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# The Risk-Taking Channel and Monetary Transmission Mechanisms in Indonesia

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## Abstract

This study aims to analyze monetary and macroprudential policies through risk taking banks in Indonesia. The importance of *risk-taking channel* analysis in the transmission mechanism of monetary policy is that it is a newer route and is different from the bank lending channel that has been previously proposed in monetary policy theory. This *risk-taking channel* affects the supply of credit by banks through the bank's decision to channel credit based on changes in bank behavior in dealing with bank risk. The study also recognizes the impact of monetary and macroprudential policies and the role of the characteristics of banks, as well as macroeconomic conditions such as economic growth and inflation rates. The analytical method used is *fixed effects* through panel data in the period 2012-2019. This study uses 3 types of proxies to measure risk, first with the Z-score measurement method, second with the ratio of the number of risky assets to total assets and third, the ratio of the number of bad loans to total assets. The results of this study found that the impact of monetary policy and macroprudential policy significantly affects bank risk. In addition to the main variables, this study also uses GDP growth and inflation variables as control variables for macroeconomic conditions that significantly effect on bank risk, liquidity, and bank size variables as control of bank characteristics which also significantly affect bank risk. So it can be concluded that the risk-taking channel exists in the Indonesia's banking.

**Keywords**: monetary policy: macroprudential policy; risk-taking
JEL Classification: B22, C33, E58

## INTRODUCTION

*Excessive risk-taking* in the US banking industry driven by the Federal Reserve's long-term expansionary monetary policy is considered a key factor contributing to the global crisis in 2008. Starting from the lowering of the US central bank interest rate in 2001, which was around one percent. This was done to move the American economy, which at that time was in a negative state. By lowering the central bank's interest rates, lending rates will also decrease. Low loan interest rates will be an incentive for households and companies to borrow money from banks, both for doing business and for consumption. Increased economic activity through investment and consumption

will have a positive impact on economic growth. In addition, the existence of production activities through it is also expected to reduce the number of unemployed.

But on the other hand, low-interest rates also have a *side effect*, if the application is *too low for too long*. So that this condition can encourage economic agents to behave in *excessive risk-taking behavior*. As a result, it will lead to *financial imbalances* and further increase the risk of financial system stability. It is also considered to be one of the main contributors to the 2008/2009 crisis. As a result of this phenomenon, many researchers have investigated the relationship between monetary policy and bank risk taking and have raised debates and questions for researchers and policymakers about how too low central bank interest rates can affect bank risk taking (Borio and Zhu (2008), and Adrian and Shin, (2009), Leonardo Gambacorta, (2009)).

Borio and Zhu (2008) were the first to propose a monetary policy risk-taking channel. Changes in monetary policy can affect the risk perception and risk tolerance of financial intermediaries, thereby affecting portfolio risk, asset pricing, and external financing requirements. Subsequently, several studies emerged and followed.

The purpose of monetary policy by the central bank is actually to achieve a certain level of inflation and economic growth. However, based on experience from the 2008 global crisis, it turns out that there is a trade-off with banking risk-taking that has the potential to threaten the stability of the financial system and even the economic system. This link between monetary policy and financial sector stability has finally become a central issue to see how the transmission of monetary policy adopted ultimately affects banking risk. This transmission line is called the risk-taking channel (Borio & Zhu, 2008).

Furthermore, Borio (2008) suggests the importance of *risk-taking channel analysis* in the monetary policy transmission mechanism. This is different from the bank lending route proposed by Bernanke and Blinder (1988) and Bernanke and Gertler (1995) who argue that monetary policy works through bank reserves (bank reserve) and next influences offer credit banking in the economy. *The risk-taking channel* affects the supply of credit by banks through the bank's decision to channel credit based on changes in bank behavior in dealing with risk credit. Adrian and Shin (2009) suggest that this *risk-taking channel* is also different from the concept of *financial accelerators* proposed by Bernanke and Gertler (1999). In this regard, the results of empirical research are sufficient to provide evidence of the existence of *risk-taking channels* in the policy transmission mechanism monetary.

This study will analyze the relationship between interest rates and bank risk in Indonesia. Study this will use three methods to measure risk bank which not yet been carried out in previous studies. In addition, this research will also include macroprudential policies, namely the Statutory Reserves (GWM) and Loan to value (LTV).

## LITERATURE REVIEW

Related to the relationship between interest rates and bank risk, one aspect that is also of concern to researchers is how to measure bank risk. One method that is widely used to measure risk is the *Z-score method*. This method is considered under the definition of risk in the banking literature (Lapteacru, 2016). Bankruptcy is defined as a state when losses exceed equity, so the probability of bankruptcy or risk bank

could be defined as Prob [−ROA < CAR]. Mark Z obtained from Z = $\frac{\mu \text{ROA} + CAR}{\sigma ROA}$ is an *inverse* representation of bank risk. However, This method has a restriction that must be met, namely normality. The Z value can represent bank risk only if the *return on assets* (ROA) data is a normally distributed random variable (Demirgüç-Kunt & Huizinga, 2010).

Various methods of transformation have been used by researchers to overcome this weakness. Laeven & Levine (2009) proposed using the logarithm of the Z value as a measure of banking risk, while Demirgüç-Kunt & Huizinga (2010) used the logarithm of the Z value plus one to include the negative Z value.

Meanwhile, Lapteacru (2016) has conducted a simulation test to compare the consistency of Z values, both before and after being transformed. There are at least two conclusions important from the study by Lapteacru (2016) this. First, if distribution  *skewed* and or has excess kurtosis, the application of the indigo Z approach (without transformation) gives inconsistent results. Second, the logarithmic transformation does not reduce the slope and therefore fails to give satisfactory results in accordance.

Previous research (Minghua, 2017) used this method in measuring risk. Through the calculation process using the *Z-Score formula*, the resulting Z value is not normally distributed but is *left-skewed*. Therefore, researchers transform with method logarithm mark (Z+1) with hope mark results normally distributed transformation. The value of this transformation is used to represent bank risk. However, when referring to the results of the Lapteacru (2016) study, the use of the Z score method. data that are not normally distributed can result in Z values that fail to represent risk bank even though already done transformation logarithmic. So from, Therefore, another method is needed to measure risk if the data is not distributed normally.

This study will also use two other risk measurement methods such as those carried out by Delis (2011). First, calculate the ratio of the number of *risky assets* to total assets. Risk assets are bank assets that can change in value due to changes in market conditions or changes in credit quality in various payment opportunities. In other words, an increase in risky assets indicates a riskier bank condition.

Second, by calculating the ratio of the number of bad loans to total assets. Bad loans reflect the quality of the bank's assets, namely the negative potential for income and the market value of assets because of the quality of credit decrease. So credit congestion could make as a proxy for credit risk because apart from credit congestion will result in a loss for banks. The higher bad credit scores will increase the credit risk bank.

Furthermore, in this study, to analyze the mechanism of transmission policy monetary through tracking *risk-taking* banks, not only see the effect of interest rate-based monetary policy but also macroprudential policies, namely the Statutory Reserves and LTV. This is because of the *linkages* between monetary policy and macroprudential and *risk-taking behavior* in the banking sector, where efforts to maintain financial stability through monetary and macroprudential policies are often responded to by excessive *risk-taking behavior* by banks which can worsen economic conditions (*monetary policy-bank risk nexus*). So that studying the pattern of *risk-taking behavior* of banks in responding to policy mix interventions, can be one of the foundations for risk mitigation in the banking sector.

Approach beginning in explaining the role of the bank in transmitting policy, the monetary view is believed to be through the money channel or the obligations of the banking sector to the economy (*money view*), then the idea that banks influence the economy through credit channels develops. The credit line in the monetary policy transmission mechanism was first developed by Bernanke and Blinder (1988). Analysis of how the supply of bank credit is influenced by monetary policy can be through various channels analyzed by economists and is active research in the study of monetary economics. The transmission lines of monetary policy through bank credit that have been proposed so far include the liquidity channel (Diamond and Rajan, 2006), the Bank Capital Channel (Van der Heuvel, 2007), and those that have recently become the attention of economists since the onset of the economic crisis. Globally in 2008 was the risk-taking channel (Borio, 2008, Adrian and Shin, 2009).

Borio (2008) suggests the importance of risk-taking channel analysis in the monetary policy transmission mechanism. *The risk-taking channel* affects the supply of credit by banks through the bank's decision to channel credit based on changes in bank behavior in dealing with credit risk. In this regard, the results of empirical research are sufficient to provide evidence of the existence of a *risk-taking channel* in the transmission mechanism of monetary policy. In the context of the Indonesian economy, in-depth observation of the role of risk factors in the financial sector in the operation of the transmission mechanism has not been carried out. Goeltom et al. (2009) generally conclude that based on empirical analysis, risk perception plays a significant role in transmitting monetary policy in Indonesia. This presentation indirectly indicates an interaction between monetary policy and risk in the banking sector which is transmitted through the supply of bank credit.

Second, the reason behind the existence of a macroprudential policy is the procyclicality theory, which shows the phenomenon where the financial cycle accelerates the economic cycle. In periods of an increasing economy, the financial cycle tends to be faster than the economic cycle. Expansion of bank credit increases rapidly, prices of financial assets and property can soar, and excessive accumulation of debt will lead to a higher accumulation of risk.

In general, the macroprudential policy does not yet have a theoretical framework so the uncertainty of the impact of a central bank instrument is pragmatic in its use (bank Indonesia, 2020). Several studies related to macroprudential policy, namely Antipa et al. (2011) conducted a UK and US case study, analyzing that macroprudential policies are effective for managing ( *smoothing* ) the credit cycle and preventing the impact of a deeper global financial crisis. Furthermore, Barrel et al. (2013) also conducted a case study of OECD countries (Latin America and Asia), stating that macroprudential policies can be used to address macroeconomic risks in banking while reducing the probability of a crisis occurring.

Finally, by using macroprudential policy, it is very effective in stabilizing the credit cycle in the short term. Macroprudential policy as a complement to monetary policy is more effective in reducing procyclicality and bank risk. The characteristics of banks also greatly influence macroprudential policies in dealing with credit problems (Gambacorta et al, 2017).

In the context of economic conditions in Indonesia, several previous studies related to the effects of macroprudential policies such as those conducted by Swaningrum & Hariwan (2014) in evaluating the effectiveness of macroprudential

policy instruments in reducing systemic risk in Indonesia. This study can conclude that the proxy variable for macroprudential policy is LTV and GWM LDR on year study not yet can be effectively overcome procyclicality credit. Furthermore, Nuryana (2017) investigates the assessment of the effectiveness of macroprudential instruments in reducing Indonesian banking risks. The results of his research show that the Capital Buffer and LDR reserve requirements simultaneously have a significant effect on credit risk. Partially, the Capital Buffer affects credit risk, while the LDR reserve requirement does not affect credit risk.

Finally, there is Maria (2019), the effectiveness of macroprudential policies on banking risk. The results of his research related to credit risk in the go public banking industry in Indonesia show that the Capital Buffer and Statutory Reserves, as macroprudential policy instruments and have a positive and significant effect on bank credit risk in Indonesia. Meanwhile, for further research, it is recommended to add the Loan to Value (LTV) variable as a macroprudential policy instrument.

## RESEARCH METHODS

### Data

This study uses secondary data in the form of panel data, which is a combination *of cross-section data* and *time-series data*. 30 banks in Indonesia act as *sections* here. Observations were made quarterly for 8 years, from 2012 to 2019, so there were 32 time series in this study. The data used were obtained from various sources, including data on reports from each bank, Bank Indonesia (BI), and the Financial Services Authority (OJK). Data on bank characteristics are sourced from quarterly reports of each bank which can be accessed through the official website of each bank as well as through statistical data from the Financial System Authority (OJK). This bank characteristic data will be used to measure the dependent variable, namely risk, as well as for the control variable. Data to measure the independent variables, that is ethnic group flower Bank Indonesia and Current Account Must Minimum (GWM) and Loan to value (LTV) sourced from Bank Indonesia (BI). Meanwhile, data on other control variables, namely macroeconomic conditions (GDP and Inflation) were from BI.

### Method

This research refers to the theoretical model developed by Dell'Ariccia (2016).

$$Risk_{it} = \alpha_i + \beta 1\ MONETERY\ POLICY_{it} + \beta 2\ MACROPRUDENTIAL\ POLICY_{it} + \beta 3\ MONETERY_{it}*MACROPRUDENTIAL_{it} + \beta 4\ CHARACTERISTICS\ BANK_{it} + \beta 5\ MACRO_{it} + \varepsilon_{it}$$

Where:

$Risk_{it}$ : risk of bank *i* during quarter *t*

MONETARYit : Monetary policy (IR) Interest rate at the quarter *t*

$MACROPRUDENTIAL_{it}$: Macroprudential policy (GWM, LTV) during quarter *t*

CHARACTERISTICS OF $BANK_{it}$: Specific control variables (BANK SIZE, LIQ) Characteristics of a bank during quarter *t*

$MACRO_{it}$ : Specific control variables Macroeconomic conditions as seen from (GDP, INF)

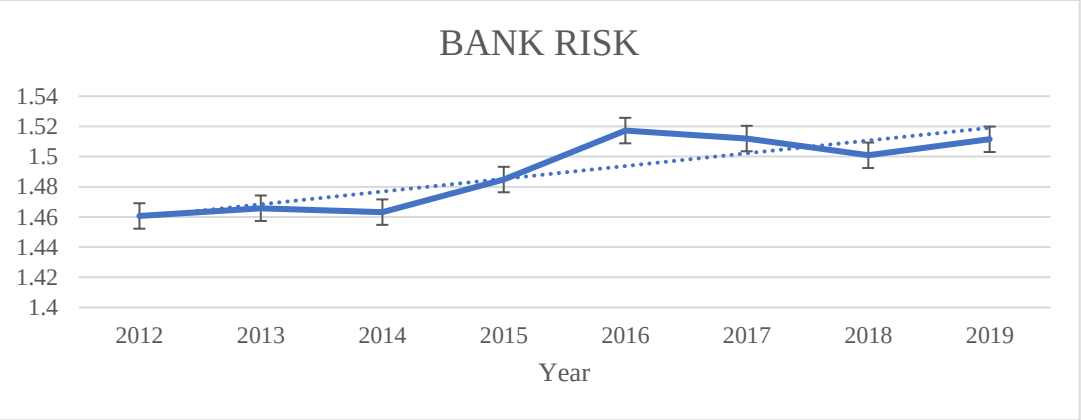
$\varepsilon_{it}$ : error

The model that will be used in this research is the *fixed effect* model. *The fixed Effect* model can accommodate heterogeneity between *sections*, in this case, heterogeneity bank that will be arrested through mark intercept. Use says fixed in *the fixed-effect* model to show that the factors causing heterogeneity in each bank are assumed to be constant throughout the observation period (Ekananda, 2016).

## RESULTS AND DISCUSSION

### Descriptive analysis

The monetary policy and macroprudential policy adopted by the central bank will directly have an impact on the performance (especially profit) of the banking system. This is because the banking sector is the most strategic part of the transmission line for monetary policy and the transmission line for macroprudential policy. This fact has prompted banks to take bolder behavior in taking risks to get more profits when monetary policy and macroprudential policies adopted by the central bank provide large profit opportunities, and banks can also act very anticipatively to secure their funds if monetary policy and macroprudential policies adopted by the central bank pose a threat of harm to the banking business. The image below is a graph of Z-Scores risk, asset risk, and NPL.




**Graph 1**. Bank risk for the last 8 years (2012-2019)
Source: processed by the author

Graph 1 shows the evolution of bank risk over the past decade, the trend tends to increase until 2019. It can be seen how the consequences of taking bank risk began to emerge suddenly in 2016, triggered by the monetary policy of Bank Indonesia which drastically lowered the BI rate. Whereat the beginning of 2016 BI was around 7.5 percent and experienced a decline of 5 times in the same year until the end of December 2016 it fell to 4.75 percent.

**Table 1.** Descriptive statistics

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| RISK A | 960 | 1.4557 | .3550 | .2747 | 2.1945 |
| RISK B | 960 | .71886 | .1415 | .0935 | 1.8232 |
| RISK C | 960 | .01942 | .0211 | .00027 | .2224 |
| IR | 960 | 4.9590 | .7773 | 3.83 | 6.04 |
| GWM | 960 | 7.2031 | .8091 | 6 | 8 |
| LTV | 960 | 76.25 | 9.6064 | 60 | 95 |
| BANK SIZE | 960 | 17.6778 | 1.8458 | 12.7881 | 21.0182 |
| LIQ | 960 | 103.9761 | 47.7503 | .9252 | 390.19 |
| GDP | 960 | 5.2215 | .3703 | 4.7762 | 6.1211 |
| INF | 960 | 4.6937 | 1.7294 | 2.48 | 8.6 |

It can be seen that the lowest risk with a min value is at risk C = 0.0027, namely Bank Danamon in 2014-2, and the highest risk is at Risk A 2.1945, namely Bank of Tokyo Mitsubishi in 2017-3. Meanwhile, the highest interest rate was at 6.04 percent in 2015-4, and the lowest was at 3.83 percent in 2012-2. The highest RR with a value of 8 percent was in 2012 and the lowest was with a value of 6 percent in 2019. The highest LTV with a value of 95 percent was in 2019 and the lowest was with a value of 60 percent in 2013. Conditions between RR and LTV are slightly inversely proportional, where the Statutory Reserves tend to decrease every year and vice versa LTV tends to increase every year.

**Estimated Results of Monetary Policy with Bank risk**

Model 1 (attachment) shows the results of the regression to analyze monetary policy on bank risk which is reviewed through interest rates (IR) on the Z-Score. The Z-score value is calculated from the ratio of ROA and CAR. Furthermore, the risk-taking channel, which is the transmission channel of monetary policy, can be analyzed through the bank's response to these risks. Therefore, the dependent variable in the Risk A model is measured using Z-score bank i and period t. According to the monetary policy theory of Mishkin (1995) that when the central bank implements a contractionary monetary policy (the policy rate increases), interest costs will increase, thereby reducing the growth in the volume of credit extended by banks. For different Jenga sectors such as corporations and households, credit demand is influenced by interest rates, as well as credit spreads. In addition, the net worth of households and firms determines the extent of their borrowing capacity (Andrian & Shin, 2009). Thus, the growth in credit volume can increase bank risk. Under the classical theory that the higher the interest rate, the higher a person's desire to save or keep money in the bank.

Based on the results of the variable estimation test (attachment), monetary policy in this case is proxied by the interest rate (IR) which significantly influences the *risk-taking channel* (bank risk). The results of the regression carried out show that the IR variable has a significant negative effect on bank risk, which is measured by Risk A and Risk C, different things for Risk B which have different directions, namely positive but not significant. This is stated based on the results of the t-test in the Risk A table, the IR variable shows a significant estimation result with a p-value below the 10% real level and has a coefficient with a negative direction of -1.035. This means that when a contractionary monetary policy is implemented, there is an increase in the interest rate by 1 percent, and it will be able to reduce bank risk by 1,035 percent,

cateris paribus. Vice versa if monetary policy is expansionary. This implies that the higher the interest rate, the lower the bank's risk. Next for Risk C, the IR variable is also significant and consistently has a negative direction on bank risk. The estimation results of the t-test show that the *p-value* level is below the 5% significance level with a coefficient value of -0.002. This means that if each IR increases by 1 percent, it will result in a decrease in bank risk of 0.002 Risk C. These results are under the findings of Jimenez et. al (2009), Dell'Ariccia, (2016), Maddaloni and Peydro (2018), Angeloni et al. (2014) and by Minghua Chen, et al (2017).

**Macroprudential Policy Estimation Results on Bank risk**

Furthermore, macroprudential policy variables or often referred to as complementary instruments in this case are proxied by the Statutory Reserves (GWM) and Loan to Value (LTV). Of the three types of bank risk measurement, the estimation results show that the significant effect is the reserve requirement variable in model 2 (attachment) in Risk A with a *p-value* below the 1% real level and has a negative coefficient direction. These results show that when the macroprudential policy is contractionary, i.e. an increase in the statutory reserve requirement set by the central bank can reduce bank risk. On the other hand, if the central bank implements an expansionary policy, it can increase bank risk. From the coefficient value, the analysis shows that when the reserve requirement policy is increased by 1 percent, it will reduce bank risk by 2,806 percent, cet paribus. The results of this test are following the hypothesis and confirm the findings of Cordella et al. (2014) and Federico et al. (2013) that macroprudential policy is effective and influences bank risk.

This is different from the central bank's macroprudential policy based on Loan to Value (LTV). In model 3 (attachment) the LTV variable is LTV policy with a negative direction and the coefficient value is 5,204 but statistically not significant. This means that when the LTV policy is enforced, the tendency of credit will be in a safe condition without much influence. The failure of the implementation of LTV according to Oh Hwa Se (2013) could be because, in its implementation, LTV policies can experience deviations. Deviations can occur due to the expansion of non-bank credit. This situation may also occur in Indonesia, the Government of Indonesia is also implementing subsidized mortgages as one of the political economy methods that the government does for the lower-middle-class people, which makes mortgage practices still run smoothly even though there is LTV implementation. People are attracted to credit at non-bank institutions because the down payment at non-banks is very cheap or through Islamic banks.

The absence of a significant influence from LTV or the lack of success of the LTV policy is reinforced by the reports on the Indonesian economy by BI and LPS in 2017. The report states that Bank Indonesia's move in early 2016 to ease monetary policy by cutting the BI Rate and the relaxation of LTV regulations quite aggressively has not had a significant impact in helping increase property sales. Therefore, the failure of the LTV policy in Indonesia could and needs to be reviewed and managed so that the function of macroprudential policy, in this case, LTV, can be successful in controlling bank risk in Indonesia. Hahm et al. (2012) stated that for Korea and several Asian countries the use of the DTI ratio was an important complement to LTV policies for macroprudential purposes in controlling mortgages and in the case of Hong Kong.

Meanwhile in Indonesia, the DTI macroprudential policy has not been regulated, only to regulate and implement LTV.

**Estimated Result of Interaction of Monetary Policy with Macroprudential Policy on Bank Risk**

Furthermore, this study also investigates the effect of the interaction between monetary policy and macroprudential policy on *risk-taking channels* both at Risk A (Z-Score), Risk B, and Risk C. First, Risk A Model 4 (appendix) interacts between monetary policy based on the interest rate (IR) with the reserve requirement macroprudential policy, and model 5 (attachment) interacts between interest rate-based monetary policy (IR) and LTV macroprudential policy. The estimation test results show that there is no significant effect as seen from the p-value above the 10% real level, while the direction of the coefficient is different when IR interacts with GWM on bank risk, the coefficient is negative, and when IR with LTV is negative. Second, the Risk B model (4) and model (5) interact with monetary policy and macroprudential policy, namely IR with Statutory Reserves and IR with LTV. The results of the two estimation tests are not significant as seen from the p-value which is above the 10% real level. Meanwhile, the direction of the coefficients is different, model (4) is positive and model (5) is negative. Third, Risk C when viewed in the model (4) and model (5) interacts with monetary policy and macroprudential policy, namely IR with Statutory Reserves and IR with LTV. The results of both estimation tests also show that there is no significant value seen from the p-value which is above the 10% real level. Meanwhile, the direction of the coefficients is different, model (4) is positive, and model (5) is negative.

This interaction variable is not significant, it may be due to several things as found by Dell A'rcia et. al (2012) regarding the optimal macroprudential policy response to the credit boom, as well as the optimal mix of monetary and macroprudential policies are likely to depend on the type of credit boom. Given that the data used in this study is less specific and focuses on aggregate credit. He added that regarding the optimal combination of policies, it is also necessary to take into account political economy considerations and the type of supervisory arrangement in a country. This result is also supported by several previous research results such as the results found by Collard et al. (2017) suggest that monetary and macroprudential policies can be uncooperative, so separate policies are optimal conditions.

Furthermore, research in the same year conducted by Cerutti, et. al (2017) found an important conclusion that in developed countries, effective policies that tend to be used are borrower-based policies such as LTV restrictions and DTI ratios while in developing countries, macroprudential policies are more often used with policies related to foreign exchange rate policy. This can be drawn from the conditions and status of the Indonesian state as a small open economy so that it is very vulnerable to external shocks. The last and most recent findings of Martin, et. al (2021) state that macroprudential policy and monetary policy are largely interdependent. This interdependence implies a potential *trade-off* between the two policy functions because the transmission of macroprudential instruments is likely to affect the transmission mechanism of monetary policy. With these various conditions and findings, in the analysis results in this study, the interaction variables of monetary policy and macroprudential are not significant to risk.

**Effect of Liquidity on Bank Risk**

The liquidity variable in this study is proxied as LDR. A high LDR level indicates that a bank lends its funds quite large *(loan-up* ) or relatively illiquid *(illiquid)* because the amount of funds needed to finance credit is getting bigger, so this is closely related to the risk if at any time the owner of the funds withdraws. the funds or in other words the bank cannot return the funds it borrowed from the customer. In Table Risk A, the t-test results show that the LIQ variable does not have a significant effect on bank risk as measured by the Z-score. Although the effect is not significant, there is a positive relationship between LDR and Z-score. Likewise, it does not affect risk C. The results of this study support the research conducted by Wimboh (2004). This means that the LDR ratio which is in the best range determined by Bank Indonesia indicates that the bank concerned has succeeded in carrying out its intermediation function, namely funding and well. Where this condition means the bank has succeeded in achieving its profit target.

In contrast to the Risk B model, the results of the LDR test on risk assets, this study shows that LDR has a positive and significant effect on the occurrence of bank risk. These results are following the hypothesis in this study. Where indicates that the higher the LDR ratio will lead to increased risk to the bank, conversely the lower the LDR ratio will cause a decrease in bank risk. The results of this study confirm that if the bank lends a large number of funds *(loan-up* ) considering that the bank's assets include credit, then the bank will have a high risk of uncollectible loans which can later lead to non-performing loans and the bank will experience losses. The results of this study support the empirical findings of Kohler (2012).

**Effect of Bank Size on bank risk**

It can be seen in tables Risk A, Risk B, and Risk C that the results of the Bank size test on bank risk consistently have a negative effect. These results show under the initial hypothesis. However, based on the results of statistical tests, Bank size is significant for Risk A at a p-value below the 5% significance level. This means that when bank size increases by one unit, it will reduce bank risk, which in this case is calculated by Z-scores of 2,620. For the significance of bank size on Risk B at a p-value below the 1% level of significance, it means that when bank size increases by one unit, it can reduce risk which in this case is calculated based on asset risk of 0.91. This means that larger banks show a lower level of bank risk-taking because they can obtain greater privacy. Following the research conducted. by Levine (2008), Agoraki et al. (2011) and Delis, Manthos D and Kouretas, Georgios (2011), Kohler (2012), and Andries, Cocriş, & Pleşcău, I. (2015) which state that bank size harms bank risk.

**Inflation Effect on Bank Risk**

Inflation is one of the other control variables that will be used in this study to describe macroeconomic conditions. Inflation is a condition where there is an absolute increase in prices that lasts continuously for a long period and is followed by a decline in the real (intrinsic) value of a country's currency. The results of the regression carried out show that the inflation variable has a significant negative effect on bank risk, both Risk A, Risk B, and Risk C. This is stated based on the results of the t-test in the Risk A table, the inflation variable at the p-value level is below the real level 1 % and has

a coefficient that is consistent with the negative direction. From the results of the regression that has been carried out, it is obtained that the inflation variable has a coefficient of -0.933. These results indicate that each inflation increases by 1 percent, it will result in a decrease in bank risk by 0.933 for Risk A. Meanwhile, for Risk B, the inflation variable is also significant and has a negative effect. This is evidenced by the results of the t-test, the level p-value is below the 10% real level, with an efficiency value of -0.007. This means that each inflation increases by 1 percent, it will result in a decrease in bank risk by 0.007 Risk B. Likewise with Risk C, the inflation variable is still consistent and has a significant effect in a negative direction on bank risk. It can be seen that the p-value is below the 1% level of significance with a coefficient of --0.001. This shows that each inflation increases by 1 percent, it can reduce bank risk by 0.001 Risk C. These results support the research conducted by Vodova and Shen et al. (2009) with similar results.

When there is high inflation, banks will increase loan and deposit interest rates. The increase in interest on these loans will lead to smaller loans disbursed by banks. In addition, with high inflation, prices will become higher so that the real income of the community decreases. This can cause bank liquidity to decrease because people are reluctant to save their funds in banks

**Effect of GDP on Bank Risk**

In addition to inflation, the control variable describes macroeconomic conditions, namely GDP. The economy generally experiences ups and downs, at least as seen from the development of output levels and prices. The ups and downs of economic activity are relatively repeated with varying timescales. In economics, this up and down motion is known as the business cycle. In addition, the macroeconomic environment has a fairly strong influence on the banking sector. As stated by Festić and Bekő (2008) that exposure to macroeconomic risk factors is a source of systemic risk that affects the performance of the banking sector which is expressed as the ratio of non-performing loans to total loans. In general, the *business cycle theory* highlights the *countercyclicality* of credit risk and business failure.

GDP growth indicates an increase in economic activity which makes people's incomes increase so that people can fulfill their obligations and the risk of non-performing loans will decrease, it can be said that an increase in GDP will reduce bank risk. This can happen because of an increase in economic growth which shows that all business fields are in good condition, which is marked by an increase in productivity. When growth increases, business activities will usually be profitable so that the income received by the community increases as well.

The GDP variable shows the estimation results with the t-test test showing that the GDP variable has a negative and significant effect on bank risk as measured by Risk A and Risk C, the difference for Risk B is not significant. This can be seen based on the results of the t-test in the Risk A table, the GDP variable at the p-value level is below the 1% real level and has a coefficient with a negative direction. From the results of the regression that has been carried out, it is obtained that the inflation variable has a coefficient of -7.081. These results indicate that every 1 percent increase in GDP will result in a decrease in bank risk of 7,801 Risk A. Likewise with Risk C, the GDP variable also consistently has a significant effect in a negative direction on bank risk. It can be seen that the p-value is below the 5% significance level with a

coefficient of -0.013. This shows that every GDP growth increases by 1 percent, it can reduce bank risk by 0.013 Risk C. This result is in line with the results obtained by research by Gambacorta (2009), Altunbas et. al (2009), and Kohler (2012). Meanwhile, for Risk B, the GDP variable gives an insignificant estimation result.

***Robustness Check***

This research was conducted based on the theoretical model developed by Dell'Ariccia (2016) with 3 risk measurement methods referring to Delis (2011) and Kohler (2012), the analysis in this study found evidence of a significant relationship between interest rate-based monetary policy on bank risk as well as a macroprudential policy with the Statutory Reserves instrument also has a significant influence on bank risk. In addition, the debate or attention of sensitive factors so far in the study of bank risk is the size of the bank against the risk of the bank.

Based on research by Kohler (2012), bank size has a significant effect on banks' response to the direction of risk. Meanwhile, research from Dell'Arcia (2016) shows that the size of the bank has no significant effect on the direction of the bank's risk response. To prove this, this study also tries to identify these problems by doing several sample separations. So that the sample classification is carried out between systemic and non-systemic banks based on the amount or amount of the bank's assets. The regression results show that there is no significant difference in the direction of the bank's risk response. Researchers found a significant negative relationship between bank size and bank risk, in a sample of small or non-systemic banks. A consistent negative coefficient between bank size and bank risk is obtained in the full sample that includes systemic and nonsystemic. This shows that the results of this study are not contaminated by large or systemic banks (appendix).

## CONCLUSIONS AND SUGGESTIONS

### Conclusion

This study aims to identify and analyze the relationship between monetary policy, macroprudential policy on bank risk, and the interaction of the policy mix on bank risk. Based on the theoretical model developed by Dell'Ariccia (2016) with 3 risk measurement methods referring to Delis (2011) and Kohler (2012).

First, based on the results and analysis in this study, there is evidence of a significant relationship between interest rate-based monetary policy and bank risk. Second, similar to monetary policy, this study also finds a significant relationship between macroprudential policy and the Statutory Reserves instrument on bank risk. Third, the case is different for the macroprudential policy with LTV instruments, there is no significant effect on bank risk. Similarly, when the interaction of monetary policy with a macroprudential policy on bank risk shows no significant effect.

In the end, this research shows that of the three risk measurement methods used, the one that better describes risk is risk A with a z-score measurement compared to the other two methods. This is evident from the significance and suitability of the model with the variables used. The main implication of this research is that monetary policy and macroprudential policy through *risk-taking channels* exist in Indonesian banking.

**Suggestion**

Based on the results of this study, that interest rate-based monetary policy and macroprudential policy with Statutory Reserves have a significant impact on bank risk, so it is suggested to the monetary authority in this case that the central bank needs to make a stable interest rate policy and Statutory Reserves, not make policy changes that are too high or low. because it can lead to excessive risk behavior.

Furthermore, the macroprudential policy based on the LTV instrument is not significant, this can be due to the risk proxy in this study not being specific but accumulative risk so that further research can be carried out specifically on property credit risk.

Finally, the interaction of the policy mix in this study also did not show a significant effect. So it is also important for the monetary authority in this case the central bank to learn how to take into account the effect of its policies on risk-taking.

**REFERENCES**

Agung, J. (2010). Integrating monetary and macroprudential policies: towards a new paradigm of monetary policy in Indonesia after the global crisis. Bank Indonesia, 181-214.

Angeloni, I., Faia, E., & Duca, ML (2014). Monetary policy and risk-taking. *Journal of Economic Dynamics and Control*, *52*, 285-307.

Antipa, P., Mengus, E., & Mojon, B. (2010). Would Macro-prudential Policies Have Prevented the Great Recession?. Banque de France, mimeo.

Adrian, T., & Shin, HS (2009). Prices and Quantities in the Monetary Policy. International Journal of Central Banking, 5(4).

Agur, I., & Demertzis, M. (2015). *Bank Risk Taking, Regulation and the Impact of Monetary Policy* (No. 271). Working Papers.

Altunbas, Y., Gambacorta, L., & Marqués-Ibanez, D. (2009). An empirical assessment of the risk-taking channel. *Available at SSRN 1459627*.

Altunbas, Y., Manganelli, S., & Marques-Ibanez, D. (2017). Realized bank risk during the great recession. *Journal of Financial Intermediation*, *32*, 29-44.

Andries, AM, Cocri, V., & Pleşcău, I. (2015). Low-interest rates and bank risk-taking: Has the crisis changed anything? Evidence from the Eurozone. Review of Economic and Business Studies, 8(1), 125-148.

Ariefianto, MD, & Soepomo, S. (2013). Risk Taking Behavior of Indonesian Banks: Analysis on the Impact of Deposit Insurance Cooperation establishment. Bulletin of Monetary Economics and Banking, 15(3), 3-25.

Backus, D., & Kehoe, P. (1992). International Evidence on the Historical Properties of Business Cycles. *American Economics*, 864-888.

Barrel, R & Karim, D (2013) what should we do about (macro) prudential? Macro-Prudential Policy and credit. London: Brunel University.

Bernanke, BS (1988). Credit, Money, and Aggregate Demand. *The American Economic Review Vol 78 no2*.

Bernanke, BS (1995). Inside the Black Box: The Credit Channel of Monetary Transmission Mechanism. *Journal of Economic Perspectives, Vol 9 No.4.*

Borio, C. (2003). Towards a macroprudential framework for financial supervision and regulation. BIS Working Papers, 128.

Borio, C., & Zhu, H. (2008). Capital regulation, risk-taking, and monetary policy: a missing link in the transmission mechanism? *J. Finance. steady. 8*, 236–251.

Bouzgarrou, H., Jouida, S., & Louhichi, W. (2018). Bank profitability during and before the financial crisis: Domestic versus foreign banks. *Research in International Business and Finance*, *44*, 26-39.

Campos, MF (2019). The effectiveness of macroprudential policies and SBI interest rates on bank credit risk in Indonesia. *MBR (Management and Business Review)*, *3* (1), 23-32.

Cerutti, E., Claessens, S., & Laeven, L. (2017). The use and effectiveness of macroprudential policies: New evidence. Journal of Financial Stability, 28, 203-224.

Collard, F., Dellas, H., Diba, B., & Loisel, O. (2017). Optimal monetary and prudential policies. American Economic Journal: Macroeconomics, 9(1), 40-87.

Cordella, T., Federico, P., Vegh, C., & Vuletin, G. (2014). Reserve Requirements in the Brave New Macroprudential World. *World Bank Policy Research Working Paper 6793*.

Delis, MD, & Kouretas, GP (2011). Interest rates and bank risk-taking. *Journal of Banking & Finance*, 35(4), 840-855.

Dell'Ariccia, G., Laeven, L., & Suarez, G. (2016). Bank Leverage and Monetary Policy's Risk-Taking Channel: Evidence from the United States. *The Journal of Finance*, 72(2), 613–654

Demirgüç-Kunt, A., & Huizinga, H. (2010). Bank activity and funding strategies: the impact on risk and returns. *J. Finance. econ. 98,*, 626–650.

De Paoli, Bianca, and Matthias Paustian. 2013. "Coordinating Monetary and Macroprudential Policies." Federal Reserve Bank of New York Staff Report No. 653

Ekananda, M. (2015). *Basic Econometrics for Research in Economics, Social and Business.* Jakarta: Media Discourse Partners.

Ekananda, M. (2016). Panel Data Econometric Analysis. Jakarta: Media Discourse Partners.

Ekananda, M. (2016). *Time Series Econometric Analysis.* Jakarta: Media Discourse Partners.

Federico, P., Vegh, C., & Vuletin, G. (2014). Reserve Requirements Policy Over the Business Cycle. *NBER Working Paper No. 20612*.

Gambacorta, L. (2009). Monetary policy and the risk-taking channel. *BIS Quarterly Review December*.

Gambacorta, L., & Murcia, A. (2017). The impact of macroprudential policies and their interaction with monetary policy: an empirical analysis using credit registry data.

Goodhart, C., & Schoenmaker, D. (1995). Should the functions of monetary policy and banking supervision be separated?. *oxford Economic papers*, 539-560.

Gultom, Miranda. S, Solikin M. Juhro and Firman Mochtar, 2009. Indonesian Monetary Policy Transmission Mechanisms and the Role of Risk Perception, Research Notes, Bank Indonesia, March

Hahm, JH, Mishkin, FS, Shin, HS, & Shin, K. (2012). *Macroprudential policies in open emerging economies* (No. w17780). National Bureau of Economic Research.

Jonsson, M., & Moran, K. (2014). The linkages between monetary and macroprudential policies. *Sveriges Riksbank Economic Review* , *1* (2014), 1-21.

Köhler, M. (2012). Which banks are riskier? The impact of loan growth and business model on bank risk-taking.

Kuttner, K and I Shim (2012): "Taming the real estate beast", mimeo.

Laeven, L., & Levine, R. (2009). Bank governance, regulation, and risk-taking. *J. Finance. econ.* *93*, 259–275.

Lapteacru, I. (2016). On the consistency of the Z-score to measure the bank Risk. *LAREFI Working Paper N°2016-05*.

Meeker, LG, & Gray, L. (1987). A note on non-performing loans as an indicator of asset quality. *Journal of banking & finance, 11* (1), 161-168.

Maddaloni, A., & Peydro, JL (2018). Monetary policy, macroprudential policy, and banking stability: evidence from the euro area. *International Journal of Central Banking.*

Martin, A., Mendicino, C., & Van der Ghote, A. (2021). On the interaction between monetary and macroprudential policies.

Minghua, C.d. (2017). Monetary policy and bank risk-taking: Evidence from emerging. *Emerging Markets Review*, 116-140.

Mishkin, F. (2001). The Transmission Mechanism and the Role of Asset Prices in Monetary Policy. *Working Paper, No. 8617.*

Nuryana, I. (2017). Assessment of the effectiveness of macroprudential instruments in reducing bank credit risk in Indonesia (Study on Go Public Banking Period 2012-2015). *Reference: Journal of Management Science and Accounting*, *5* (1), 55-68.

Rajan, R. (2006). Has finance made the world riskier? *European Financial Management*, 499– 533.

Se, OH (2013). Loan-to-value as a macro-prudential policy tool: Experiences and lessons of Asian emerging countries. *DsF policy paper*, *33*.

Shen, Chung-Hua et.al. 2009. Bank Liquidity Risk and Performance. Journal of Banking and Finance, Vol. 29, 1153-1184

Satria, J., & Juhro, SM (2011). RISK BEHAVIOR IN THE TRANSMISSION MECHANISM. *Bulletin of Monetary, Economics and Banking*, 251-150.

Swaningrum, A., & Hariwan, P. (2014). Evaluation of the Effectiveness of Macroprudential Instruments in Reducing Systemic Risk in Indonesia. *Bandung: Satya Wacana Christian University* .

Vinals, J. (2011). Macroprudential policy: an organizing framework. *IMF papers*.

Warjiyo, P. (2006). Banking system stability and monetary policy: linkages and developments in Indonesia. *Bulletin of Monetary Economics and Banking*, *8* (4), 429-454.

Warjiyo, P. (2014). *Monetary Policy Transmission Mechanism in Indonesia.* Jakarta: BI Institute

Wimboh. 2004. Effect of IIR, LDR, and CAR on NPL at PT. Bank Mandiri (Persero).Thesis

# APPENDIX

## The results of the estimation of the risk variable A (Z-Score)

Table of Risk A

| VARIABLES | (1) IR_FE | (2) GWM_FE | (3) LTV_FE | (4) IR*GWM_FE | (5) IR*LTV_FE |
|---|---|---|---|---|---|
| IR | -1,035* | | | 2.286 | -1.782 |
| | (0.531) | | | (5,467) | (2,380) |
| LIQ | 0.049 | 0.050 | 0.045 | 0.055 | 0.049 |
| | (0.035) | (0.032) | (0.034) | (0.034) | (0.035) |
| GDP | -7.081*** | -4.215** | -6.353** | -6,105** | -7.189*** |
| | (2,504) | (1,905) | (2,460) | (2,402) | (2,462) |
| INF | -0.933*** | -0.230 | -1.276*** | -0.069 | -0.923*** |
| | (0.235) | (0.158) | (0.314) | (0.162) | (0.253) |
| BANK SIZE | -2,620** | -4.153*** | -2,295* | -4,111*** | -2,604** |
| | (1,093) | (1.321) | (1,174) | (1.313) | (1,124) |
| GWM | | -2,806*** | | -0.248 | |
| | | (0.789) | | (4.352) | |
| LTV | | | -5,204 | | -4.955 |
| | | | (5,739) | | (12,503) |
| IR*GWM | | | | -0.462 | |
| | | | | (0.785) | |
| IR*LTV | | | | | 0.945 |
| | | | | | (3,036) |
| Constant | 123,996*** | 148,027*** | 115,331*** | 142,704*** | 128,101*** |
| | (30,710) | (33,342) | (30,707) | (46,735) | (29,491) |
| Observations | 960 | 960 | 960 | 960 | 960 |
| R-squared | 0.146 | 0.163 | 0.141 | 0.167 | 0.146 |
| R-squared | 0.146 | 0.163 | 0.141 | 0.167 | 0.146 |
| Number of BANK | 30 | 30 | 30 | 30 | 30 |
| Dummy Time | YES | YES | YES | YES | YES |

Description: * Significant at the 10 percent level of significance
** Significant at the 5 percent level of significance
*** Significant at the 1 percent level of significance
Number of observations = 960; with Prob > F = 0.00; and R-squared = 0.146.

**The result of estimation of variable risk B (total risky assets divided by total assets)**

Table of Risk B

| VARIABLES | (1) IR_FE | (2) GWM_FE | (3) LTV_FE | (4) IR*GWM_FE | (5) IR*LTV_FE |
|---|---|---|---|---|---|
| IR | 0.006 | | | -0.038 | 0.047 |
| | (0.006) | | | (0.073) | (0.064) |
| LIQ | 0.001*** | 0.001*** | 0.001** | 0.001*** | 0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| GDP | 0.014 | 0.013 | 0.023 | 0.036 | 0.026 |
| | (0.064) | (0.051) | (0.068) | (0.070) | (0.073) |
| INF | -0.007* | -0.002 | -0.001 | -0.004 | -0.001 |
| | (0.004) | (0.005) | (0.003) | (0.007) | (0.002) |
| BANK SIZE | -0.071*** | -0.078*** | -0.080*** | -0.079*** | -0.081*** |
| | (0.021) | (0.025) | (0.017) | (0.025) | (0.017) |
| GWM | | -0.012 | | -0.049 | |
| | | (0.018) | | (0.046) | |
| LTV | | | 0.176 | | 0.509 |
| | | | (0.125) | | (0.455) |
| IR*GWM | | | | 0.007 | |
| | | | | (0.011) | |
| IR*LTV | | | | | -0.063 |
| | | | | | (0.079) |
| Constant | 1,800*** | 2,028*** | 1,781*** | 2,140*** | 1,544* |
| | (0.633) | (0.733) | (0.614) | (0.635) | (0.839) |
| Observations | 960 | 960 | 960 | 960 | 960 |
| R-squared | 0.011 | 0.012 | 0.013 | 0.012 | 0.013 |
| R-squared | 0.011 | 0.012 | 0.013 | 0.012 | 0.013 |
| Number of BANK | 30 | 30 | 30 | 30 | 30 |
| Dummy Time | YES | YES | YES | YES | YES |

Description: * Significant at the 10 percent level of significance
** Significant at the 5 percent level of significance
*** Significant at the 1 percent level of significance

Number of observations = 960; with Prob > F = 0.00; and R-squared = 0.011.

**The result of the estimation of the variable risk C-proxy by the number of NPL by total assets.**

Table of Risk C

| VARIABLES | (1) FE | (2) FE | (3) FE | (4) FE | (5) FE |
|---|---|---|---|---|---|
| IR | -0.002** | | | -0.006 | -0.002 |
| | (0.001) | | | (0.005) | (0.005) |
| LIQ | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| GDP | -0.013** | -0.008** | -0.010** | -0.008** | -0.012* |
| | (0.006) | (0.003) | (0.005) | (0.004) | (0.006) |
| INF | -0.002 | -0.001*** | -0.002* | -0.001*** | -0.001** |
| | (0.001) | (0.000) | (0.001) | (0.000) | (0.001) |
| BANK SIZE | -0.010 | -0.013 | -0.011 | -0.013 | -0.011 |
| | (0.006) | (0.009) | (0.007) | (0.009) | (0.007) |
| GWM | | -0.005 | | -0.008* | |
| | | (0.004) | | (0.005) | |
| LTV | | | 0.007 | | 0.026* |
| | | | (0.012) | | (0.015) |
| IR*GWM | | | | 0.001 | |
| | | | | (0.001) | |
| IR*LTV | | | | | -0.001 |
| | | | | | (0.005) |
| Constant | 0.283* | 0.329 | 0.261* | 0.358* | 0.281 |
| | (0.150) | (0.201) | (0.141) | (0.200) | (0.167) |
| Observations | 960 | 960 | 960 | 960 | 960 |
| R-squared | 0.104 | 0.119 | 0.100 | 0.121 | 0.110 |
| R-squared | 0.104 | 0.119 | 0.100 | 0.121 | 0.110 |
| Number of BANK | 30 | 30 | 30 | 30 | 30 |
| Dummy Time | YES | YES | YES | YES | YES |

Description: * Significant at the 10 percent level of significance
** Significant at the 5 percent level of significance
*** Significant at the 1 percent level of significance
Number of observations = 960; with Prob > F = 0.00; and R-squared = 0.104.

**Robustness check; Sub-sample analysis**

Table of differences in the impact of sis and non-systemic banks in the risk-taking channel of monetary policy

| | SYSTEMIC (High Cap) | | | NON-SYSTEMIC (Low-Cap) | | |
|---|---|---|---|---|---|---|
| **VARIABLES** | **RISK A** | **RISK B** | **RISK C** | **RISK A** | **RISK B** | **RISK C** |
| IR | -0.012* | 0.009 | -0.001 | -0.010 | -0.001 | -0.001* |
| | (0.006) | (0.006) | (0.007) | (0.007) | (0.007) | (0.001) |
| LIQ | 0.001 | 0.001* | 0.001*** | 0.000 | 0.001*** | 0.000 |
| | (0.001) | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) |
| GDP | -0.060** | -0.008 | -0.075*** | -0.037 | -0.075*** | -0.008 |
| | (0.021) | (0.033) | (0.024) | (0.025) | (0.024) | (0.005) |
| INF | -0.011*** | -0.003 | -0.008 | -0.007* | -0.008 | -0.001 |
| | (0.003) | (0.003) | (0.007) | (0.004) | (0.007) | (0.001) |
| BANK SIZE | -0.003 | -0.036 | -0.093*** | -0.024* | -0.093*** | -0.005 |
| | (0.020) | (0.035) | (0.014) | (0.013) | (0.014) | (0.003) |
| GWM | -0.037*** | -0.014 | -0.036 | -0.022 | -0.036 | -0.002 |
| | (0.012) | (0.012) | (0.026) | (0.013) | (0.026) | (0.003) |
| LTV | -0.000 | 0.123 | 0.073 | -0.113 | 0.073 | -0.000 |
| | (0.050) | (0.078) | (0.169) | (0.071) | (0.169) | (0.010) |
| IR*GWM | -0.007 | -0.002 | 0.001 | -0.011 | 0.001 | 0.028 |
| | (0.006) | (0.007) | (0.014) | (0.012) | (0.014) | (0.026) |
| IR*LTV | 0.049 | -0.006 | 0.002 | 0.022 | 0.002 | -0.004 |
| | (0.040) | (0.031) | (0.090) | (0.045) | (0.090) | (0.005) |
| Constant | 1,924*** | 1.356 | 2,534*** | 1978*** | 2,534*** | 0.156* |
| | (0.466) | (0.812) | (0.316) | (0.271) | (0.316) | (0.087) |
| Observations | 480 | 480 | 480 | 480 | 480 | 480 |
| R-squared | 0.311 | 0.075 | 0.094 | 0.065 | 0.094 | 0.104 |
| R-squared | 0.311 | 0.075 | 0.094 | 0.065 | 0.094 | 0.104 |
| Number of BANK | 15 | 15 | 15 | 15 | 15 | 15 |
| Dummy Time | YES | YES | YES | YES | YES | YES |

Description: * Significant at the 10 percent level of significance
** Significant at the 5 percent level of significance
*** Significant at the 1 percent level of significance

Number of observations = 480; with Prob > F = 0.00; and R-squared = 0.311.