Macroprudential Policy and Credit Risk in Dual Banking System

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Article Information	Abstract
	Issues related to financial stability are a very complex problem, especially the global crisis impact in 2008. Based on these conditions, the Basel Committee on Banking Supervision introduced a macroprudential policy to mitigate financial system risk systemically. The study aims to analyze the impact of macroprudential policy on the banks' risk exposure by adopting credit risk as a risk proxy. By adopting a panel dynamic approach as analytical tool in this study, credit risk is used to be a dependent variable while independent variables consist of the reserve requirement, capital buffer, and a net open position in either conventional and Islamic banks. The observation period starts from 2014 to 2019 with quarterly data, and it involves 22 banks in Indonesia. The study found that macroprudential policy has a long-run relationship to Islamic banks' credit risk but not to conventional banks. The result from Variance Decompositions (VDs) and Impulse Response Factors (IRFs) also showed that each independent variable have an impact to credit risk value in many different directions. According to that, this study suggests that Indonesian financial authority has to pay attention to the different effectiveness and impact of its macroprudential policy, which has to consider the specific characteristics of either conventional or Islamic banks.

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INTRODUCTION

Since 1979, financial stability related problem has been a very complex problem. This further strengthened during the Global Financial Crisis (GFC) in 2008 and was followed by the introduction of a control policy, namely the macroprudential policy by the Basel Committee on Banking Supervision (Clement, 2010).

According to Galati and Richhild (2011), the macroprudential policy aims to limit risks and costs that come from systemic crises. On another side, the macroprudential policy has an objective to maintain financial stability that is oriented towards the financial system as a whole and limits the presence of systematic risk. Moreover, the policy also attempts to apply prudential principles for the financial system to balancing a macroeconomic and microeconomic conditions (Department of Macroprudential Policy, 2016; Bustamante et al., 2012).

Bernanke et al., (1999) stated that the emergence of macroprudential policy regulation is rooted by market system inefficiency associated with the macroprudential intervention, resulting in externalities such as between banks or other financial institutions and also between the financial sector and the real economy. This condition is based on a string of current literatures from banking and financial turmoil.

In Indonesia, implementing macroprudential policies framework has the objective of identifying embodied risk in the financial system that has the potential to lead to a systemic risk, facing spread risk, knowing the spread channels of risk in the financial and banking system, and implementing macroprudential policy instruments at right condition. Moreover, the objective is amed to reduce potential risks that are scattered in the financial system, macroeconomic, and real sectors (Kremer and Shcoenmaker, 2011).

At another framework, a model developed by Ascarya et al., (2016), provide a monitoring process to the financial system. The framework adopts a convept of early warning system which will five a risk signals in the first step in carrying out the macroprudential supervision process. At end of 2015, Bank Indonesia has implemented six (6) types of macroprudential policies, that is Loan to Value Ratio (LTV), Reserves Requirement based on Loan to Deposit Ratio (RR- LDR), Net Open Position (NOP), Credit Base Rate Transparency (CBRT), Countercyclical Capital Buffer (CCB) and Capital Surcharges (CS).

The macroprudential policy also tightens capital and liquidity requirements to encourage banks to reduce credit growth when the economy in "boom" conditions and maintenance resilience bank in the future when the economy deteriorates (Gersl and Martina, 2014). This is also part of the prudential policy to always strive to safeguard the resilience and performance of the banking system in order to simultaneously support the objective of monetary policy to stabilize credit supply.

Balogh (2012) argues in his research, if a country is experiencing a crisis condition, the application of prudential regulations will only be oriented to individual banks' health. This was aimed to encourage banks to tighten lending by increasing stricter capital requirements. This mechanism is a Basel II concept that has drawn criticism from economists. Basel II is aimed at strengthening bank risk management, however, it has a similar procyclical effect of change.

Another research explained by Agung (2010), that the implementation of the Basel II framework has indirectly encouraged banks to increase capital when the economy is weakening and reduce capital when the economy is strengthening. This condition is caused by the approach used in the Basel II framework, namely the internal-rating-based (IRB) approach in which the capital requirements are directly proportional to the probability of default and losses due to default.

These risk factors will increase reciprocal with the economic downturn. When the economy weakens, its impact on debtor's quality deteriorates, and banks require additional capital. Because increasing capital in the short term is not easy, banks will reduce lending to meet the capital ratio requirements. Then the economic system has more contraction, experiences an adverse impact and bank capital is getting worse because the risk of default is increasing.

This condition in line with the Financial Stability Review Annual Report issued by Bank Indonesia (2016) stated that the role of macroprudential policies which will ensure that credit flows can take place in a sustainable manner by encouraging banks to prepare capital and liquidity when the economy is good and lowering capital requirements in times of crisis and recession. So, that is not to hamper banks in lending.

Table 1. Marcroprudential Policy Instrument in Indonesia

Instrument	Target	Regulation		Instrument Category
		Fixed / time varying	*Rule / discretion*	
LTV	Credit	*Fixed*	*Rule*	Repeated calibration needed
RR-LDR	Credit, Liquidity	*Time varying*	*Rule*	Mitigate systemic risk
CBRT	Credit, Government	*Fixed*	*Rule*	Mitigate systemic risk
NOP	Liquidity	*Fixed*	*Rule*	Perlunya kalibrasi ulang
CCB	Capital	*Time varying*	*Rule / discretion*	Repeated calibration needed
CS	Capital	*Fixed*	*Rule*	Mitigate systemic risk

Source: Ascarya et.al (2016)

Macroprudential policies implementation by Bank Indonesia is based on the financial system condition in Indonesia. This is because the macroprudential policies introduced by the Basel Committee on Banking Supervision have a very broad types and categories so that each country has the application of different macroprudential policy instruments (Tovar et al., 2012). This condition also depends on the level of economic and financial development owned by a country and the application of the exchange rate regime, as well as the condition of the country's resilience to global financial shocks (Zulkhibri and Naiya, 2016).

In Indonesiaan perspective, a macroprudential policy implementation is as a learning form in anticipation and prevention of the severe crisis conditions in 1997 to 1998 and the global crisis impact in 2008. Hence, in 2011 the Republic of Indonesia Law no. 21 of 2011 dated 22 November 2011 concerning the Financial Services Authority (Otoritas Jasa Keuangan) also emphasized Bank Indonesia to play its role in macroprudential policy while the Financial Services Authority performs its role in the microprudential level (Otoritas Jasa Keuangan Report, 2015).

Aviliani et al., (2015) suggested that Indonesia financial crises experienced in 1997 to 1998 and global financial crisis in 2008 gave an impact of imbalances in the financial system originating from the banking system. In carrying out its function as an intermediary institution, banks have an important role in developing the economy of a country and banks are expected to be able to increase their contribution to the economic sector and the financial system to run effectively and efficiently.
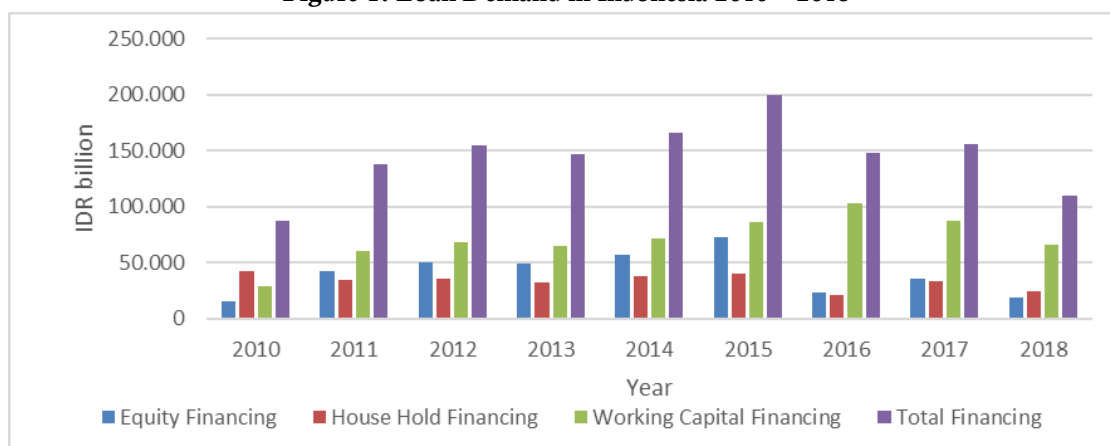
In another research, Festic and Beko (2008)) stated that banks play their role as intermediary institutions, namely channeling funds from parties excessively funded to parties who need funds. Banks are also trying to increase as many new customers as possible, increasing capital, and expanding credit and other services.

According Financial Stability Review report 2016 issued by Bank Indonesia, most Indonesia banks rely on credit as the main source of income to finance their operations. This condition because the provision of credit is the most important bank activity in generating a profit, even though on the other hand there is a large risk that comes from the provision of credit by banks

Based on Statistik Ekonomi dan Keuangan Indonesia issued by the Central Bank of Indonesia (2020), Indonesia's credit conditions were classified as fluctuating from 2010 until 2018. The difference in conditions in 2010 and 2015 amounted to 112.670.450 million rupiahs. This is due to a very reactive global economic condition. The large increase in domestic investment carried out by the United States through the tapering off policy in which investor abroad withdraw all their capital and then reinvest it in their countries. This condition is supported by the decline in interest rates in the

United States. This circumstances was also similar to what happened during the economic crisis in 2008 is bubble property in European countries.

Figure 1. Loan Demand in Indonesia 2010 – 2018

Source: SEKI Bank Indonesia 2020

Previous studies in marcrorpudential policy were also already conducted by several researches. Dutta and Saha (2020) found that macroprudential policy were able to minimize financial risk exposure even though it was more effective during normal condition than financial turmoil. This finding is also in line with Meuleman and Vennet (2020), Esteban et al., (2020), Thi and Anh (2019) and Zhang et al., (2018) who also found that macroprudential policy lessened the bank's individual risk over the observation period.

In contrast, Duan and Zhu (2020) who stated that macrorprudential policy did not effective to lessen credit risk. For the big size banks, loan-to-value (LTV), as a macroprudential policy instrument is less effective to decrease banks' risk exposure. In addition, Davis, Karim and Noel (2020) explained that macroprudential policy had negative impact to banks' profitability. It meant that the banks tended to be less profitable when macroprudential policy is applied.

Specifically for dual banking system, consist of Islamic and conventional banks, Sakti et al., (2018) found that reserve requirement policy had positve impact to credit growth of Islamic and conventional banks while it occurred inversely for capital buffer which impact negatively fo financing growth of Islamic bank. The different impact of macroprudential policy for Islamic and conventional banks also appeared in this study.

According to the previous studies, there have different results in terms of how macrprodential policy influence banks performance especially in their risk exposure. Therefore, this study attempts to reassess and analyze the impact of macroprudential policy to provide clearer findings compared to previous studies.

RESEARCH METHODS

Panel data is used in this study starting from first quarter of 2014 to fourth quarter of 2019 in which the data were retrieved from banks' financial report, Central Bank of Indonesia and Otoritas Jasa Keuangan (OJK). Totally there have 11 conventional banks in this sample that consist of Bank Mandiri, Bank Negara Indonesia, Bank Rakyat Indonesia, Bank Mega, Bank Central Asia, Bank Bukopin, Bank Panin Indonesia, Bank Victoria International, Bank Maybank Indonesia, Bank BJB and Bank BTPN. On the other hands, 11 Islamic banks were also utilized to be a sample of the study which are Bank Syariah Mandiri, Bank Negara Indonesia Syariah, Bank Rakyat Indoesia Syariah, Bank Mega Syariah, Bank Central Asia Syariah, Bank Bukopin Syariah, Bank Panin Dubai Syariah, Bank Victoria Syariah, Bank

Maybank Syariah, Bank BJB Syariah and Bank BTPN Syariah.

Table 2. The Definition of The Variables

Variable	Description
Non-Performing Loan/Financing	The percentage of bad loan lending/financing to total lending/financing (Festic and Beko, 2008).
Capital Buffer	A regulatory capital ratio minus the minimum required capital ratio of 8 percent (Stolz and Wedow, 2005).
Reserve Requirement	The amount of money required to be deposited in central bank
Net Open Position	the net difference in assets and liabilities in the balance sheet for each foreign currency plus the net difference in receivables and liabilities (Peraturan Bank Indonesia Nomor 20 / 5 / PBI / 2018)

In addition, all variables used in the study is decribes in the Table 2. The general model of the study is explained in the formula as a follow:

$$NPF = f(RINF, REG, LN\_SIZE) \dots (1)$$

According the following formula by using panel analysis approach, the model above-explained can be developed as below:

$$NPL/F_{it} = \beta_0 + \beta_1 CB_{it} + \beta_2 RR_{it} + \beta_3 NOP_{it} + \varepsilon_{it} \dots (2)$$

Where NPLit is the percentage of the number of bad loans compared to total financing in conventional and Islamic bank for bank i in year t; Cbit is the number of capital buffer of conventional and Islamic bank for bank i in year t; RR is the number of reserve requirement of conventional and Islamic bank for bank i in year t; and NOP is the number of net open position for bank i in year t.

To estimate the model, we follow Fakhrunnas (2020) and Pedroni (2000) who adopted panel dynamic which assumed that inside panel analysis, the effect of time-series is exist that is also able to examine short-run and long-run analysis. To conduct panel dynamic approach, several steps are conducted in this study. Firstly, unit roots test must be conducted as suggested by Levin, Lin and Chiu (2002) with the formula as a follow:

$$y_{it} = \rho_i y_{i,t-1} + z'_{it}\gamma + \mu_{it} \dots (3)$$

Where; $t_\rho = \frac{(-1)b \pm \sqrt{b^2 - 4ac}}{2a}$

The symbol of z_{it} presents deterministic variables, μ_{it} is as iid (0, σ^2) and $\rho_i = \rho$. T-statistic on ρ explain the value of panel unit roots' statistic test. According to Zulkhibri, Naiya, & Ghazal, (2015), the nol hypothesis of the test are not stationary to all kinds of unit types of unit roots.

Secondly, Pedroni (2000,2004) explained that several kinds of panel co-integration test can be held with data panel with using the following general formula as a follow:

Panel rho-statistic:

$$Z_\rho = \left(\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{L}_{11i}^{-2}\hat{e}_{it-1}^2\right)^{-1}\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{L}_{11i(\hat{e}_{it-1}\Delta\hat{e}_{it}-\hat{\lambda}_i)} \dots (4)$$

Panel PP-statistic:

$$Z_{PP} = \left(\hat{\sigma}^2\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{L}_{11i}^{-2}\hat{e}_{it-1}^2\right)^{-\frac{1}{2}}\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{L}_{11i(\hat{e}_{it-1}\Delta\hat{e}_{it}-\hat{\lambda}_i)} \dots (5)$$

Panel ADF-statistic:

$$Z_t = \left(\hat{S}^{*2}\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{L}_{11i}^{-2}\hat{e}_{it-1}^{*2}\right)^{-\frac{1}{2}}\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{L}_{11i(\hat{e}_{it-1}^*\Delta\hat{e}_{it}^*)} \dots (6)$$

Group rho-statistic:

$$\hat{Z}_\rho = \sum_{i=1}^{N}\left(\sum_{t=1}^{T}\hat{e}_{it-1}^2\right)^{-1}\sum_{i=1}^{T}(\hat{e}_{it-1}\Delta\hat{e}_{it}-\hat{\lambda}_i) \dots (7)$$

Group PP-statistic:

$$\hat{Z}_t = \sum_{i=1}^{N}\left(\hat{\sigma}^2\sum_{t=1}^{T}\hat{e}_{it-1}^2\right)^{-1/2}\sum_{i=1}^{T}(\hat{e}_{it-1}\Delta\hat{e}_{it}-\hat{\lambda}_i) \dots (8)$$

Group ADF-statistic:

$$\hat{Z}_{PP} = \sum_{i=1}^{N} \left(\sum_{t=1}^{T} \hat{S}_i^{-2} \hat{e}_{it-1}^{*2} \right)^{-1/2} \sum_{i=1}^{T} (\hat{e}_{it-1}^* \Delta \hat{e}_{it}^*) \ldots \ldots \ldots \ldots (9)$$

According to Rosylin & Bahlous (2013), Fakhrunnas et al., (2018) and Fakhrunnas (2020), the existence of co-integration relationship appears when the majority of the test results are significant in 1% to 10% level of sginficance.

Thirdly, Variance Decomposition (VDs) and Impulse Response Factors (IRFs) are then applied to examine the relative strength and its multivariate causalities among the observed variables (Rosylin and Bahlous, 2013). Moreover, the use of VDs gives a light to explain the variation of the impact of independent variables to dependent variable while IFRs capture shock effect and provide a current and future direction of the observed variables (Pesaran and Shin, 1999).

RESULTS AND DISCUSSION

Appendix 1 describes the results of the unit roots test to determine whether the variables in the research carried out had a stationarity level at the at level or first difference. Based on these results, it is known that based on the unit roots test using individual intercept and individual intercept and trend, variables in conventional banking such as NPL and CRR do not have a stationarity level at the level when referring to the results of IPS and ADF. Meanwhile, other variables have a stationarity level at the level. After testing the stationarity level at the first difference, NPL, CCB, CRR and INOP all have a stationarity level.

In testing the unit roots results using Islamic banking as the object of research, NPF and CRR did not have a stationary level at the level by referring to the results of the IPS and ADF using both individual intercept and individual intercept and trend. Meanwhile, CCB, IRR and INOP have at-level stationarity. In unit roots testing at the first difference level, all variables are stationary at that level. Based on

this test, it is possible to test short-term and long-term relationships.

Table 3. Pedroni Co-integration Result

Cointegration Test	Conventional Bank	Islamic Bank
Within Dimension		
Panel v-stat	-0.913114	-1.51
Panel rho-stat	0.049268	-2.31***
Panel PP-stat	-3.54***	-7.03***
Panel ADF-stat	-1.33*	-1.78**
Between Dimension		
Group rho-stat	1.281982	0.598
Group PP-stat	-2.47***	-3.606 ***
Group ADF-stat	1.309073	0.452

Note: ***, ** and * represent the level of significance for each.
Source: Data Processing, 2020

Table 3 describes the results of the pedroni cointegration test using panel data. In conventional banks, three of the seven test indicators used show significant results, namely Panel PP-stat which is significant at the 1% level, ADF-stat Panel significant at 10% and Group PP-stat which has a significance level at the 1% level. Based on the results of the pedroni cointegration test, it can be concluded that there is no long-term relationship between the variables used in the research model in conventional banks. This is because only three of the seven indicators are significant.

Meanwhile, in Islamic banking, four of the seven test indicators showed significant results, namely the rho-stat Panel, the PP-stat Panel and the PP-stat Group each at the 1% level and the ADF-stat Panel significant at the 5% level. It can be concluded that the variables used in the research model in Islamic banks have a long-term relationship with one another. This is because the majority or four out of seven, indicators have a significant value.

The result is also supported by Dutta and Saha (2020) Meuleman and Vennet (2020), Esteban et al., (2020), Thi and Anh (2019) and Zhang et al., (2018) who also found that macroprudential policies impact the bank's

performance significantly. The different impact of macrorpudential policy for Islamic and conventional bank is supported by Sakti et al., (2018). In the long-run, the co-integration finding also emphasizes that the effectiveness of macroprudential policy in dual banking system may vary depending on the characteristic of each bank in the system. In case of Indonesian dual banking system, the result from table 3 delineates that macroprudential policy is able to stabilze Islamic bank's risk exposure in the long-run but it is not for conventional bank.

Moreover, to determine the level of influence of the macroprudential variables on non-performing loan or financing, the analysis using the variance decompositions method can be performed. Based on appendix 2., there is not even one macroprudential variable that has an effect on the decline in non-performing loans in the first period in conventional banking. In general, reserve requirements are macroprudential variables that have the most significant effect in the long run, namely 0.42%. Not only that, in the short term, the reserve requirement variable affects the 0.36% reduction in non-performing loans in the 3rd period.

Furthermore, the capital buffer affects the decline in the value of non-performing loans by 0.18% in the 2nd period and 0.17% in the 11th period. In the long term, namely in the 24th period, the effect of capital buffer reaches 0.169%, which means that it has an influence with a downward trend on non-performing loans. Meanwhile, the net open position has an effect of 0.04% in the second period and experiences fluctuations in the effect of the next period on non-performing loans. In the long term, the net open position has an effect of 0.119% on non-performing loans that occurred in the 24th period.

In Islamic banking for 24 observation periods (2014Q1-2019Q4), the value of non-performing financing has decreased from the 1st to the 24th period. This decrease in value shows the effect of capital buffers, reserve requirements and net open positions. In general, capital buffers, both in the long and short-run, have the highest level of influence on the decline in the value of non-performing loans. For example, in

the short-run period, namely the 2nd period, the capital buffer affects 0.42% of the decline in the value of non-performing financing. Meanwhile, in the 5th period the capital buffer had an effect of 0.84%. In the long run, namely in the 24th period, the capital buffer has an effect of up to 0.96% on the decline in the value of non-performing financing.

Moreover, the effect of reserve requirements, in the first period does not have influence on non-performing financing in Islamic banks. The contribution of reserve requirements to the decline in the value of non-performing financing is only obtained in the second period, reaching 0.026%. In the long-run, reserve requirements have an effect of 0.14% on the decline in the value of non-performing Islamic banking financing. Meanwhile, the effect of net open position is higher than the reserve requirement, even though in the short terms period, namely the second period, it only affects 0.02% of the decline in the value of non-performing financing. However, in the long run, the net open position has an effect of 0.25% on the decline in the value of non performing financing.
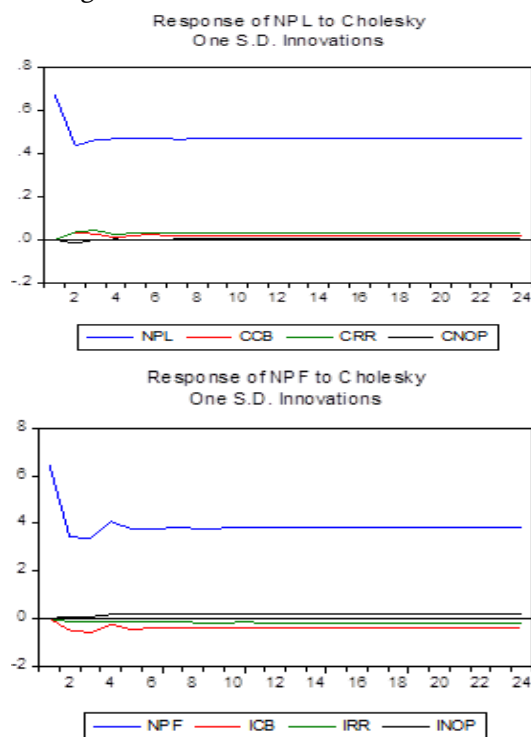

Figure 2. Impulse Response Factors (IFRs) for Conventional and Islamic Banks

To determine the trend of the influence of macroprudential variables on non-performing loans / financing can be seen in Figure 1. In this figure, generally it can be seen that in the short term, the macroprudential variable tends to have a greater influence on Islamic banking compared to conventional banking. However, there are similarities between the two banks, namely that the macroprudential variable tends to fluctuate in the short term but is more stable in the long term. In addition, the influence of macroprudential variables on conventional and Islamic banking tends to be small.

CONCLUSION

Macropudential instruments are implemented to tackle systemic risk issue in the financial system. The instruments become one of the effort from financial authority institution to maintain the soundness of financial system. According to the findings, macroprudential policies consisting of reserve requirement, capital buffer and net open position has a long-run impact to credit risk in Islamic banks. However, a long-run relationship to credit risk in conventional banks does not appear due to there is no co-integration among the observed variables.

Based on this situation, it can be concluded that macrorpudential policy seems to be more effective to Islamic bank than its counterparty in the long-run. As a bank that promotes profit and loss sharing paradigm, Islamic bank tend to be more responsive to the policy. In addition, the degree of influence for each independent variable to dependent variables either in conventional or Islamic banks also varies to credit risk.

The implication of the finding must become a concern to the financial authorities in Indonesia, such as ministry of finance, central bank of Indonesia and financial service authority, while performing macroprudential policy to reponse certain circumstances in the banking industy. Due to the different characteristic of conventional and Islamic bank, the authorities must precisely measure the impact of the issuance for each macrprudential policy's instrument. To pave the way forward, the future study needs to observe macroprudential policies with cross-country level to examine the practice of the policy in dual banking system worldwide especially its impact to conventional and Islamic banks respectively.

REFERENCES

Agung, Juda. (2010) [*Mengintegrasikan Kebijakan Moneter dan Makroprudensial: Menuju Paradigma Baru Kebijakan Moneter di Indonesia Pasca Krisis Global*]. *Bank Indonesiea Working Paper No.7*.

Anh P.T.H. (2019) Is Lending Standard Channel Effective in Transmission Mechanism of Macroprudential Policy? The Case of Vietnam. In: Kreinovich V., Thach N., Trung N., Van Thanh D. (eds) Beyond Traditional Probabilistic Methods in Economics. ECONVN 2019. *Studies in Computational Intelligence,* vol 809. Springer, Cham. Available from: doi.org/10.1007/978-3-030-04200-4_47 [accessed 1st Desember 2020].

Ascarya *et al.* (2016) Conceptual Proposal for Future Macroprudential Framework Under a Dual Financial System in Indonesia*. In Macroprudential Regulation and Policy for The Islamic Finance Industry: Theory and Application*, Chapter 2. Switzerland: Springer

Aviliani, Siregar, Hermanto., Maulana, Tubagus N.A., & Hasanah, Heni. (2015). The Impact of Macroeconomics Conditions on The Bank's Performance in Indonesia. *Buletin Ekonomi Moneter dan Perbankan*, April Vol. 17 No. 4, 391-414

Balogh, Peter. (2012). Macro Prudential Supervision Tools in the European Banking System. *Procedia Economics and Finance*, [online] vol. 3, 642-647. Available from: https://doi.org/10.1016/S2212-5671(12)00208-0 [accessed 23rd November 2020]

Bank Indonesia. (2016) [*Mengupas Kebijakan Makroprudensia*]. Jakarta, Departemen Kebijakan Makroprudensial Bank Indonesia.

Bank Indonesia. (2016) [*Kajian Stabilitas Keuangan Maret 2016*]. Jakarta, Bank Indonesia

Bank Indonesia. (2020) [*Statistik Ekonomi dan Keuangan Indonesia*]. Jakarta, Bank Indonesia

Bernanke, Ben., Gertler, Mark., & Gilchrist, Simon. (1999) *The Financial Accelerator in a Quantitative Business Cycle Framework*. Handbook of Macroeconomics Volume 1, Edited by J..B.laylor and M. Woodford

Bustamante, C., Gonzales, A., & Perez, J. (2012) Macroprudential Policy, External Shocks and Financial Intermediation on a Small Open Economy. *Borradores de Economica,* No. 716I.

Clement, Piet. (2010) The Term "Macroprudential": Origin and Evolution. Quartelly Review. BIS Quarterly Review, [online] part 6 March 2010, available from:

bis.org/publ/qtrpdf/r_qt1003h.pdf [accessed 30th November 2020]

Davis, E. P., Karim, D. & Noel, D. (2020) The effect of macroprudential policy on banks' profit. 514. [online] Brunel, Available at: niesr.ac.uk/sites/default/files/publications/DP514_0.pdf. [accessed 3rd December 2020]

Duan, J. and Zhu, Y. (2020) Credit risk cycle indices - properties and macroprudential policy, [online] *Singapore.* Available at: d.rmicri.org/static/pdf/CreditRiskIndices_June-21-2020.pdf. [accessed 3rd December 2020]

Dutta, K. D. and Saha, M. (2020) Nexus of governance, macroprudential policy and financial risk: cross-country evidence, *Economic Change and Restructuring.* [Online] Springer US, pp. 1–46. doi: 10.1007/s10644-020-09301-9. [accessed 23rd November 2020]

Esteban, G. *et al.* (2020) Evaluating the impact of macroprudential policies on credit growth in Colombia Esteban, *Journal of Financial Intermediation.* Elsevier Inc., (100843), [online] pp. 1–43, Available from: doi: 10.1016/j.jfi.2019.100843. [accessed 23rd November 2020]

Fakhrunnas, F. (2020) Total Financing of Islamic Rural Banks and Regional Macroeconomic Factors : A Dynamic Panel Approach, *Jurnal Ekonomi & Studi Pembangunan,* [online] 21(1), pp. 1–15, available from: doi: 10.18196/jesp.21.1.5028. [accessed 23rd November 2020]

Fakhrunnas, F., Dari, W. & Mifrahi, M. N. (2018) Macroeconomic effect and risk-taking behavior in a dual banking system. *Economic Journal of Emerging Market,* [online] 10(2), pp. 165–176. available from: doi: 10.20885/ejem.vol10.iss2.art5. [accessed 23rd November 2020]

Festic, M. & Beko, J. (2008) The Banking Sector and Macroeconomic Performance in Central European Economies. *Czech Jornal of Economics and Finance.* No. 58, Vol. 3-4, pp. 131-151

Galati, Gabriele & Richhild Moessner. (2011) Macroprudential Policy – A Literature Review. [online] *Bank for International Settlements,* Februari. Working Paper No. 337. available from: https://www.bis.org/publ/work337.pdf. [accessed 10th November 2020]

Gersl, Adam., & Martina, Jasova. (2014). Measures to Tame Credit Growth: Are They Effective? *Economic System,* [online] No. 38, pp. 7-25, available from: doi.org/10.1016/j.ecosys.2013.10.001, [accessed 20th November 2020]

Jahn, Nadya & Kick, Thomas. (2013). Determinants of Banking System Stability: A Macro-prudential Analisys, *Bank of International Settlement.* [online] Working Paper, Page 1-30, available from: bis.org/bcbs/events/bhbibe/jahn.pdf, [accessed 20th November 2020]

Kremers, J. & D. Schoenmaker. (2010) Twin Peaks: Experiences in the Netherlands. *Special Paper. no. 196. London: LSE Financial Markets Group*

Levin, A., Lin, C. F., & Chu, C. S. J. (2002) Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics,* [online] 108(1), 1–24. available

from: doi.org/10.1016/S0304-4076(01)00098-7 [accessed 30 November 2020].

Meuleman, E. and Vennet, R. Vander (2020) Macroprudential policy and bank systemic risk, *Journal of Financial Stability.* [online] Elsevier B.V., (100724), pp. 1–50. available from: doi: 10.1016/j.jfs.2020.100724, [accessed 30 November 2020]

Pedroni, P. (2000) Fully Modified OLS for Heterogeneous Cointegrated Panels. A*dvances in Econometrics*, [online] vol 15, page 93–130, available from: doi.org/10.1016/S0731-9053(00)15004-2 [accessed 2nd December 2020]

Pedroni, P. (2004) Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests With an Application to The Econometric, *Econometric Theory*, [online] Vol 20(3) page 597–625 available from: doi.org/10.1017/S0266466604203073 [accessed 2nd December 2020]

Pesaran, M. H., & Shin, Y. (1999). An autoregressive distributed lag modeling approach to cointegration analysis, in Strom, S. (Ed.). *Paper presented at Econometrics and Economics Theory in the 20th Century*: The Ragnar Frisch Centennial Symposium, Cambridge University Press, Cambridge

Quint, Dominic & Pau Rabanal. (2011). Monetary and Macroprudential Policy in an Estimated DSGE Model of the Euro Area. *12th Jacques Polak Annual Research Conference*, November

Rosylin, M. Y. and Bahlous, M. (2013) Islamic banking and economic growth in GCC & East Asia countries, *Journal of Islamic Accounting and Business Research*, [online] 4(2), pp. 151–172. available from: doi: 10.1108/JIABR-07-2012-0044. [accessed 30 November 2020]

Sakti, M. R. P. *et al.* (2018) The concept and practices of macroprudential policy in Indonesia : Islamic and conventional, *Al-Iqtishad: Jurnal Ilmu Ekonomi Syariah (Journal of Islamic Economics)*, [online] 10(1), pp. 75–96. available from: doi: http//dx.doi.org/10.15408/aiq. v10i1.5446. [accessed 3rd December 2020]

Stolz, Sthephanie & Wedow, Michael. (2005) Banks regulatory capital buffer and the business cycle: evidence for German savings and cooperative banks. Discussion Paper Series 2: Banking and Financial Studies. [online]. No 07/2005.Available from:https://core.ac.uk/download/pdf/6537891.pdf [accessed 7th December 2020]

Thi, P. and Anh, H. (2019) Is lending standard channel effective in transmission mechanism of macroprudential policy? The case of Vietnam. *Springer International Publishing [online]*. available from: doi: 10.1007/978-3-030-04200-4. [accessed 3rd December 2020]

Tovar, Camilo E., Mercedes Garcia-Escribano, and Mercedes Vera Martin. (2012) Credit Growth and the Effectiveness of Reserve Requirements and Other Macroprudential Instruments in

Latin America. *IMF Working Paper* WP/12/142, Juni.

Zhang, X. *et al.* (2018) Macroprudential policy, credit cycle, and bank risk-taking, *Sustainability*, [online] 10(3520), pp. 1–18. available from: doi: 10.3390/su10103620. [accessed 30th November 2020]

Zulkhibri, M and Naiya, I. (2016). Macroprudential Policy and Regulation in a Dual Banking System: An Exploratory Perspective. *In Macroprudential Regulation and Policy for The Islamic Finance Industry: Theory and Application, Chapter 1. Switzerland*: Springer

Zulkhibri, M., Naiya, I. and Ghazal, R. (2015) Strcutural Change and Economic Growth in Selected Emerging Economics, *International Journal of Development Issues*, [online] 14(2), pp. 98–116. available from: doi: 10.1108/MBE-09-2016-0047.[accessed 3rd November 2020].

Appendix 1. Unit Roots Test Result

Variables	Individual Intercept						Individual Intercept and Trend					
	At Level			first Difference			At Level			first Difference		
	IPS	ADF	PP	IPS	ADF	PP	IPS	ADF	PP	IPS	ADF	PP
NPL	-1.11	27.18	34.07**	-6.84***	89.92***	213.02***	0.50	20.65	28.47	-5.02***	64.57***	202.37***
NPF	-0.71	29.84	49.63***	-8.63***	112.02***	639.47***	-1.91**	39.42**	89.90***	-6.53***	80.88***	785.58***
CCB	-1.97***	33.20*	43.04***	-8.54***	110.35***	524.66***	-2.02**	39.17**	43.13***	-6.68***	82.47***	757.90***
ICB	-0.73	29.19	31.76*	-8.46***	109.05***	204.52***	0.26	17.73	21.73	-7.13***	87.49***	408.42***
CRR	-0.31	18.56	62.25***	-8.82***	115.48***	1067.49***	-0.91	30.30	94.39***	-6.58***	82.22***	1135.43***
IRR	-8.55***	120.14***	104.57***	-14.84***	376.35***	595.91***	-8.11***	256.96***	91.37***	-12.18***	345.41***	758.02***
CNOP	-4.52***	60.65***	94.37***	-13.70***	182.11***	783.34***	-4.62***	61.72***	112.67***	-12.31***	150.78***	1339.65***
INOP	-5.19***	69.78***	81.73***	-11.16***	146.47***	511.29***	-5.56***	74.46***	91.92***	-9.22***	112.45***	484.63***

Note: ***, ** and * represent the level of significance for each
Source: Data Processing, 2020

Appendix 2. Variance Decompositions Result

Period	Conventional Banks					Islamic Banks				
	S.E.	NPL	CCB	CRR	CNOP	S.E.	NPF	ICB	IRR	INOP
1	0.671879	100	0	0	0	6.464533	100	0	0	0
2	0.803452	99.59436	0.181123	0.180072	0.044445	7.336315	99.5317	0.422358	0.025574	0.020367
3	0.928267	99.39014	0.212952	0.36355	0.033361	8.107089	99.06407	0.859076	0.050222	0.02663
4	1.040478	99.45851	0.177635	0.336845	0.027014	9.084237	99.12407	0.750605	0.061494	0.063836
5	1.141469	99.4271	0.182167	0.368097	0.022637	9.850154	98.9728	0.848229	0.075127	0.103844
6	1.234627	99.41143	0.189048	0.380164	0.019354	10.552	98.92578	0.864594	0.087211	0.122414
7	1.320427	99.41414	0.181036	0.387598	0.017224	11.23731	98.88486	0.878581	0.095564	0.140997
8	1.401314	99.41098	0.179603	0.39377	0.015651	11.87184	98.84762	0.89053	0.102806	0.159042
9	1.477986	99.4066	0.179827	0.399138	0.014434	12.47392	98.81566	0.902319	0.109087	0.172934
10	1.550632	99.4057	0.177685	0.403016	0.013596	13.05048	98.79228	0.909131	0.114158	0.184436
11	1.620089	99.40424	0.176501	0.406226	0.013036	13.60173	98.77057	0.916388	0.118487	0.194553
12	1.686748	99.40248	0.1759	0.408997	0.012624	14.13137	98.75254	0.922041	0.122232	0.203191
13	1.750825	99.40145	0.174948	0.411272	0.012327	14.64214	98.7369	0.926993	0.125457	0.210647
14	1.812647	99.40048	0.174174	0.413212	0.012133	15.13556	98.72327	0.931276	0.128275	0.217179
15	1.872444	99.39948	0.173598	0.414915	0.012008	15.6134	98.71123	0.935077	0.130759	0.222934
16	1.930383	99.39868	0.173004	0.416388	0.011926	16.07706	98.70059	0.93841	0.132961	0.228038
17	1.986634	99.39797	0.172471	0.417682	0.011881	16.52772	98.69108	0.941402	0.134927	0.232597
18	2.041339	99.39729	0.172016	0.418837	0.011862	16.9664	98.68254	0.94408	0.136693	0.236691
19	2.094616	99.39668	0.17159	0.419866	0.011861	17.39403	98.67482	0.946501	0.138287	0.240388
20	2.146571	99.39614	0.171199	0.42079	0.011872	17.8114	98.66783	0.948696	0.139734	0.243743
21	2.197299	99.39563	0.170848	0.421628	0.011893	18.2192	98.66145	0.950697	0.141053	0.246802
22	2.246882	99.39517	0.170524	0.422388	0.011919	18.61808	98.65561	0.952528	0.14226	0.249601
23	2.295395	99.39474	0.170224	0.423082	0.01195	19.00858	98.65025	0.954211	0.143369	0.252173
24	2.342903	99.39435	0.169948	0.423719	0.011983	19.39123	98.6453	0.955761	0.144391	0.254543

Source: Data Processing, 2020