



The Impact of Banking Policies to the Macroprudential Policy

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Abstract

The interaction between banks and macroeconomics is of crucial importance to financial stability. This study aims to answer the question of how macroeconomic shocks are transmitted to banking variables or vice versa. The study investigated the impact of the banking policies, the principal component of analysis (PCA) of banking quality indicators (CAMEL), and BI's rate to the aggregate of GDP and GDP priority sectors. The methodology used is the Factor Augmented Vector Autoregressive (FAVAR) model to observe the endogeneity of the observed variables. The results show that there is substantial heterogeneity in the transmission of macroeconomic shocks, caused by CAR, CAMEL and BI rate. In the short run, we find that the impulse response functions of aggregate GDP and GDP per sector of priority to the shock of the CAR decrease and close to zero in the long term. Our findings align with the expected effects that the CAMEL has implications to the decline of GDP of priority sector. Finally, we find that the impulse response of aggregate GDP and GDP of the priority sector to monetary policy shock decreases in the short run and near to zero in the more extended period.

Key words : FAVAR, Banking policies, Macroeconomics, Sector of priority, CAMEL

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INTRODUCTION

Bank is a financial intermediary that connects the depositors and the creditors and provides financial services such as wealth management, currency exchange, dan safety deposit boxes. There is one type of bank as the central bank, which aims to regulate the banks, inflation control, and currency stability through the relevant policies. The bank regulation that we call as the bank policy can be highly regulated from the central bank or internally individual banks. There are some policies that most central bank uses which are monetary policy, macroprudential policy, and microprudential policy. For the monetary policy, this regulation consists of announcing and implementing the regulatory plan and action to manage the quantity of money supply and interest rate. The monetary policy recently uses the inflation-targeting framework, which effectively manages inflation (Malovaná & Frait, 2017).

After the crisis in 2008 to 2013, some of the scientists of monetary economists began to think about revising monetary policy tools. Because a focus on price stability is not enough, there have been several studies that discuss this matter, whether the central bank needs to establish additional monetary policy tools to maintain financial stability even though the addition of such policy tools does not represent a risk to price stability. But so far the problems above have still not found the best solution (Malovaná & Frait, 2017; Woodford, 2012). Several tools used to regulate monetary policy are open market operations and direct bank lending facilities ((Ennis & Weinberg, 2016), emergency lending for bank liquidity issues, and bank reserve requirements.

To create financial stability, it requires the role of many parties. Not only macroprudential policy can play a role, but a

stable macroeconomic condition, sound financial management institutions, supervision of each institution and efficient payment system also help in creating a climate of the sound financial stability system (Osinski et al., 2013). Based on the reasons, the role of all parties is needed because the financial system is the source of the country's economic situation.

The macroprudential policy was triggered after the recent financial crisis. The policymakers, researchers, and practitioners to discuss more regulation and supervision to mitigate financial imbalances. They consolidate to enhance more attention on a macro-based approach for financial management instead of microprudential perspectives. Nowadays, we recognize this approach as the macroprudential policy, which allows the authorities to affect the supply of credit straightly. The aim of macroprudential system is to limit the systemic risk of financial institutions and the costs of financial crises that can eliminate negative externalities in an economic condition (Borio & Drehmann, 2011). Table 1 shows some difference between macroprudential policy and microprudential policy.

To achieve the aim of macroprudential policy, the authorities need to establish a set of macroprudential tools which define as instruments to mitigate systemic risk (Claessens, 2015). The macroprudential tools are not taken in isolation. However, the two policies will be more effective when combined with other policies such as monetary policy and fiscal policy. Besides, the combination of all systems can promote the creation of financial stability (Ascarya et al., 2016). The relationship between macroprudential and monetary policies is the same as coordinating monetary policy with fiscal policy, to achieve optimal economic results since they are not merely substituting. However, the coordination between the two policies above (macroprudential and monetary) (Bean et al., 2010; Galati & Moessner, 2018).

Table 1. The Differences Between Macroprudential and Microprudential Policy

Scope	Macro-prudential	Micro-prudential
Proximate Objective	Limit systemic financial risk	Limit individual institutions risk
Main Objective	To prevent a macroeconomic downturn	To protect customer (investor/depositor)
Identification of Risk	Endogenous – risk due to weaknesses in the financial system	Exogenous – risk due to economic fundamentals, natural laws, commercial law, and disaster (e.g. bank rush)
Cross-Sectional Correlations among Financial Institutions	Substantial	Unnecessary
Adjustment of Prudential Supervisions	In term of systemic risk: top-down	In term of individual institutions risk: bottom-up

Source: Adapted from Borio & Drehmann (2011), Galati & Moessner (2013).

The interaction connecting macroprudential and monetary policy often has the potential to cause conflict. Based on the finding from Malovaná & Frait, (2017), if the monetary policy is tightened, it will jeopardize the loan to GDP ratio and the risk-weighted capital ratio which is not at risk. At the same time, this supports that monetary policy affects financial vulnerabilities building up. Short-term interest rate increases increase the average risk weighting of banks and there is a positive connection between bank lending and capital ratios for bank with low capital. While the methodology used is a VAR model and data panel regression model (Malovaná & Frait, 2017).

The interaction between banks and macroeconomics is of crucial importance to finance and economic stability (Buch et al., 2014). When the macroeconomy in a country is shocked, this will have a significant impact not only on bank risk but other variables at the bank level also feel the effects (Buch, 2010). Using macroeconomic and bank-level data in the U.S over 23 years, their research revealed that bank loans from representative (median) mortgage increase after expansionary shocks, these results are in line

with increase capital loans or increase in credit supply and development in investment demand during the booming period. To make a good model, they use FAVAR (Factor-Augmented Vector Autoregressive).

Besides, macroprudential policy is also needed to decrease the existence of systemic risk in finance, especially in banking. Some studies are arguing that macroprudential systems are considered useful in mitigating financial risk. Claessens et al., (2013) analysis how the financial statement of some banks give effect to macroprudential policies, using panel data regression. By controlling endogeneity, they found that debt-to-income and borrowing-to-value ratios restrictions could effectively reduce growth assets. However, Cerutti et al., (2017) analyzed the use of macroprudential policy in several countries for 14 years. As a result, macroprudential policies are widely used in developing countries, whereas for developed countries, borrower-based strategies are more often used. They found several asymmetrical effects of policies that worked better in a booming period of a financial cycle. There are twelve instruments for a macroprudential proxy policy that complement previous studies of Claessens et al., (2013), the addition of proxies in Cerutti et al., (2017) research consisting of taxes,

additional capital on SIFIs, exposure limits between each bank and concentration.

Not only macroprudential policies but also banking regulation is useful to decline the effect of capital flow volatility. Research conducted by Cerutti et al., (2017) revealed that bank supervision could reduce capital flow volatility and boost economic growth. Variable used this research include growth of GDP, Total capital movement, Volatility of total capital movement (is a proxy connecting bank regulation and capital inflows) (Neanidis, 2019), FDI flows, Volatility of FDI movements, Equity flows, Volatility of equity, Debt flows, Volatility of Debt flows, Banking supervision Initial GDP per capita (log), Education, Population growth rate, Investment, Trade, Government consumption, Inflation, Institutions, and Private credit (Cerutti et al., 2017; Neanidis, 2019).

Bank capital is substantial because to drive the bank's operations and to survive failure or loss. When the bank capital is high, it will reduce the value of the profit of the bank's profit so that it will increase the bank buffer against the value of its assets (Repullo, 2004; von Thadden, 2004; Zheng et al., 2019). According to incentive-based theories, bank incentives to monitor the relationship between borrowers will be higher in line with the increase in bank capital (Holmström, 2009), or it can reduce excessive risk-taking (Acharya et al., 2016). Acharya et al., (2016) in his research analysis how to increase bank capital without endangering bank discipline. Based on the theory that has been explained, it can be concluded that the connection of bank capital and defeat risk is negatively correlated.

Zheng et al., (2019) explored the connection of bank liquidity and the risk of collapse bank that occurred in the U.S by adding a variable bank capital moderation. The results of the study moderating variables

(i.e. bank capital) determine the occurrence of failure risk associated with creating bank liquidity. But the moderation effect is more influential for small banks (Zheng et al., 2019). On the other hand, changes in the capital adequacy ratio at a bank have an impact on household credit as changes in housing prices develop. Besides, those marginal reserves are very useful in growing loan and foreign funding (Vandenbussche et al., 2015).

CAMEL are components derived from the bank's condition, which the supervisor assessed uses some of the available information. It is a new market sensitivity component. Bank practitioners use CAMEL for supervisory assessment of the bank's overall condition (Bassett et al., 2015). Previous research discusses that shocks to a bank's rating on real economic activity have minimal effect and only in the short term (Hwa et al., 2018). In particular, Hwa et al., (2018) find that A decrease in the CAMELS ratio causes a decrease in bank activity further. Still, an increase in the CAMELS ratio does not create an effect of an increase in bank activity. The previous study that conducted by Bassett et al., (2015) explores the standards used for CAMELS assessments for commercial banks have changed materially over time. The results show that when CAMELS increases, it will have an effect on decreasing lending activity in the next quarter and real GDP also falls below the downward trend in loans which causes the economy downturn.

In this research, we will develop Buch's (2014) paper, namely a focus on the impact of banking policies on macroprudential policies in Indonesia. We use a banking policy proxy, namely the capital adequacy ratio (CAR) because the minimum CAR has been set in Basel III. We will also analyze whether the value of the banking quality indicators (CAMEL) and monetary policy has an impact on macroeconomics. For monetary policy, we use the BI rate as a proxy. Where as for

macroprudential, we use a proxy for macroeconomic variables, namely GDP growth.

Besides that, what distinguishes this study from the previous one is that we add the priority sector GDP variable, because the priority sector is very involved in banking services, especially in terms of capital borrowing. For this reason, we assume whether changes in banking policy will affect GDP growth in the priority sector so that later it can have an impact on aggregate GDP growth and have an effect on macroprudential systems.

We use the factor augmented vector autoregressive (FAVAR) to observe the endogeneity of the observed variables, and we inspect the impulse response functions related to the objectives of this study. For the sample of this research, we utilize 2002 – 2018 Indonesian banking data from *Otoritas Jasa Keuangan (OJK)'s - Statistik Perbankan Indonesia* and macroeconomics variables and banking policies from Bank Indonesia database.

The reason we use the Indonesian data since Indonesia has the potential economic growth as the emerging countries. In the last decades, the Indonesian government attempt to maximize the extensive wealth both of natural and human resources by spending on infrastructures development. This expansion is massively financed by the Indonesian government and state-owned enterprises debt both from domestically financial institutions and international funds.

Overall, this study contributes to empirical research on the impact of banking policy on economic output. We fill the gap observe the impulse response functions of the aggregate of GDP and GDP per sector of priority to shock of bank's capital adequacy ratio (CAR), a shock of CAMEL_PCA, and shock of BI's rate. The results of this

research, compared to the existing study, will enrich the literature of the banking policy and macroeconomics variables to design more reliable policies to achieve the goal of economic outcomes.

METHOD

This chapter explains the data, and methodology used for determining the shock effect of banking policy to economic priority sectors. There are three main shocks here, Capital Adequacy Ratio (CAR), CAMEL_PCA, and monetary shock. The clashes are expected transmitted to total GDP growth, agriculture growth, mining growth, industry growth, construction growth, and maritime growth.

The analysis period is from the first quarter of 2002 until the fourth quarter of 2018. We utilize 2002-2018 Indonesian banking data from *Otoritas Jasa Keuangan (OJK)'s - Statistik Perbankan Indonesia* and macroeconomics variables and banking policies from Bank Indonesia database. The banking data (consist of 43 banks listed in Indonesia Stock Exchange).

In this paper, we use the capital adequacy ratio (CAR) variable as a proxy for banking policy, Because Basel III has regulated the minimum CAR obligations that must be met by the bank. The macro-economic variables we use in this study are GDP growth and GDP growth in priority sectors. The priority sectors we examine are priority sectors based on the government's work plan for the 2014-2019 period. There are five priority sectors, namely Agriculture, Mining, Industry, Construction and Maritime. We also use BI rate data as a proxy for monetary policy.

The variables of CAMEL data were obtained from specific banking variables with the principal component of analysis (PCA). Capital Adequacy can be calculated using total capital divided by risk-weighted assets, common equity divided by total assets, total

capital divided by total assets. Asset quality can be called a noncurrent loan ratio, and can be calculated using the following proxies: loan loss reserves divided by growth loans, loan loss provision divided by growth loans, impaired loans are divided as growth loans. Management quality can be calculated as a non-interest expense to revenue (net interest income plus non-interest income). Earnings can be proxy by the Return on assets (ROA) variable, Return on Equity (ROE) and Log (Bank Z-score). Liquidity is a measure of the extent to which a bank funds long-term investments with short-term liabilities, it can be calculated by liquid assets divided by total assets, liquid assets divided by total deposits, net loans divided by total assets.

We use FAVAR (Factor Augmented Vector Auto Regression) used by Buch et al., (2014) to determine the effect of banking policy on the economic sector and we inspect the impulse response functions related to the objectives of this study. The economic sectors are modelled by small-scale macro variables as endogenous variables: GDP growth, fund rate (BI rate/7 days reverse-repo rate), and inflation rate $G_t = [\Delta y_b, ffr_b, if_i]$.

The set of augmented variables in our FAVAR model are banking variables. Banking variable used presented in Table, mainly variables that link to CAMEL. CAMEL data are obtained from banking specific variables with PCA (see capital C, A, M, E, and L in Table 2). In addition to total GDP, we add five priority sectors: agriculture, mining, industry, construction, and maritime to the calculation. We want to know the effect/shock of banking policy to the economic growth of priority sectors.

The estimation of FAVAR follows Stock and Watson (2016) and Buch et al., (2014) procedure: Factor F: there are seven variables, consist of CAR, CAMEL_PCA, fund (policy) rate, and four unobserved factors.

The number of unobserved factors is determined by Amengual and Watson (2007) test. We also use Bai and Ng (2002) criterion test, and the result is the same with Amengual and Watson (2007). Banking B: following Buch et al. (2014) and Boivin et al. (2009). The basic model:

$$X_t = \Lambda' B_t + \Xi_t \quad (1)$$

The procedure is iterative; first, we estimate B_t from first 4 (number of unobserved) PCA of X_t . Second, regress X_t on B_t , yielding $\Lambda^{\circ G}$. Third, compute $X^{\circ t} = X_t - \Lambda^{\circ G} G_t$. Then, estimate B_t from first 4 PCA of $X^{\circ t}$. We do these steps until the convergence is achieved.

We use the VAR (1) model of F_t . The order of VAR is determined by the Bayesian Information Criterion (BIC).

$$F_t = c + \Phi_1 F_{t-1} + Pw_t \quad (2)$$

The macroeconomic shocks have sign restriction and contemporaneous restriction. Sign restriction follows (Peersman, 2005), and contemporaneous limit and long-run restrictions follow (Bjørnland & Jacobsen, 2013).

The confidences (standard error) of impulse response function are estimated by the bootstrap procedure suggested by Killian (1998). We use 500 replications of bootstrap, same with Buch et al (2014).

RESULTS AND DISCUSSION

We present the descriptive statistics of variables used in our research in Table 2. We collect 13 economic variables over 17 years (68 quarters) that are applied according to our methodology stated in the previous section.

As we can see on the table 2, the value of mean and median of most of the rate variables are relatively the same, showing that the data are not skewed significantly. Among the variables that are quite skewed are growth

industrial production, growth agriculture, growth mining, growth industry, and capital.

Table 2 shows the descriptive statistics (in percentage, except exchange rate which presented in rupiah) of observed variables

consist of mean, median, standard deviation, minimum value, and maximum value from Q1 2002 - Q4 2018. All variables, except BI rate, are measured in the quarter over quarter.

Table 2. Descriptive Statistics of Observed Variables

Observed Variables	Mean	Median	St. Dev.	Min	Max
BI rate	7.307	6.950	2.629	3.830	15.11
Growth GDP	1.325	1.274	0.309	0.146	2.775
Growth Agriculture	0.953	2.324	10.996	-14.475	60.712
Growth Mining	1.023	0.232	7.209	-3.958	58.381
Growth Industry	1.092	0.620	4.762	-1.102	39.083
Growth Construction	1.695	1.075	7.423	-2.815	60.641
Growth Maritime	1.3050	0.9150	5.5865	-3.4526	44.3016
Capital	3.771	-6.666	17.570	-13.687	39.402
Asset Quality	24.269	20.06	9.032	14	46.07
Managerial	3.336	3.03	2.436	-2.291	10.369
Earnings	6.916	5.42	2.503	4.56	11.145
Liquidity	21.365	15.99	13.968	5.43	53.545
CAMEL_PCA	57.916	60.948	8.642	28.498	67.827

Source: processed data

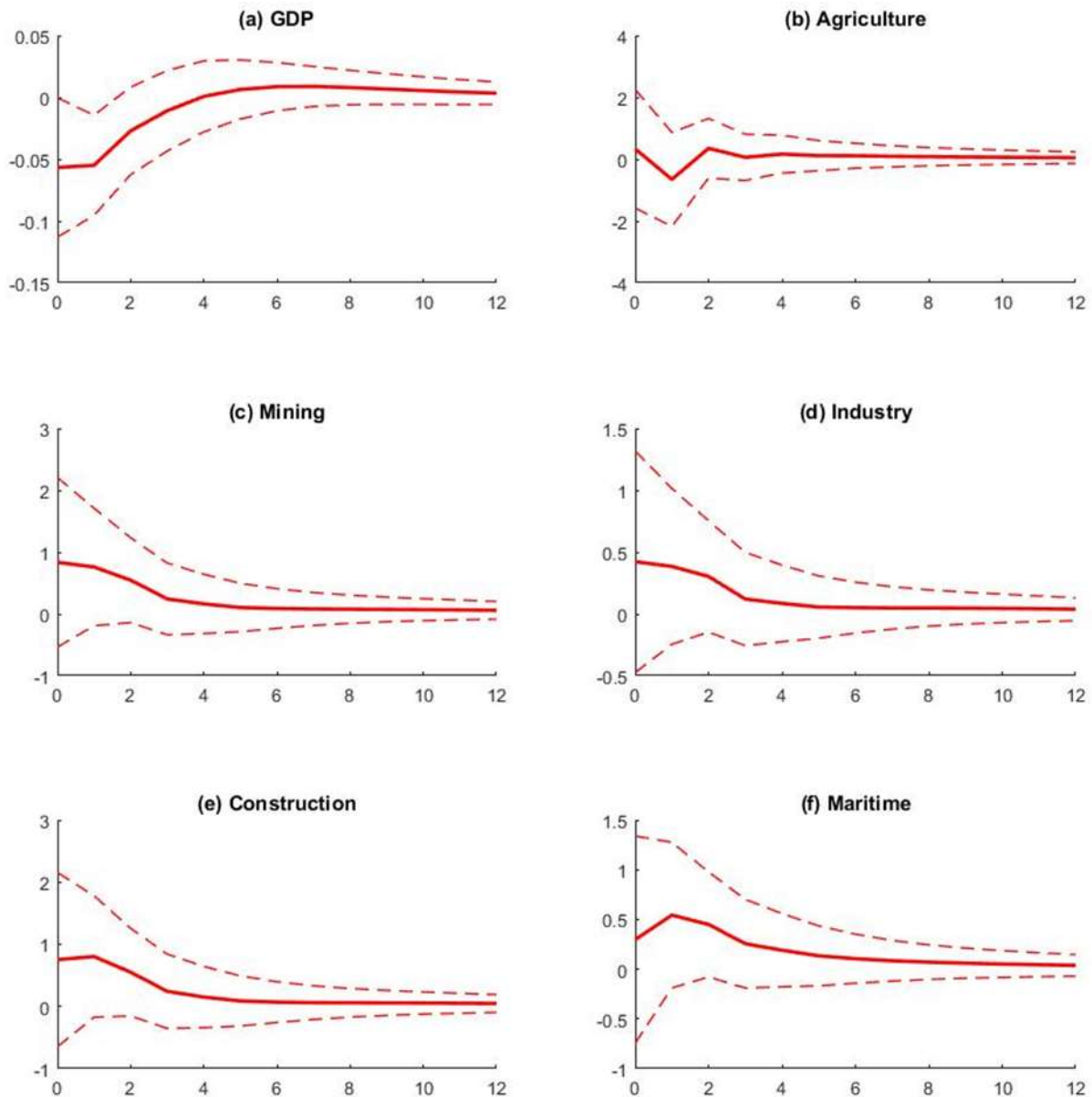
In Figure 1, we investigate the impact of capital adequacy ratio (CAR) shock to aggregate GDP and GDP per sector of priority (agriculture, mining, industry, construction and maritime). It shows the responses with 95% confidence level to shocks of the size of one standard deviation.

In the short periode, the shock of CAR decreases the aggregate GDP, which means the increase of CAR gives the negative impact temporarily to aggregate GDP. This finding consistent with the theory which explains that the higher CAR will create more reserve for the banks and reduce the loans. This finding is same with the previous study by Martynova (2015), the higher bank capital requirements may reduce bank lending, such as small businesses, it can decrease economic growth.

The figures 1 show the impulse response of (a) aggregate GDP (b) GDP of agriculture sector, (c) GDP of the mining

sector, (d) GDP of industry sector, (e) GDP of construction sector, and (f) GDP of the maritime sector to the median of banking's capital adequacy ratio (CAR) shock.

Moreover, this condition drives the decrease of credit supply which give a negative impact on aggregate GDP. However, we find the shock of CAR increases the GDP of mining, industry, construction, and maritime until four quarters. For the GDP of agriculture, the growth does not change significantly in a short period. Based on this evidence, we expect the shock of CAR does not give the impact for GDP of priority sector since there are not include the financial sector and the sector of priority are mostly driven by government spending. Overall, in the long run, the shock of CAR to aggregate GDP and GDP of priority converges to zero which means the shock of CAR does not have a significant impact for both aggregate GDP and GDP of priority sector in the more extended period.



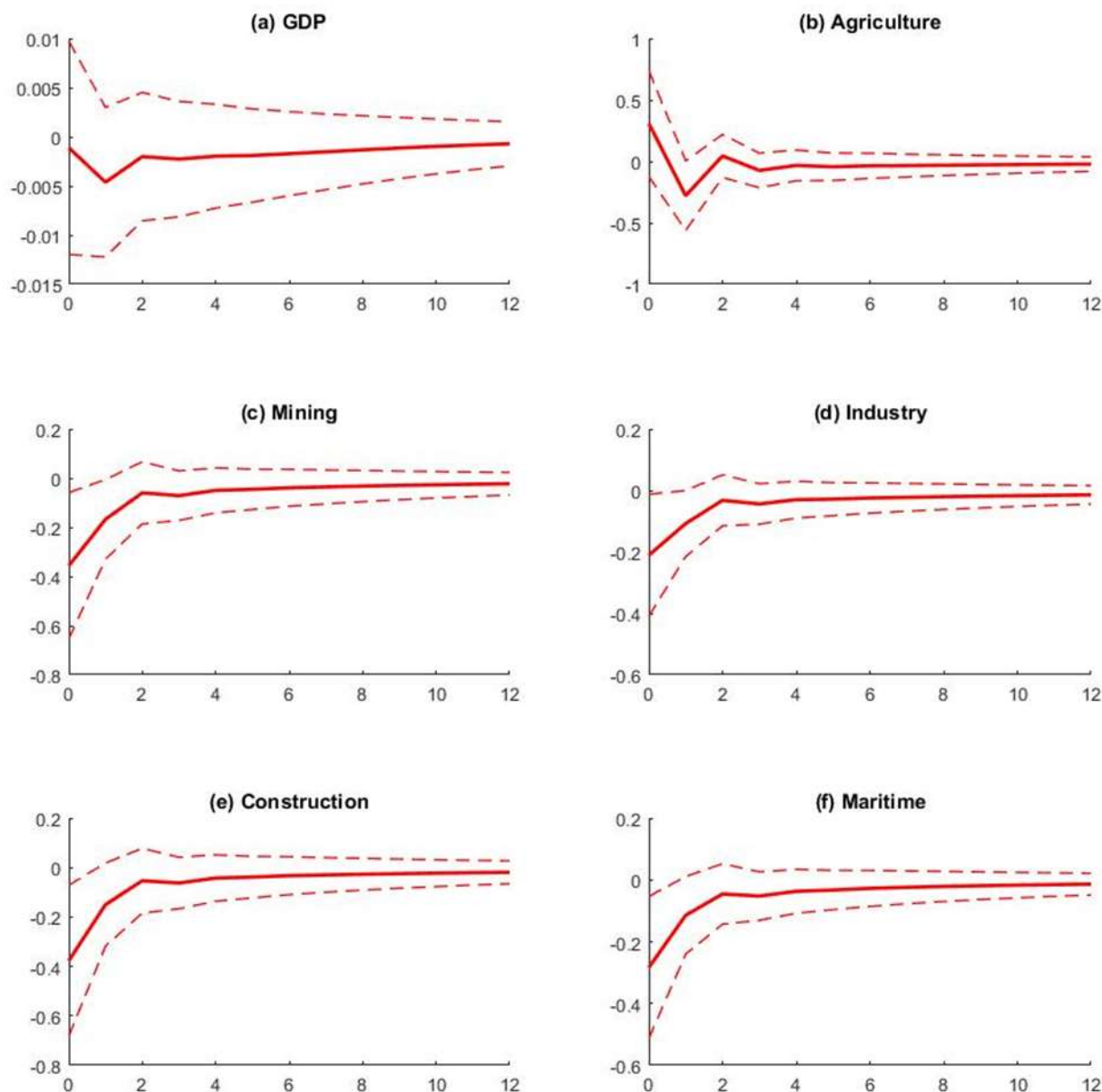
Source: processed data

Figure 1. Impulse Response Functions of Aggregate GDP and GDP Per Sector to Median of (CAR) Shock.

As previously explained that these findings (Figure 1) support research from (Buch et al., 2014; Malovaná & Frait, 2017). Besides, this finding answers the problem related to how macroeconomic shocks are transmitted to banking variables, that in the long term changes that occur in banking CAR will not have a direct effect on macroeconomics. However, it is having a short-term impact on aggregate GDP

because banks save more funding to meet CAR needs than provide loans.

The figures 2 show the impulse response of (a) aggregate GDP (b) GDP of agriculture sector, (c) GDP of the mining sector, (d) GDP of industry sector, (e) GDP of construction sector, and (f) GDP of the maritime sector to Median of CAMEL_PCA Shock.



Source: processed data

Figure 2. Impulse Response Functions of Aggregate GDP and GDP per Sector to Median of CAMEL_PCA Shock.

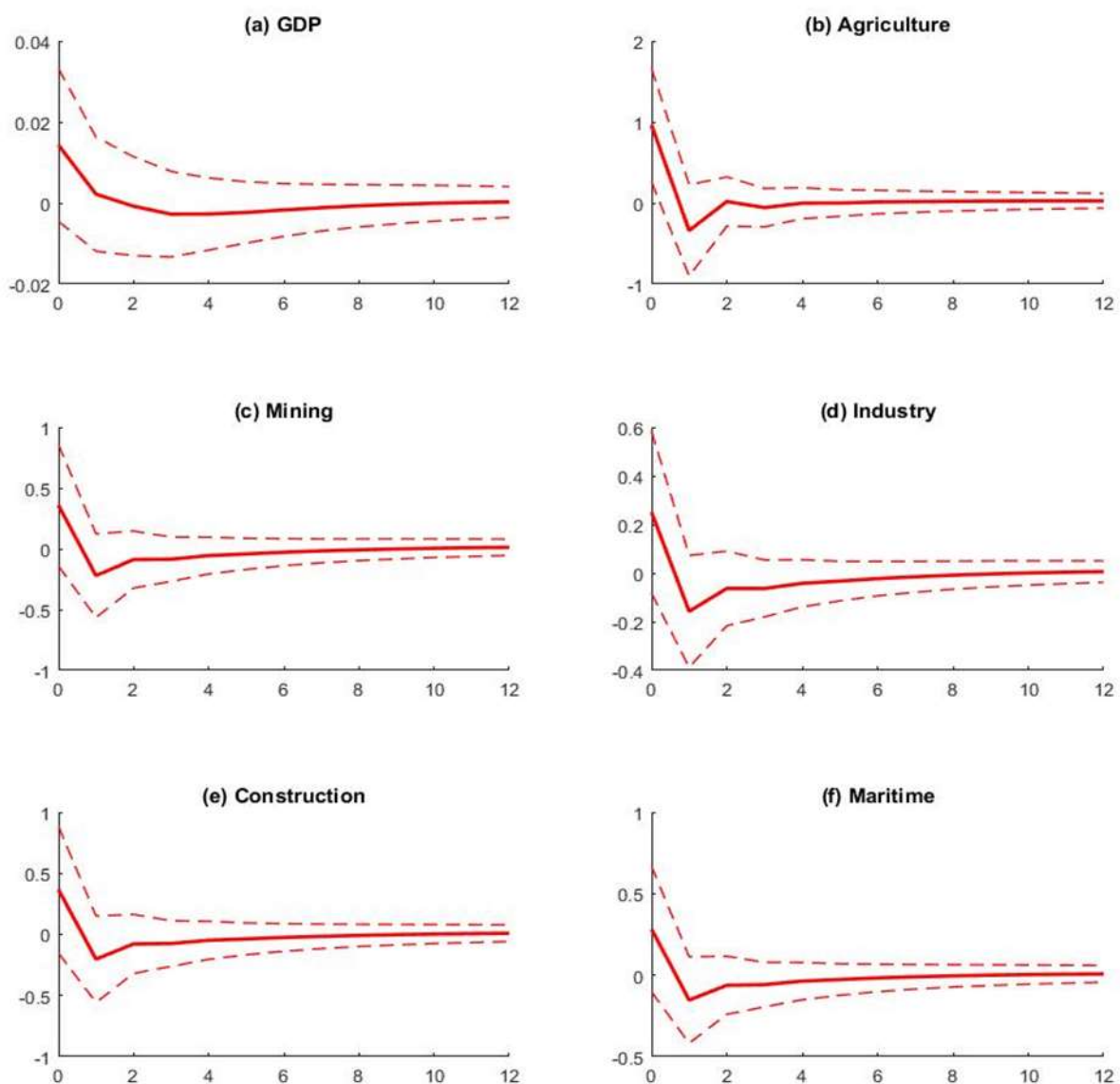
Figure 2 shows the impulse response of aggregate GDP and GDP of priority sector to the shock of CAMEL_PCA. For the total GDP, the shock of CAMEL_PCA does not give significantly and economically impact. For the GDP of priority sector, the CAMEL shock (decrease in CAMEL ratio) will decrease the growth in the short run. These findings align with the expected effects that

the higher camel means the low quality of banking indicators, and it impacts the decrease of GDP of priority sector. These finding also same with previous study (Bassett et al., 2015; Martynova, 2015) when CAMELS become rise, it could have a dampening effect on lending activity in the following quarter, and real GDP falls below its trend. Indeed, the shock of CAMEL_PCA will close to zero in the more

extended period, which means these banking indicators does not give a significant impact in the long run.

The results of Figure 2 answer the problems discussed in this study, namely how macroeconomic shocks are transmitted to banking variables. Our results show that for conditions in Indonesia if the CAMEL assessment of a bank deteriorates, it means that the bank is in shock so that the low quality of CAMEL will have a downward effect on GDP growth aggregate in priority

sectors. A decrease in the CAMEL ratio can affect the decline in GDP because if a bank has a lousy assessment in a certain period, the debtors and creditors will be reluctant to use these banking services. So that if a bank loses the trust of the debtor, the bank will find it challenging to carry out its operations and will eventually have an impact on macroeconomics and macroprudential policies in that country. Based on figure 2, in the short term, the sector that feels the impact of the CAMEL shock is the agricultural sector.



Source: processed data

Figure 3. Impulse Response Functions of Aggregate GDP and GDP Sector Priority to (BI)'s Rate Shock.

We find the impulse response of aggregate GDP and GDP of priority sector to monetary policy shock in Figure 3. In the short run, the graph shows the shock of BI's rate decreases the aggregate GDP and GDP per sector of priority. Overall, the shock does not significantly impact the growth of aggregate GDP and GDP of the priority sector in the long period. This finding is consistent with Buch et al., (2014)'s research and makes long-term neutrality of monetary policy. Based on the analysis above, we expect the economy will undergo the recessions since the banking policies do not give significant impact in the long run.

Based on figure 3, both GDP growth and GDP of all priority sectors have the same graphical form, namely experiencing a decline in the short term due to changes in monetary policy. However, the decline in aggregate growth GDP is not that significant compared to the GDP of priority sectors. This finding is beneficial for policymakers, especially Indonesian banks to be careful in making changes in the BI rate, however, in the long run, the BI rate does not affect GDP, consistent with Topcu et al., (2012) research, that J. Tobin and P. Samuelson stated that both monetary and fiscal policy can sustain an increase in national output for a sufficiently long period, but fiscal policy is more effective than monetary policy. Contrary to theory Keynes, government spending is a component of aggregate demand that affects output, but monetary policy causes widespread ineffectiveness, while that is a theory Monetarists argue that monetary policy can affect production however conversely, fiscal policy is not sufficient (Belliveau, 2011).

CONCLUSION

We investigate the impact of the banking policies using the proxies consist of bank's capital adequacy ratio (CAR), the principal component of analysis (PCA) of banking quality indicators (CAMEL), and BI's rate to the aggregate of GDP and GDP per sector of priority. We use the FAVAR model to observe the endogeneity of the observed variables, and we inspect the impulse response functions related to the objectives of this study. For the sample of this research, we utilize 2002 - 2018 Indonesian banking data from *Otoritas Jasa Keuangan (OJK)'s - Statistik Perbankan Indonesia* and macroeconomics variables and banking policies from Bank Indonesia database. The reason we use the Indonesian data since Indonesia has the potential economic growth as the emerging countries. In the last decades, the Indonesian government attempt to maximize the extensive wealth both of natural and human resources by spending on infrastructures development. This expansion is massively financed by the Indonesian government and state-owned enterprises debt both from domestically financial institutions and international funds.

In general, we find the impulse response functions of aggregate GDP and GDP per sector of priority to the shock of the CAR is a decrease in the short run and close to zero in the long term. Based on this evidence, we expect the shock of CAR does not give the impact for GDP of priority sector since there are not include the financial sector and the sector of priority are mostly driven by government spending. Afterwards, we discover the impulse response of aggregate GDP and GDP of priority sector to the shock of CAMEL_PCA. For the total GDP, the shock of CAMEL_PCA does not give significantly and

economically impact. For the GDP of priority sector, the shock decreases the growth in the short run. These findings align with the expected effects that the higher camel means the low quality of banking indicators, and it impacts the decrease of GDP of priority sector. Indeed, the shock of CAMEL_PCA will close to zero in the more extended period, which means these banking indicators does not give a significant impact in the long run. Finally, we find the impulse response of aggregate GDP and GDP of priority sector to monetary policy shock is decreased in the short term. Overall, the shock does not significantly impact the growth of total GDP and GDP of the priority sector in the long run. These findings were consistent with Buch et al., (2014) and makes long-term neutrality of monetary policy. Based on the analysis above, we expect the economy will undergo the recessions since the banking policies do not give significant impact in the long run. The results of this research, compared to the existing study, will enrich the literature of the banking policy and macroeconomics variables to design more reliable policies to achieve the goal of economic outcomes.

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