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Evaluation Of Macro-prudential Policy On Credit Growth In Indonesia: Credit Registry Data Approach

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Abstract. *Macro-prudential policies have an essential role in mitigating the imbalances in the financial sector that stem from procyclical credit growth. This study aims to evaluate macro-prudential policy in mitigating risk on procyclical credit growth with a registry data approach. Structural Vector Autoregression (SVAR) analysis method is used to evaluate macro-prudential policy in influencing credit growth. The results show LTV instruments can reduce credit growth but not to procyclical mitigation. Dissimilar results in the implementation of CCB and GWM + LDR instruments are capable of procyclical credit mitigation. Policies that can be done by the central bank are the establishment of early warning system in macro-prudential policy as well as strengthening of Countercyclical Buffer (CCB), Loan to Value (LTV) instruments and Minimum Reserve Requirement + Loan Funding Ratio (GWM + LFR) in capturing systemic risks from various sources which further strengthens the assessment and surveillance.*

Keywords*: macro-prudential policies, credit, registry data, structural vector autoregression*

Abstrak. *Kebijakan makroprudensial memiliki peran penting dalam memitigasi ketidak-seimbangan di sektor keuangan yang bersumber dari pertumbuhan kredit yang bersifat procyclical. Penelitian ini berutujuan untuk mengevaluasi kebijakan makroprudensial dalam memitigasi resiko pada pertumbuhan kredit yang bersifat procyclical dengan pendekatan registry data. Metode analisis Strutural Vector Autoregression (SVAR) digunakan untuk mengevaluasi kebijakan makroprudensial dalam mempengaruhi pertumbuhan kredit. Hasil penelitian menunjukan bahwa instrumen LTV dapat meredam pertumbuhan kredit tetapi tidak untuk memitigasi procyclical. Berbeda hasil dalam implementasi intrumen CCB dan GWM+LDR yang mampu memitigasi procyclical kredit. Kebijakan yang dapat dilakukan bank sentral adalah pembentukan kerangkan early warning system pada kebijakan makroprudensial serta penguatan instrumen Countercyclical Buffer (CCB), Loan to Value (LTV) dan Giro Wajib Minimum+Loan Funding Ratio (GWM+LFR) dalam menangkap resiko sistemik dari berbagai sumber yang selanjutnya dapat memperkuat assemen dan surveilans.*

Kata kunci: *kebijakan makroprudensial, kredit, registry data, structural vector autoregression*

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Introduction

Indonesia was affected by the global crisis caused by financial sector instability in 2008/2009. The source of the financial sector instability derived from the credit bubble that turned into a global crisis and led to a drastic reduction in economic growth (Claessens and Kose, 2013; Purnawan and Nasir, 2015). Therefore, the booming credit growth could trigger a global crisis. Credit risk still felt in 2017, which is influenced by low aggregate demand reflected in the economic slowdown. Also, high credit growth compared to deposit fund growth will potentially create a funding gap risk. Based on the experience of the global crisis and credit growth conditions macro-prudential policy created in mitigating financial instability.

Since the phenomenon of the crisis of 2008/2009 macro-prudential policy became a policy that plays a vital role in mitigating systemic risk (Baskaya et al., 2015; Claessens and Kose, 2013; Fendoğlu, 2015). Research conducted by Arnold et al. (2012); Shi et al. (2014); Tomuleasa, (2015); Tovar et al. (2012) explain the importance of macro-prudential policy in minimizing systemic risk in the financial system. Systemic risk may stem from a trend of financial cycles following the economic cycle, as well as with procyclical credit growth having potential as a systemic risk (Arnold et al., 2012; López, et al., 2014; Bianchi, et al., 2016). Research López et al. (2014); Bianchi, et al. (2016) provide an overview in mitigating systemic risk arising from the procyclical credit growth of an early warning system.

The effectiveness of macro-prudential policies to mitigate systemic risks derived from credit growth is procyclical. There are anomalies in the implications in each country. This anomalies based on economic fundamentals and financial system patterns in each different country have an impact on the implementation of macro-prudential policy (Alegria, et al., 2017; Claessens and Kose, 2013; Zhang and Zoli, 2016). Pramono et al. (2015); Purnawan and Nasir (2015); Utari, et al. (2012) explains that macro-prudential policy as Countercyclical Buffer (CCB), Statutory reserve requirement (GWM) and GWM + Loan Deposit Ratio (GWM + LDR) to give effect to mitigating credit growth is procyclical in Indonesia. Similar results are shown in the study Drehman and Tsatsaronis (2014) and Fendoğlu (2017) through the instrument Countercyclical Buffer (CCB) and the Loan to Value (LTV) on macro-prudential policy to be effective in mitigating the risk systemic credit growth in emerging market countries. Gómez, et al. (2017) confirm that macro-prudential policy through instrument countercyclical buffer (CCB) effectively affect credit growth in the country of Colombia.

Different results conducted by Tovar et al. (2012) explain that the instrument of Minimum Reserve Requirements (GWM) policy is less effective in reducing credit growth. In line with the study, research by Igan and Kang, (2011) found that the Loan to Value (LTV) instrument impacts systemic risks stemming from excessive credit growth but not for procyclical credit growth. Furthermore, research Basten and Koch, (2015) explains the Countercyclical Buffer (CCB) instrument has a weak effect on credit growth. Based on the research explain that macro-prudential policy implication is still anomalous.

In Indonesia, a developing country is in mitigating systemic risk on procyclical

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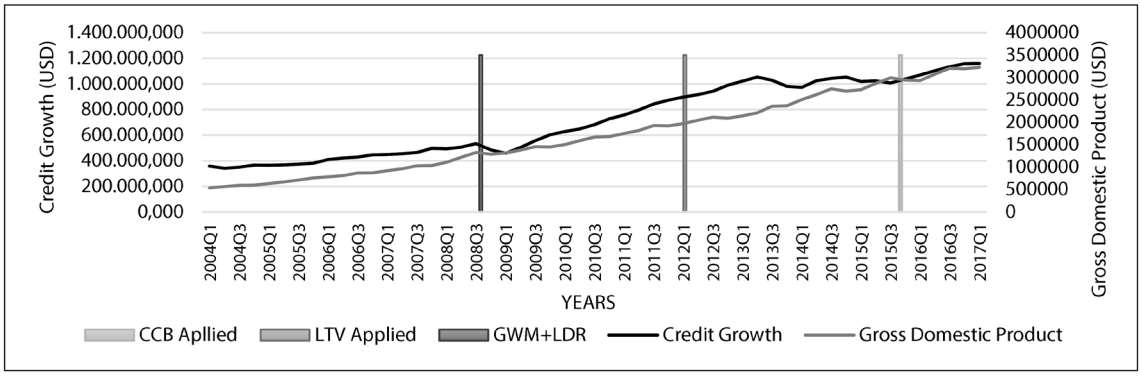
credit growth with macro-prudential policy through several instruments applied. Macro-prudential policy instruments used by Bank Indonesia to overcome systemic risk arising from credit growth are Loan To Value (LTV), Countercyclical Buffer (CCB) and GWM + Loan Deposit Ratio (GWM + LDR). The use of the Loan to Value (LTV) instrument is an instrument used to overcome property loans[1]. Correspondingly delivered by Kiley and Sim, (2015) and Cronin and Mcquinn, (2016) in explaining Loan To Value (LTV) are used to overcome credit growth in the property and motoring sectors. The second instrument used is countercyclical buffer (CCB), which aims to anticipate potential systemic risks from credit growth and/or excessive banking financing[2]. The next instrument is the GWM + Loan Deposit Ratio (GWM + LDR) by increasing lending accompanied by sufficient capital and liquidity stability (Bank Indonesia, 2017). Therefore, such macro-prudential policy is used to mitigate credit growth that could potentially pose systemic risks in the long run affecting the stability of the system.

Figure 1 explains how the implementation of macro-prudential policies in mitigating procyclical credit growth will have systemic risk impacts. Procyclical credit behavior has the potential to cause systemic risk (Arnold et al., 2012; López et al., 2014; Bianchi et al., 2016). Implications of macro-prudential policy as a whole are still weak due to loan growth there is procyclical. The implementation of GWM + LDR there are still some points that show credit growth in the direction of credit growth. In addition, the implementation of LTV policy in controlling credit developments in the property sector is also still a few points that show credit growth in line with credit growth. The same result also in CCB implementation still at the certain point there is the procyclical indication. Thus, the macro-prudential policy applied in Indonesia is still weak and needs to evaluated.

Figure 1. Credit Growth and Economic Growth in Indonesia



Source: Bank Indonesia, 2017 (edited)

The macro-prudential policy implications in Indonesia that are weak in mitigating procyclical credit growth may trigger a systemic risk to the stability of the financial system.

[1] Based on Bank Indonesia regulation No.18 / 16 / PBI / 2016 on Loan to Value ratio for property loans, Financing to Value ratio for property finance and down payment for credit or motor vehicle financing

[2] Based on Bank Indonesia Regulation No.17 / 22 / PBI / 2015 on the obligation to establish Countercyclical Buffer

Consequently, this study aims to evaluate macro-prudential policy in mitigating procyclical credit growth with registry data approach. The use of the registry data to look specifically at macro-prudential policy weaknesses in mitigating the procyclical credit growth due to the macroeconomic conditions of a country or the conditions in the banking system or also the inappropriate implementation of macro-prudential policies. As a study by Gómez et al., (2017) and López et al., (2014) in evaluating the impact of macro-prudential instruments in affecting credit growth through resolving data.

Method

The type of data used in this research is time series data from 2006M1 until 2017M3. In addition to being able to provide a detailed description of the credit developments that are influenced by the implementation of macro-prudential policy in each month, so the data can interpret the phenomenon that occurs. The indicators used as a proxy for the banking characteristics are liquidity ratio, Return on Asset (ROA), Size (total assets), Capital Adequacy Ratio (CAR) and banking risk variables seen through Z-score.

The research model specification modifies the research used by Aguirre and Blanco, (2015) and Gómez et al., (2017) in viewing credit developments through the data registry.

$$LogCredit_t = \alpha_1 + \alpha_2 \sum_{j=1}^{3} MacroTool_t + \alpha_2 \sum_{j=1}^{4} MacroControl_t + \alpha_3 \sum_{j=1}^{4} BankControl_t + \varepsilon_t \quad (1)$$

Equation (1) to see how macro-prudential policy instruments, macroeconomic policy indicators and banks characteristics affecting credit growth in Indonesia. However, the effect of the business cycle on credit growth can provide a systemic risk to the financial system. Equation (2) this research passes the interaction between economic growth (LogGDP) with macroTool policy to mitigate the risk of procyclical.

$$LogCredit_t = \alpha_1 + \alpha_2 \sum_{j=1}^{3} MacroTool_t * LogGDP_t + \alpha_2 \sum_{j=1}^{4} MacroControl_t + \alpha_3 \sum_{j=1}^{4} BankControl_t + \varepsilon_t \quad (2)$$

Furthermore, this research also interaction macro-prudential policy (MacroTool) with monetary policy (Birate) in influencing the dynamics of credit growth. Macro-prudential policy interaction with monetary policy can see in Equation (3).

$$LogCredit_t = \alpha_1 + \alpha_2 \sum_{j=1}^{3} MacroTool_t * BIrate_t + \alpha_2 \sum_{j=1}^{4} MacroControl_t + \alpha_3 \sum_{j=1}^{4} BankControl_t + \varepsilon_t \quad (3)$$

Credit growth in financial institutions also influenced by the condition of financial institutions visible from the level of financial risk. The high-risk level of financial institutions reflects the adequacy of capital in accommodating the risk of loss is minimal, so it can affect credit growth. Thus in Equation (4) will include a banking risk variable (Z-score) as one determinant of credit growth.

$$LogCredit_t = \alpha_1 + \alpha_2 \sum_{j=1}^{3} MacroTool_t * Z - Score_t + \alpha_2 \sum_{j=1}^{4} MacroControl_t + \alpha_3 \sum_{j=1}^{4} BankControl_t + Z - Score_t + \varepsilon_t \quad (4)$$

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The analytical tool used in this research is the Structural Vector Autoregression (SVAR) methodology which has the character of restriction in the relationship between variables based on the theory and the phenomenon that occurs (Sims, 1980; Kilin and Tun, 2014). With the model of Structural Vector Autoregression (SVAR) accompanied by restriction has the following basic model Kazanas, et al., (2011).

$$Yt = \sum_{i=0}^{\infty}(A_i\, U_{t-i} = A(L)X_t) \quad (5)$$

Where: Ut is a vector of independent and dependent variables in this study. The variable Ai as the contemporaneous relations between variables while A (L) is a finite-order matrix polynomial with the operator Lag L. restriction built in equations (1) to equation (4) as follows. The restrictions will use in limiting relationships between variables to suitable with the phenomenon as well as the prevailing theories. Therefore, the macro-prudential policy implicit in mitigating credit growth will undermine.

Result and Discussion

Credit growth that is well managed will pose a procyclical credit risk. Procyclical credit risk will be a source of systemic risk to financial system stability that will lead to the economic crisis (Gómez et al., 2017; Rubio and Carrasco-gallego, 2014). Procyclical risk mitigation of credit can be through macro-prudential policy (Baskaya et al., 2015; Claessens and Kose, 2013; Fendoğlu, 2015; Shi et al., 2014). However, empirically in the macro-prudential policy implications, there are still some anomalies. Drehmann and Tsatsaronis (2014) and Fendoğlu (2017) explains that macro-prudential policy instruments such as Loan to Value (LTV) and Countercyclical Buffer (CCB) are effective in mitigating credit growth. In contrast, Basten and Koch (2015) asserted that Countercyclical Buffer (CCB) instruments have weak effectiveness in overcoming credit growth. While, Lim et al., (2011) in an evaluation of macro-prudential policy through LTV instrument and GMW explained that effective in reducing procyclicality on credit, but depend on a fluctuation in the financial sector. It is, therefore, necessary to review the effectiveness of macro-prudential policy in influencing credit growth.

The result of this research shows in Table 1. Model 1 it shows that LTV and GWM + LFR instrument give influence to credit growth except for CCB instrument. The probability value of the LTV instrument of 0.071 less than the alpha value (α = 10%) gives an idea that the LTV instrument influences on credit growth. LTV instruments that can affect credit growth in accordance with research conducted by Gete and Reher (2016); Cronin and Mcquinn (2016); Hongkong Monetary Authority (2010). However, in dealing with the procyclicality of credit, the ineffective LTV instrument seen in Model 2 shows from the probability value of the LTV instrument 0.395 greater than the alpha value (α = 10%). LTV instrument effectiveness is only in economic growth but not in procyclical credit growth. Property-based credit growth can be mitigated through LTV instruments but is not effective when credit growth is booming. McCarthy and McQuinn (2017) explains that LTV Instruments are effective in influencing credit growth, but not in proactively managing credit growth.

Table 1. Estimation Result *Structural Vector Autoregrssion* (SVAR)

Variable	Model 1	Model 2	Model 3	Model 4
D_CCB	[0.935] (0.121)	-	-	-
D_LTV	[0.479]*** (0.071)	-	-	-
D_GWM+LFR	[0.919]* (0.000)	-	-	-
D_CCB*GDP	-	[37.236]** (0.039)	-	-
D_LTV*GDP	-	[43.735] (0.395)	-	-
D_GWM+LDR*GDP	-	[12.722]* (0.000)	-	-
D_CCB*BIrate	-	-	[0.734] (0.8000	-
D_LTV*BIrate	-	-	[5.673]** (0.046)	-
D_GWM+LDR*BIrate	-	-	[0.527] (0.737)	-
D_CCB*Z-Score	-	-	-	[69.411]* (0.000)
D_LTV*Z-Score	-	-	-	[26.922]** (0.012)
D_GWM+LDR*Z-Score	-	-	-	[-0.248] (0.381)
LogGDP	[1.298] (0.223)	[-0123]* (0.030)	[0.196]* (0.000)	[-0.248]* (0.000)
BIrate	[-61.50]* (0.000)	[2.661]* (0.000)	[0.098] (0.884)	[1.273]*** (0.063)
RER	[0.883]*** (0.095)	[-67.847]* (0.000)	[-48.829]* (0.000)	[-76.511]* (0.000)
D_krisis	[-20.601]** (0.032)	[0.433] (0.428)	[-0.446] (0.296)	[0.579] [0.301]
Bank_Likuiditas	[1.889]* (0.00)	[-11.139] (0.241)	[8.286] (0.162)	[-16.921] [0.11)
Bank_ROA	[-3657.348] (1.00)	[-0.011] (0.992)	[0.7286] (0.188)	[-0.323] [0.621]
Log_Bank_SIZE	[6.291]** (0.032)	[91.733] (0.257)	[14.211]* (0.003)	[-97.779] [1.000]
CAR	[0.018]* (0.000)	[5.822] (0.398)	[11.268]* (0.000)	[7.239] [0.452]
Z-Score	-	-	-	[-2.916]*** [0.086]

* significant α=1%, ** significan α=5%, *** significan α=10%.

[...] = coefficient; (...) = probability

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GWM + LDR instrument also show the same result with a probability value of 0.00 smaller than the alpha value (α = 1%), which indicates that GWM + LDR can give effect to credit growth. Pramono et al., (2015); Purnawan and Nasir (2015) affirm that the GWM + LDR instrument is effective in lending growth. Besides, the simulation on model 2 also shows the probability of a GWM + LDR of 0.00 is less than the alpha value (α = 1%) which gives meaning to the LDR + LDR instrument to mitigate the procyclical credit growth. Application of GWM + LDR can push the intermediation function in a more optimal direction with credit risk management. Utari et al., (2012) explains that the GWM + LDR instrument is effective in mitigating excessive credit growth.

The implementation of CCB instruments in the results of this research analysis is not effective in influencing credit growth but is effective in mitigating procyclical credit growth. The reason for the analysis result of model 1 shows that CCB instrument does not affect credit growth seen from probability value equal to 0,121 bigger than an alpha value (α = 1%). However, simulation of model 2 in the application of CCB instrument effectively mitigates procyclical credit growth with a probability value of 0.39 is smaller than an alpha value (α = 5%). CCB Instruments is an additional capital used as a buffer to mitigate losses when there is excessive credit growth. Thus additional capital that must form during the expansion period can be used when the condition of contraction in the economic growth. Hessou and Lai (2018) confirm that CCB is used to mitigate procyclical credit growth.

The interaction of monetary and macro-prudential policies is also used to mitigate credit growth. The results of this study show the monetary policy mix through the interest rate (BI rate) with LTV instrument effective in affecting credit growth. The determination of the interest rate by the central bank underlying the determination of the interest rate of bank credit with the determination of the amount of LTV can give effect to the growth of property loan. Suh (2014) explains that the interaction of monetary and macro-prudential policies can be used to stabilize credit growth.

The different result in the macro-prudential and monetary policy mix through CCB and GWM + LDR instruments are not effective in affecting credit growth. In the implementation of the CCB policy mix with the interest rate shows that with a probability value of 0.8 higher than the alpha value (α = 10%) gives the notion that the policy mix does not affect credit growth. The objectives cause the ineffectiveness of monetary policy with macro-prudential through CCB in the formation of different policies. Besides, the Instrument GWM + LDR with a probability value of 0.737 is higher than the alpha value (α = 10%). The effectiveness of the GWM + LDR instrument policy with interest rates in affecting economic growth is ineffective due to the presence of higher Third Party Fund (DPK) growth conditions than credit growth with the slowing of economic growth.

Credit growth is also inseparable from the internal condition of the banking system; in this context can be a ratio of the banking risk parameters in lending. Current conditions can lead to health improvements that will contribute to lending. In the case of a risky banking condition accompanied by excessive credit, growth can be an evaluation of the strength of macro-prudential policy in mitigating credit risk. The results of this study showed in Model

4 suggest that a CCB instrument with a probability value of 0.00 is less than the alpha value (α = 1%). The result means that it is effective in influencing loan growth in the middle of banking risk. The effectiveness of CCB policy in influencing credit growth in banking risk condition is evident from the purpose of CCB usage. Auer and Ongena (2016) explains that CCB is effective in influencing the growth of loan credits through the management of bank capital

LTV instruments in affecting credit growth in the presence of very effective banking risk seen from the probability value of 0.01 that smaller than the value of alpha (α = 1%). Increased NPLs of gross mortgages can be a source of increased mortgage credit risk along with an increase in mortgage growth. Thus the establishment of LTV instruments can suppress the increase in gross mortgage NPLs that further avoids the increased credit risk. Thanassoulis (2014) explain that bank stability can give effect to banking risk..

Other findings in this study in evaluating macro-prudential policy with credit growth through the registry data approach indicate that the internal condition of the stock also exerts influence in the channeling of loans by banks. Banking stability is proxy through liquidity, Return On Asset (ROA), size, Capital Adequacy Ratio (CAR) and banking risk significantly influence with probability value each smaller than alpha value. Banking stability becomes the most crucial aspect of the banking decision to channel credit (Shijaku, 2017). Ghenimi, et al (2017) explains that bank stability can give effect to banking risk.

The determinants of credit growth can be affected by the country's economic conditions. Clark and Kassimatis (2015) and Herman, et al., (2017) explain that a country's macroeconomic conditions can affect credit growth. The results of this study explain that changes in exchange rates of a country can give effect to the credit growth seen from the probability value in each model is smaller than the alpha value. Magud & Vesperoni (2015) explains that exchange rate flexibility can affect credit growth through capital flow.

The determination of interest rates conducted by the central bank can also give effect to the growth of credit. The interest rate relationship with credit growth can see through the probability value of each model smaller than the alpha value. Research conducted by Sáiz, et al., (2017), (Bauer, 2017) provides an overview of the determination of interest rates by the central bank into the basis of determining the interest rates of banks that can give effect in credit growth. Besides, the occurrence of a crisis can also affect the credit growth seen from the probability value is smaller than the alpha value. The occurrence of a crisis that gives effect to the downward economic growth can give effect in credit development due to high risk of bad credit. The results of this study confirm by Akbar, et al., (2017) that during the crisis there will be restrictions on lending.

The economic conditions reflected in the Gross Domestic Product (GDP) in this study do not affect the economic growth. In this condition, the Central Bank in Indonesia is increasing the demand for credit amidst increasing economic growth with the prudent principle to avoid procyclical credit. In model 2, however, it is seen that with a probability value of 0.03 smaller than the alpha value (α = 10%) signifies economic growth can be a procyclical credit. Karfakis, (2013); Bahadir and Gumus (2016) to obtain credit growth

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results that tend to follow the economic growth can be a procyclical potentially systemic risk.

On the other hand, the internal condition of banks is also a reference in giving banks credit that gives effect to credit growth. The internal health of banks can make the impact of lending, in other words, credit growth will also be affected (Igan and Pinheiro, 2011). The results of this study indicate that the healthiness of banks can give effect to credit growth but not in generating procyclical credit. Bank liquidity can affect credit growth. Research by Alper, et al., (2014) explain that banking liquidity affects credit growth. Size also shows the same result. The result shows that size of banking can give influence to credit growth. Chen and Wu, (2008) explain that the size of banks that can get from high bank capital can disburse high credit.

Capital Adequacy Ratio (CAR) also contributes to the probability level of 0.00 is less than the alpha value (α = 1%). CAR has affected credit growth because CAR is the capital adequacy of the banks. Thus, the high capital adequacy provides bank ease in distributing credit. Besides, the risks resulting from the Z score give influence on the credit growth. The banking risk relationship with significant credit growth calculated by the probability value of 0.086 less than the alpha value (α = 10%). As in the study conducted by (Köhler, 2009) because of the facts that can give on loan.

The problem of credit growth accompanied by a potential procyclical can mitigate through macro-prudential instruments. Research by Gómez et al., (2017) argues that macro-prudential policy as a stabilizer of interest rate changes in the credit cycle. However, the effectiveness of macro-prudential policy instruments following the economic conditions that occur, so it cannot be entirely influential. As in the research conducted by Purnawan & Nasir, (2015) which explains the macro-prudential policy applied by the economic growth and financial system stability condition.

Table 2. Macroprudential Policies: Instruments and Targets

Intruments	Target
Loan to Value (LTV) BIrate with *Loan to Value* (LTV)	Credit Growth
Countercyclical Buffer (CCB) Giro Wajib Minimum+ Loan Deposit Ratio (GWM+LDR)	*Procyclicality*

Table 2 contributes an overview of the effectiveness of macroprudential policies in giving effect to credit growth and credit procyclicality. An effective instrument used in reducing credit growth is the LTV instrument. However, the macroprudential and monetary policy mix through BI rate and LTV also provides effectiveness in influencing credit growth. The effectiveness of macroprudential policy to dampen credit procyclicality is CCB and GWM + LDR.

Conclusion

The results of this study in viewing the effectiveness of macroprudential policy in reducing the growth of credit that has the potential to procyclical effective. However, the effectiveness of macroprudential policy is limited. The LTV policy only able to reduce credit growth, but not to procyclical mitigation. Different results in the implementation of CCB and GWM + LDR instruments are capable of procyclical credit mitigation. Controlling credit growth through macroprudential policy mix with monetary policy is only useful for the implementation of the mix of LTV instruments with central bank interest rates. Banking risk issues that can provide credit growth improvement in the results of this study CCB and LTV instruments are useful in addressing credit growth. The credit growth in need of caution in overcoming due to state imbalances such as financial crisis, exchange rate fluctuation and banking health can affect credit growth.

Thus, the policies that can be applied by the central bank in the case of controlling credit growth are the establishment of early warning system framework on macroprudential policy and strengthening of CCB, LTV instruments and (GWM + LDR) in capturing systemic risks from multiple sources that can further strengthen the assumptions and surveillance. Besides, the need for macroprudential and monetary policy mix ambiguities in mitigating risk.

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