70]	–0.01 [–0.73]	0.00 [0.11]	0.00 [–0.01]	0.16*** [2.85]	0.40 [0.93]	0.01 [0.05]	0.00 [0.30]	–0.01 [–0.61]
FDR(–2)	0.03 [0.65]	0.00 [0.09]	–0.01 [–0.18]	0.06 [1.21]	0.00 [0.51]	0.00 [0.01]	0.25 [1.17]	–0.25*** [–3.87]	0.08 [0.14]	–0.01 [–0.02]	0.00 [0.20]	0.01 [0.52]
FDR(–3)	0.09** [2.42]	0.00 [0.19]	0.02 [0.65]	0.01 [0.25]	0.00 [–0.13]	0.00 [–0.01]	–0.26* [–1.71]	0.07 [1.23]	–0.44 [–0.94]	–0.04 [–0.17]	–0.01 [–0.28]	0.00 [–0.06]
LN_FIN(–1)	–0.05 [–0.97]	0.00 [–0.17]	0.02 [0.70]	–0.05 [–0.78]	–0.02 [–1.25]	–0.01 [–0.20]	0.21* [1.36]	–0.09* [–1.34]	–0.34 [–0.61]	–0.58 [–0.97]	–0.01 [–0.23]	0.00 [0.01]
LN_FIN(–2)	0.02 [0.41]	0.00 [0.22]	0.03 [0.85]	0.05 [0.62]	0.03** [1.47]	0.02 [0.37]	–0.29 [–1.26]	0.10 [1.12]	–0.25 [–0.34]	0.71 [1.09]	–0.03 [–0.48]	0.02 [0.24]
LN_FIN(–3)	–0.10** [–2.22]	0.00 [–0.21]	–0.01 [–0.22]	0.02 [0.33]	0.00 [–0.16]	0.00 [0.01]	0.10 [0.75]	0.01 [0.16]	0.49 [1.05]	–0.04 [–0.06]	0.02 [0.49]	–0.02 [–0.33]
LN_ASSET(–1)	0.03 [0.55]	0.00 [0.23]	–0.02 [–0.51]	0.01 [0.24]	0.01 [0.79]	0.01 [0.33]	–0.06 [–0.46]	0.14** [2.15]	0.72* [1.40]	0.31 [0.46]	0.00 [0.02]	–0.04 [–0.59]
LN_ASSET(–2)	–0.02 [–0.35]	0.00 [–0.20]	–0.03 [–0.85]	–0.04 [–0.56]	–0.02* [–1.43]	–0.01 [–0.30]	0.26 [1.12]	–0.30*** [–4.21]	–0.29 [–0.46]	–0.43 [–0.45]	0.02 [0.25]	0.04 [0.38]

Table 1B (cont.). PVAR results

Variable	Prior to the COVID-19 outbreak						During the COVID-19 outbreak					
	Java Island			Outside Java Island			Java Island			Outside Java Island		
	NPREU	NPRT	NPR	NPREU	NPRT	NPR	NPREU	NPRT	NPR	NPREU	NPRT	NPR
LN_ASSET(–3)	0.10 [2.22]	0.00 [0.10]	0.01 [0.19]	0.00 [0.08]	0.00 [0.34]	–0.01 [–0.22]	–0.22* [–1.43]	0.13*** [2.40]	–0.34 [–0.73]	0.02 [0.03]	–0.01 [–0.12]	0.01 [0.07]
C	–0.01 [–0.16]	0.01** [2.24]	–0.01 [–0.39]	0.02 [0.64]	0.02*** [3.22]	0.01 [0.45]	0.10*** [5.02]	0.01 [1.12]	–0.03 [–0.63]	0.11 [0.78]	0.01 [0.64]	–0.01 [–0.51]
R-squared	0.60	0.08	0.11	0.33	0.54	0.32	0.99	0.99	0.98	0.50	0.86	0.97
Adj. R-squared	0.58	0.03	0.06	0.32	0.54	0.31	0.98	0.97	0.94	0.42	0.83	0.96
F-statistic	26.56***	1.60**	2.14**	39.88***	99.05**	38.19***	62.08***	43.68***	24.96***	5.97***	34.88***	171.76***

Note: ***, ** and * indicate levels of significance of 1%, 5% and 10%, respectively.

APPENDIX C. IRF RESULTS

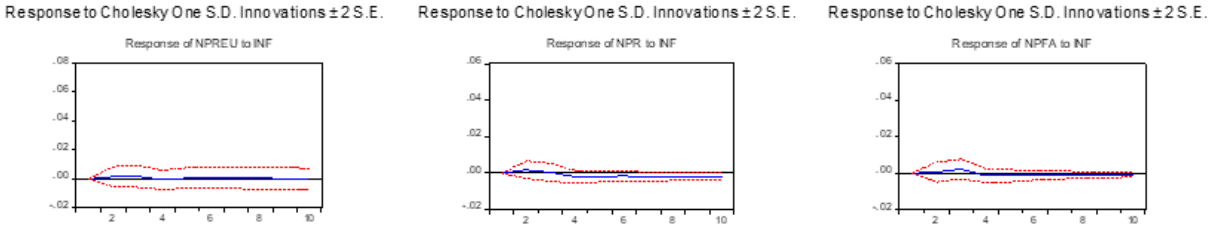

Figure 1C. Before the COVID-19 outbreak (Java Island)

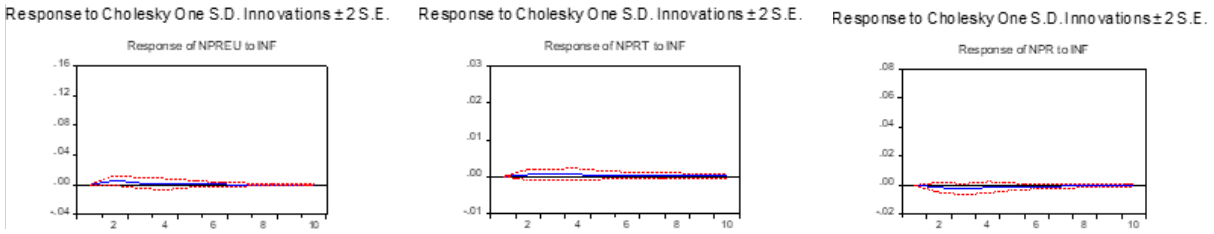

Figure 2C. Before the COVID-19 outbreak (outside Java Island)

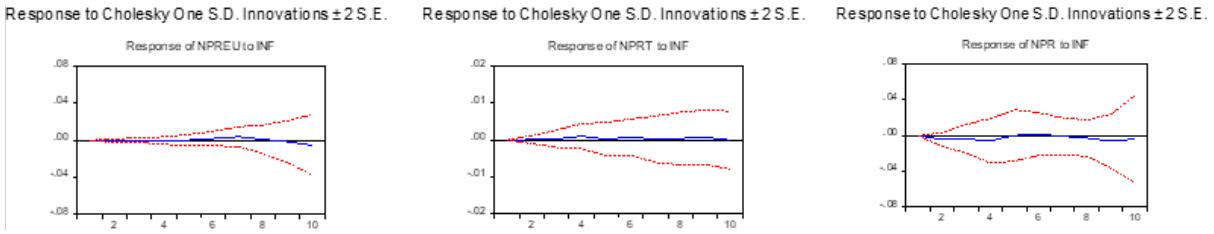

Figure 3C. During the Covid-19 outbreak (Java Island)

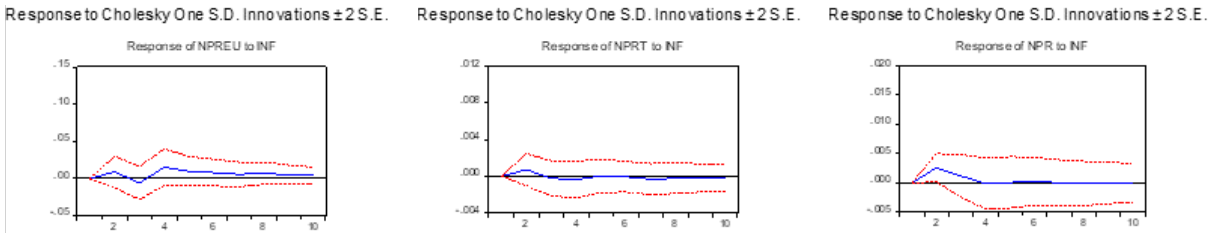

Figure 4C. During the COVID-19 outbreak (outside Java Island)

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APPENDIX D. VD RESULTS

Table 1D. Before the COVID-19 outbreak

Java Island												
Period	NPREU			NPRT			NPRT			NPR		
	S.E.	NPREU	INF	S.E.	NPRT	INF	S.E.	NPFA	INF	S.E.	NPR	INF
1	0.057	100.000	0.000	0.008	100.000	0.000	0.045	100.000	0.000	0.041	100.000	0.000
2	0.061	96.456	0.055	0.008	99.515	0.369	0.045	99.936	0.013	0.041	98.962	0.197
3	0.067	90.521	0.108	0.008	98.168	1.549	0.046	99.594	0.250	0.042	98.256	0.203
4	0.072	85.137	0.103	0.008	97.893	1.666	0.046	99.463	0.348	0.042	97.522	0.430
5	0.075	80.839	0.097	0.008	97.634	1.827	0.046	99.319	0.455	0.042	96.883	0.599
6	0.078	77.596	0.104	0.008	97.370	2.018	0.046	99.217	0.519	0.043	96.255	0.739
7	0.081	75.354	0.104	0.008	97.227	2.111	0.046	99.141	0.571	0.043	95.670	0.928
8	0.082	73.483	0.102	0.008	97.115	2.174	0.046	99.065	0.621	0.043	95.201	1.120
9	0.084	72.107	0.099	0.008	97.024	2.226	0.046	99.006	0.657	0.043	94.791	1.288
10	0.085	71.122	0.097	0.008	96.962	2.263	0.046	98.956	0.686	0.043	94.422	1.440
Outside Java Island												
Period	NPREU			NPRT			NPRT			NPR		
	S.E.	NPREU	INF	S.E.	NPRT	INF	S.E.	NPFA	INF	S.E.	NPR	INF
1	0.115	100.000	0.000	0.025	100.000	0.000	0.126	100.000	0.000	0.061	100.000	0.000
2	0.128	99.392	0.214	0.027	99.698	0.048	0.128	99.944	0.007	0.065	99.934	0.055
3	0.133	99.246	0.227	0.029	99.583	0.095	0.129	99.804	0.014	0.068	99.754	0.214
4	0.136	99.228	0.218	0.030	99.526	0.127	0.130	99.646	0.018	0.070	99.711	0.244
5	0.137	99.214	0.219	0.031	99.462	0.144	0.130	99.524	0.021	0.071	99.682	0.257
6	0.138	99.197	0.218	0.032	99.399	0.150	0.130	99.406	0.022	0.072	99.651	0.267
7	0.138	99.174	0.216	0.032	99.335	0.155	0.130	99.273	0.023	0.072	99.623	0.273
8	0.138	99.146	0.216	0.033	99.268	0.158	0.130	99.150	0.024	0.072	99.595	0.276
9	0.138	99.113	0.215	0.033	99.198	0.159	0.131	99.034	0.025	0.072	99.567	0.278
10	0.139	99.077	0.215	0.033	99.126	0.159	0.131	98.926	0.025	0.072	99.539	0.279

Table 2D. During the COVID-19 outbreak

Java Island												
Period	NPREU			NPRT			NPFA			NPR		
	S.E.	NPREU	INF	S.E.	NPRT	INF	S.E.	NPFA	INF	S.E.	NPR	INF
1	0.002	100.000	0.000	0.001	100.000	0.000	0.034	100.000	0.000	0.009	100.000	0.000
2	0.003	63.158	3.309	0.003	61.197	0.148	0.050	54.818	3.261	0.017	75.222	7.049
3	0.004	46.956	2.929	0.003	64.864	0.949	0.051	51.912	3.100	0.022	65.263	7.710
4	0.004	33.872	2.725	0.004	58.002	5.709	0.053	48.893	3.357	0.025	55.998	11.327
5	0.005	28.575	2.369	0.006	53.163	3.753	0.054	49.202	3.548	0.026	54.070	10.450
6	0.006	27.310	10.713	0.007	52.235	3.866	0.055	48.983	3.480	0.027	56.190	9.964
7	0.009	17.214	23.995	0.008	47.166	2.775	0.055	48.329	3.905	0.031	62.948	7.790
8	0.011	14.418	17.442	0.009	44.495	2.500	0.056	49.142	3.844	0.036	62.747	6.548
9	0.013	20.111	13.581	0.010	43.016	2.634	0.056	48.886	3.930	0.041	59.259	7.203
10	0.018	10.974	16.560	0.011	39.888	2.150	0.056	49.092	3.908	0.045	55.712	6.902
Outside Java Island												
Period	NPREU			NPRT			NPFA			NPR		
	S.E.	NPREU	INF	S.E.	NPRT	INF	S.E.	NPFA	INF	S.E.	NPR	INF
1	0.110	100.000	0.000	0.009	100.000	0.000	0.034	100.000	0.000	0.012	100.000	0.000
2	0.117	98.312	0.593	0.010	99.077	0.492	0.041	99.470	0.238	0.018	97.710	2.061
3	0.137	98.331	0.632	0.011	98.462	0.447	0.044	99.268	0.374	0.021	97.828	1.749

Table 2D (cont.). During the COVID-19 outbreak

Outside Java Island												
Period	NPREU			NPRT			NPFA			NPR		
	S.E.	NPREU	INF	S.E.	NPRT	INF	S.E.	NPFA	INF	S.E.	NPR	INF
4	0.141	96.974	1.796	0.012	98.191	0.478	0.048	99.256	0.305	0.024	98.006	1.414
5	0.148	96.709	2.087	0.013	97.686	0.428	0.053	99.191	0.270	0.026	98.192	1.208
6	0.151	96.404	2.280	0.013	97.179	0.391	0.056	98.990	0.286	0.027	98.325	1.079
7	0.153	96.298	2.339	0.014	96.720	0.413	0.060	98.805	0.263	0.029	98.420	0.983
8	0.155	96.048	2.513	0.014	96.161	0.412	0.063	98.613	0.240	0.030	98.493	0.915
9	0.156	95.888	2.573	0.015	95.547	0.404	0.066	98.362	0.228	0.031	98.554	0.862
10	0.157	95.737	2.618	0.015	94.916	0.411	0.069	98.081	0.215	0.031	98.601	0.821

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