

An Empirical Assessment of the Effects of Capital Requirements on Banks' Loan Portfolios and Monetary Policy in Indonesia*

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This paper attempts to provide evidence of the impact of bank capital requirements on banks' loan and on monetary policy in Indonesia, in particular to investigate whether the regulation of capital requirements constrains the effectiveness of monetary policy. Using the Thakor's (1996) model, this study identifies the enforcement of capital requirements lowers supply of bank loans and undermines the effectiveness of a loose monetary policy to support the availability of bank loans in Indonesia

Furthermore, this study employs an impulse response analysis from vector auto regression (VAR) model as suggested by Bernanke and Blinder (1992) and finds out the role of capital requirements in explaining the transmission of monetary policy through bank lending channel. It is found that the presence of a CAR leads to a lower response of bank loans to the shock of the monetary policy, which means reducing the impact of monetary policy transmission.

I. Introduction

Since 1988, many countries' central banks have imposed capital requirements upon the banks' asset base by adding a traditional leverage requirement to the banks' "risk based" requirement so that bank capital would be determined by "risk weighted" measures of total assets (Vanhoose, 2007). With the implementation of the new capital framework or Basel II Accord, more risk-sensitive capital adequacy ratios (henceforth: CARs) have been introduced by central banks to hinder the severe market distortion and the arbitrage behavior of banks. Capital requirements are believed to play an im-

portant role in maintaining bank soundness, rational risk taking behavior, and bank competitiveness (Zhu, 2007). In addition to its advantages, the presence of capital requirements also has raised concerns about the nexus of monetary policy and bank regulation. Though it is potentially important for financial stability, the imposition of a capital requirement can cause monetary policies and prudential policies to have different purposes, and it has the potential to amplify business cycles. (Cecchetti and Li, 2008).

While monetary authorities aim to ensure that there is sufficient lending available to encourage or maintain high and stable economic growth, financial

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system regulators have always worked to minimize the risks that cause a reduction in loan capabilities. During a recession, when the bank's capital tends to deteriorate, banking authorities will insist that banks have sufficient capital and that they reduce lending limits in order to minimize the decline asset value. When this occurs, an expansionary monetary policy geared to stimulate real economy growth through reduced interest rates may become less effective. Higher capital requirements could make banks safer, but at the same time, they could also increase the bank's cost to make the loan and could reduce expected profits, which in turn will constrain the number of loans a bank makes. This situation has been observed in the Indonesian economy, where the potential negative impacts of capital requirements on bank loan growth appears relevant-especially after the 1997 Asian financial crisis, which has likely continued to the present day.

After the 2008 global financial crisis, banks, the main source of financing in the Indonesian economy, still are not considered to be the optimal institutions to perform intermediary functions to the real sector. Banks are behaving carefully when setting the credit growth target, and they still tend to prefer short-term placements or liquidity in the form of Government Bonds (henceforth: SUNs) and Bank Indonesia Certificates (known in Indonesia as Sertifikat Bank Indonesia,

henceforth: SBIs). In addition, banks tend to manage and maintain high Capital Adequacy Ratios that are far above the regulatory capital requirement of 8%. This situation has been the norm in Indonesia since the 1997 currency crisis, where the average capital adequacy ratio of banks has been maintained at 17% in 2009.

During the 1997 currency crisis, Indonesian banks attempted to satisfy banking regulations by having a minimum CARs of 8%, and 5% of the total non-performing loans (henceforth: NPLs) are considered to be one of the reasons for the banks' reluctance to provide loans (Juda et al., 2001). Yudistira (2003) also finds evidence that regulatory capital requirements in the form of capital adequacy ratios affected the change in the Indonesian banks' decisions of whether to provide loans and that the amount of bank loans are determined by bank capital. In a crisis situation where the risk is very high, it can be understood that the imposition of capital requirements to protect and maintain the stability of the banking sector may cause banks to be less willing to provide loans. However, in recent situations in which the risk should have been declining, the question is raised of whether the capital requirement is still one of the causes of less lending and whether it can be used as an excuse for why banks do not lend at the optimal level.

This paper attempts to provide evidence of the impact of bank capital requirements on banks' loans and on monetary policy in Indonesia, in particular to investigate whether the regulation of capital requirements constrains the effectiveness of monetary policy. We work with an impulse response analysis from a vector auto regression (henceforth: VAR) model, as suggested by Bernanke and Blinder (1992). The VAR methodology provides a flexible technique for examining the interactions between monetary policy and bank loan in the presence of capital requirements. This study's findings supplement existing literature by providing empirical data to show how capital requirements affect monetary policy transmission in Indonesia.

The remaining sections of the paper are organized as follows: Section 2 provides a literature reviews on capital requirements, bank loans, and monetary policy. Section 3 discusses some important findings on capital requirements, banks' loan and monetary policy in Indonesia. Section 4 presents the empirical results of VAR's analysis. Finally, a conclusion and a future study recommendation are presented in Section 5.

II. Literature Review

The existing literature suggests several ways in which capital regulations may alter bank loan behavior and the efficacy

of monetary policy-often with conflicting results and little consensus. In general, the discussion in the literature can be divided into two groups¹⁾. The first group, beginning with Basel I in the 1980s and continuing to Basel III, argues that capital requirements are important in order to strengthen bank capital, improve the efficiency and competitiveness of banking, and promote financial stability against systemic crises²⁾. This argument is further supported because a financial crisis recently occurred, and capital requirements can be justified as a key mechanism for limiting significant risk taking by banks on the upside of the business cycle while also serving as a buffer for banks to continue lending on the downside of the business cycle (Peydro, 2010). As a result of the implementation of Basel, banks tends to hold capital ratio above the minimum required as an insurance against violating the minimum requirement, to protect against insolvency, and as an instrument to signal soundness to the market in order to reduces difficulty in raising new capital when capital ratio falls. (Linguist, 2004; Stolz & Wedow, 2005; Jokipii & Milne, 2008; Fonseca & Gonzalez, 2009; Stolz & Wedow, 2011; Tabak et al., 2011)

The second group argues that higher capital causes bank profits to decrease, increase credit rationing situation and leads to less lending, particularly to small- and medium-sized firms. Thakor

(1996) states that an increase in risk-based capital requirements lead to a higher probability of credit rationing and reduce aggregate lending. In the presence of risk-based capital, the loose monetary policy may lower supply of bank loan. In addition, Besanko and Kanatas (1996) also find that regulatory capital requirements may not have positive effect in promoting bank safety in an imperfect information environment. An increase in capital requirements reduces the franchise value of the bank and that lead to more risk taking behavior. (Rochet, 1992; Hellmann, Murdoch and Stiglitz, 2000). Eichberger and Summer (2004) states that the effects of capital requirements on financial stability are ambiguous.

There has been no clear answer provided in the literature that states how much capital is required to maintain financial system stability or to avoid financial crises. Arguments for capital requirements are generally based on risk behavior and on macroeconomic implications finding a predominantly negative impact of bank capital shock on bank loan availability and on bank lending channels of monetary policy³⁾. Higher capital requirements will lead to increased liquidity, more long-term bond holding, fewer bank loans, a credit crunch, and a reduction in economic output. (Blum and Hellwig, 1995; Diamond and Rajan, 2000; Furfine, 2001; Stiglitz and Greenwald, 2003).

From the literature survey conducted by Bario and Zhu (2008), we find that despite the voluminous studies regarding the impact and role of capital requirements on a bank's lending and monetary policies, there are many empirical studies that reflect the existing debate, but not for the case of emerging countries like Indonesia⁴⁾. To the best of our knowledge, there is rare of empirical study that focused on an analysis of the impact of bank capital requirement in Indonesia. Yudistira's (2003) study finds that regulatory policy influences the behavior of Indonesian banks and that the banks choose to decrease their balance sheet activity during capital shocks. An empirical study by Agung et al. (2001) addresses the existence of a credit crunch in Indonesia and finds that the capital to asset ratio is a proxy for the capital adequacy requirement and that it has a significantly positive role in explaining and determining bank lending behavior. This study also suggests that the credit extended by banks with low capital tend to grow at a slower rate than banks with a higher capital ratio.

III. Findings on Capital Requirements, Banks' Loan and Monetary Policy in Indonesia

In this section, we provide some important findings from the implementation of capital requirements and its impact on

banks' loan and monetary policy in Indonesia. We refer to the Thakor's (1996) model that analyzes the effect of the capital requirement on banks' loan and monetary policy in reviewing the fact findings.⁵⁾

1. *The Implementation of Capital Requirements in Indonesia*

Bank Indonesia (henceforth: BI), as the regulator of banking sectors adopted the capital requirement regulation as imposed by the 1988 Basel Capital Accord, known as Basel I initially with aimed to overcome the impact of banking competition after financial deregulation in the 1990s. The regulation requires banks to holds a minimum amount of capital equal to 8% of a simple risk weighted assets based on credit risk, known as the capital adequacy ratio (henceforth: CAR). At that time, the rules of minimum capital requirements, however, tends to be disregarded due to competitive pressure in loan markets.

To address the insolvency problem in the banking system due to the 1997 currency crisis, BI adopted a regulatory forbearance of CAR from 8% to 4% and used this minimum CAR criteria of 4% as one of tools aimed at determining which banks were still viable and met the requirements for recapitalization program, and which banks were be closed down. In 2001, CAR is restored back to the level of 8% in line with the success of banking recapitalization program.

Following the 2004 revision of the framework of Basel Committee on Banking Supervision (henceforth: BCBS) for International Convergence of Capital Measurement and Capital Standards, an adjusted standard of capital requirements that more sensitive and in line with actual risk, known as Basel II has been conducted step by step by the start of simples approach till more complex approach⁶⁾. A comprehensive framework of Basel II in Indonesia is planned to be fully implemented by the end of 2012.

Furthermore, the recent updated version of capital accord called BASEL III will be implemented in Indonesia in January 2019 with the aimed to strengthen the standard of regulation for capital adequacy and liquidity as a mean to improve resilience of banking sector toward crisis. The scope of Basel III covers both macro and micro-prudential aspects. In the context of micro-prudential, Basel III requires a higher definition level and quality of capital with the main focus at common equity, and the importance of additional capital conservation buffer as high as 2,5% that must owned by each bank. In the context of macro-prudential aspects, Basel III requires systematically important banks or institution to have a countercyclical capital buffers up to another 2.5% in the boom period to anticipate the possibility of loss during bust period. In addition, a capital surcharge is also imposed for systematically

Table 1: Basel III's Calculation of Capital Requirements and Buffers

Capital Requirements and Buffers (in percentage)			
	Common Equity	Tier 1 Capital	Total Capital
Minimum	4.5	6.0	8.0
Conservation Buffer	2.5		
Minimum plus Conservation Buffer	7.0	8.5	10.5
Countercyclical buffer	0 - 2.5		

Source : Bank Indonesia (2012), Consultative Paper

important banks or institutions. The capital reinforcement according to Basel III can be described in table 1.

The implementation of capital requirements in Indonesia has shown positive results as indicated in the high CAR has been maintained by all banks since 2003 (Indonesian Economic Report, 2003). Interestingly, the banks maintain its CAR at the level of the average 17% well above the minimum requirement, which means that there has been a bank's capital buffer of 9%.

A high CAR condition is regarded as one of the factors that have increased the resilience of the Indonesian banking sector, which is then able to eliminate the negative impact of the 2008 global financial crisis. Therefore, BI becomes more confident to consistently continue the implementation of Basel II and gradually towards the Basel III

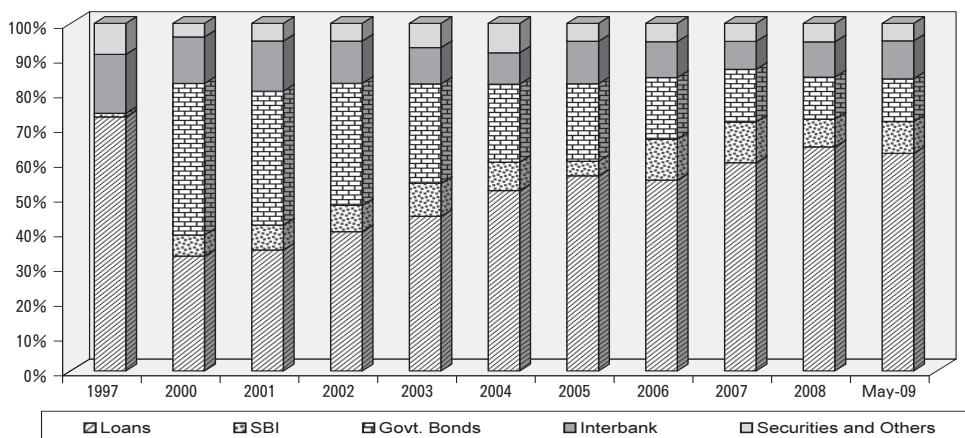
Although the implementation of capital requirement in Indonesia has been considered to improve the resilience of the banking system in Indonesia, the discussion about the possible impact on the

behavior of banks in providing loans and the effectiveness of monetary policy, in particular issues relating to the continued implementation of the Basel III remains a debatable issue among market participants and the authorities. In the next section, this paper provides an evaluation of how the portfolio investment behavior of the banking system in Indonesia after the crisis and try to link it with the implementation of minimum capital requirements.

2. Analysis on the Impact of Capital Requirements on Bank Loans in Indonesia

Prior to the 1997 currency crisis, approximately 70% of bank portfolios were comprised of loans, and less than 10% were liquid assets (with SBIs comprising 1% and other securities comprising 9%), as seen in figure 1⁷⁾. In the aftermath of the 1997 crisis, the recapitalization program has changed banks' balance sheets. Government bonds and central bank securities dominated bank balance sheets. Although the amount of credit continues to increase, the amount of government

Figure 1: Bank Balance Sheet Composition



bonds and central bank securities still comprise a large percentage of bank portfolios, amounting to Rp 263,13 trillion for government bonds and Rp 195,40 trillion for SBIs at the end of May 2009.

In the normal conditions, banks in Indonesia will place their funds in government securities or SBIs as long as the returns are greater than or equal to the cost of the funds. However, if funds are not readily available for banks in the money market at the government securities rate during crisis or high-risk situations, then banks may also need to keep a certain amount of government securities and SBIs to maintain liquidity. During the crisis period and afterwards, the cost of the fund and bankruptcy costs have also determined banks' investment decisions. As long as the perception of bankruptcy costs remained high, banks put or maintained their funds in government securities and SBIs in large amounts, which caused a decrease in

lending.

Changes in banks' balance sheets, particularly the decline in bank lending and an increase in the number of securities held by the bank can be attributed to the presence of capital requirements as explained in Thakor's (1996) model. In his model, Thakor (1996) explains that the existence of a risk-based capital requirement against bank loans will increase the bank's loan funding cost. If bank can invest in government securities or any asset that does not carry a capital requirement, the presence of a capital requirement leads bank to shift its investment from loan to securities. In addition, the proposition 6 of Thakor's (1996) model states that a small increase in the risk-based capital requirement will increase the probability that any borrower will be rationed by all banks, and hence stochastically lower aggregate bank lending. Using arguments of Thakor's (1996), we can suspect that the enforcement of

capital requirements during the period of crisis and afterwards in Indonesia has a negative impact on bank loans and limiting the growth of loans.

3. Analysis on the Impact of Capital Requirements on Monetary Policy in Indonesia

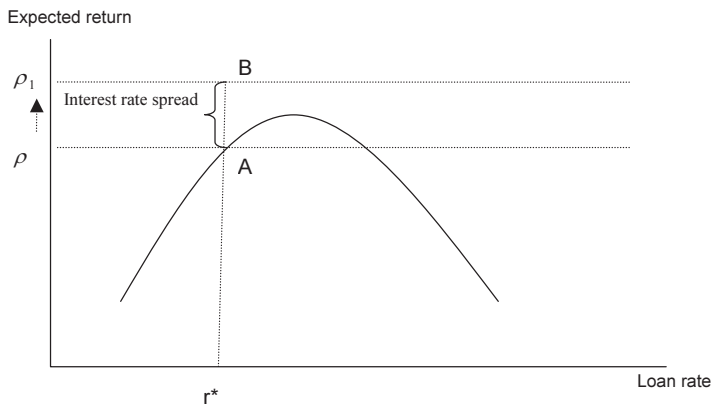
When the Indonesian economy was in a recession due to the 1997 financial crisis, the risk of bankruptcy for the both borrowing firms and the banks increased. Many firms went into distress mainly because banks were more risk averse. At this time, a high interest rate could have worsened the risk of default for the existing loans, which in turn could have reduced the ability and willingness of banks to provide loans due to a feared increase in the number of non-performing loans.

The effects of a tight monetary policy on bank loans can be explained in two ways: income effects and substitution effects. Because banks in Indonesia hold SBIs, government bonds and some liquid

assets, a tight monetary policy with increased interest rates for SBIs may result in positive net worth for banks. However, in a period of crisis, income from SBIs cannot increase in net worth due to an increase in the non-performing loan problem. Stiglitz Greenwald (2003) states that low net worth leads to an increase in bankruptcy costs that in turn could lead to less lending. In addition, a higher return on SBIs discouraged the banks' willingness to provide loans and led to a higher negative substitution effect in the availability of loans.

The impact of the tight monetary policy on bank loans also affects interest rates. Following the standard monetary approach, a tight monetary policy increased the bank costs for funds, which led to an increase in the loan rate. During the crisis period, banks in Indonesia could not increase their loan rates because doing so would have led to increased defaults by their borrowers. A liquidity constraint, however, should

Figure 2: The Impact of Monetary Policy on Loan Interest Rates Due to Higher Costs of Fund



cause banks to increase their deposit rates in order to attract additional deposits. If deposit rates are considered to equal the cost of funds, then there would be a spread in the negative interest rate.

Figure 2 illustrates that an increase in the cost of funds was not followed by an increase in the loan rate, which caused a negative interest rate to spread. This spread is described as the difference between point B and point A. This explanation is consistent with the observation in figure 3 that the loan interest rate is lower than the deposit rate during the crisis period in Indonesia.

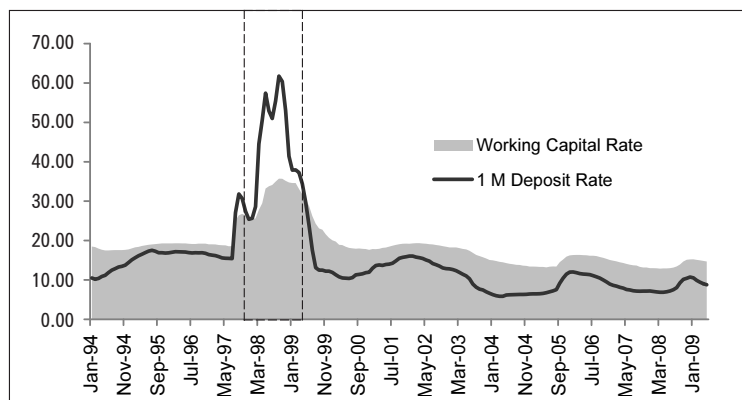
An increase in the cost of funds that resulted in a negative spread may have caused loans to no longer be profitable. However, banks still may have continued to lend for cost adjustment reasons. Note that a loan is a long-term relationship and that banks cannot recall existing loans immediately. However, an increase in fund costs can be viewed as a temporary shock that increases the loan rate

and may not be the best choice for banks to maintain profitability because it could affect a borrower's ability to repay the loan and therefore affect bank net worth due to a decrease in the loan values.

Unlike at the start of the crisis when there was a loose monetary policy to support the availability loans, the lowered interest rates did not immediately help restructured firms receive new loans or restore the banks' willingness to provide additional loans because the banks still considered the risk of bankruptcy to be high. Banks still could not predict the bankruptcy risk and are reluctant to bear the risk; therefore, the unwillingness of banks to supply loans remains. A loose monetary policy after the crisis ended did not significantly increase the loan supply.

Thakor (1996) observed the same situation in U. S. banking history in 1991, and provides an explanation for why a loose monetary policy to encourage bank lending were ineffective in US during

Figure 3: Loan and Deposit Rates



1989-93, and why U.S. banks prefer to increase security holdings than lending. Using his model, Thakor's (1996) explains two possible effects of the expanded monetary policy on bank lending with the presence of capital requirements. First, the expanded monetary policy lowers short-term interest rate by more than long-term rates. In this case, return on securities (r_M) that defines as long-term rates can be increased relative to cost of deposits (r) that defines as short-term rates. As r is lowered, net benefit of investing in securities (α) that defines as $r_M - r > 0$ increases that leads bank to invest more in securities. Assuming the cost of capital (r_E) more expensive than r , r_E is most likely not to be affected so much or if it declines will be less than in r . Therefore, a lowering r as a result of a loose monetary policy will increase α , without reducing much in cost of funding a loan (r_L) that defines as the weighted average of r and r_E . This reduces bank's expected return of lending that encourages banks to ration loan with higher probability, and leads to less supply of bank loans as banks shift from lending to security holdings.

The second effect is that long-term rates are lowered more than short-term rates. In this case, a loose monetary policy will reduce α , extending loans is more preferable relative to securities. The probability of credit rationing decreases and supply of bank loans increases.

The first effect of Thakor's (1996) model provides a basis for explaining the ineffectiveness of monetary policy loose in Indonesia after the crisis in supporting economic recovery. Despite the loose monetary policy in Indonesia lead to lower cost of deposit, but not so with capital. Therefore, the cost of funding a loan is reducing at a rate slower than the cost of deposits. In the existence of assets that free from capital requirements such as government and central bank securities, the bank's expected return from "capital requirement free assets" will rise relative to the net return from investing in loans. With an increase in risk-based capital requirement, the cost of funding a loan (r_L) increase further and reduce the expected return of extending loan that lead to an increase in the probability of credit rationing. This leads banks to shift more from loan to securities, and still keep a larger amount of government and central bank securities holdings that do not carry a capital requirement implication.

IV. Empirical Analysis

Considering the analysis of Thakor's (1996) model that states the existence of capital requirements increases the bank's cost of funding a loan that may lead to a higher credit rationing and less lending, we investigate the role of capital requirements in bank lending channel. For

this purpose, we perform an impulse response analysis from a vector auto regression (VAR) model, as suggested by Bernanke and Blinder (1992), to examine the bank lending channel model by including capital adequacy requirements as one endogenous variable.

1. Model specification

We employ monthly data for the sample period from January 2001 to May 2009. Considering the enforcement of the implementation CAR of 8% is restored again in 2001, we use the year 2001 as the beginning of the sample period. Due to the availability of bank balance sheet data we can get, this study covers the sample period only until the end of May 2009. A general formulation of the VARs model can be written as follows:

$$\begin{bmatrix} Y_t \\ M_t \end{bmatrix} = \mathbf{C(L)} \begin{bmatrix} Y_{t-1} \\ M_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{Yt} \\ \varepsilon_{Mt} \end{bmatrix} \dots\dots(1)$$

where Y is the vector of non-policy variables, M is the vector of monetary policy variables, $C(L)$ is the lag operator, and $(\varepsilon_{Yt}, \varepsilon_{Mt})$ is the vector of structural disturbances of non-policy and policy variables. Following the previous study by Agung et al. (2001), we consider the SBI rate as a proxy of monetary policy variables to test the monetary policy channel through bank loans.

Referring to Gertler and Gilchrist (1993), Kashyap and Stein (1995), and Bernanke and Blinder (1988), we include three main bank balance sheet components and CAR variables to specify the VAR in the following order: SBI rate, bank deposits, bank securities, capital adequacy ratio, bank loans, output and

Table 2: List and Definition of Variables in the VAR Model

Variable	Definition	Source
SBI Rates	1-month SBI rates	Bank Indonesia
Deposit	Total Deposits, consist of demand deposits, savings deposits and time deposits both in Rupiah and foreign currency	Monthly Commercial Bank Report, Bank Indonesia
Securities	Total securities hold by the commercial banks, excluded non-tradable government bond	Monthly Commercial Bank Report, Bank Indonesia
Capital Adequacy Ratio	Capital Adequacy Ratio	Monthly Commercial Bank Report, Bank Indonesia
Loans	Total loans extended by commercial banks both in Rupiah and foreign currency	Monthly Commercial Bank Report, Bank Indonesia
Output	Monthly data of the real GDP is interpolated from quarterly real GDP published in Indonesian Financial Statistics, Bank Indonesia. The interpolation was performed by the quadratic match-sum method	Indonesian Central Bureau of Statistics
Inflation	Consumer Price Index (2007=100)	Indonesian Financial Statistics, Bank Indonesia

prices (see table 2 for the definition of variables). All variables are regarded as endogenous and in nominal form except for the SBI rate and the capital adequacy ratio, which is in the form of a nominal percentage.

According to the bank lending channel theory, banks participate in monetary policy as a result of both their liabilities and their assets. In a monetary contraction, bank reserves and bank deposits decrease. If the decrease in deposits is not offset by other funds such as a decrease in securities, a decrease in bank loans will result.

The focus of our VAR analysis is the long-term dynamic relationships among the variables in which we adopt only the impulse response analysis and not the parameter estimates. To identify the shock effect of monetary policy on the non-policy variables, we employ the Cholesky decomposition and assume that the residuals form a recursive system. Hence, the ordering of the variables in the system affects the recursive chain of causality among the shocks of the vari-

ables. In fact, because the correlation among residuals (ϵ_t) very small, the ordering is insignificant.

2. The Unit Root and VAR Stability Test

Following standard procedure in analyzing time series models, it is recommended that we test whether these models exhibit a unit root problem before we analyze the VAR. Using the Augmented Dickey Fuller (ADF) test and considering the optimal lag based on the Schwarz Information Criteria (SIC), we find that all of the variables are stationary at order one I(1) with a 1% significance level (see table 3).

We estimate the first differentiated VAR system rather than the VECM that does not pass the stability test. Testing the optimum VAR lag order shows mixed results. For example, the Schwartz Information Criteria suggest that the optimal lag is 0, while the Akaike Information Criteria and the Hannan Quinn Information Criteria generate an optimal lag of 7 and 1, respectively.

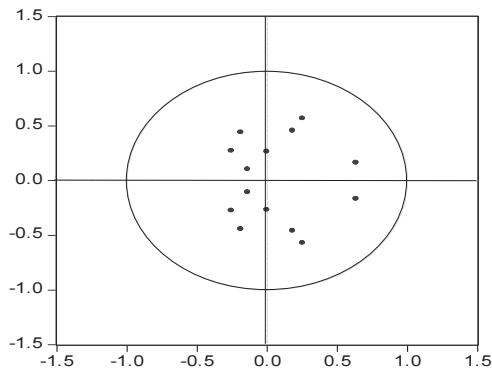
Considering the availability of data

Table 3: Results of the Unit Root Test

Variable	Level		First Diff.	
	ADF Test	P-value	ADF Test	P-value
SBI Rates	-2.591	0.098	-4.285	0.000
Output	-3.410	0.056	-6.409	0.000
Price	-0.878	0.333	-8.315	0.000
Deposit	-1.397	0.856	-10.219	0.000
Securities	-2.260	0.187	-9.985	0.000
Loans	-3.186	0.093	-11.205	0.000
Capital Adequacy Ratio	-2.591	0.098	-12.646	0.000

Notes: optimal lag is based on SIC. Trend and intercept of data are considered in P-value calculation

Figure 4: Inverse roots of AR characteristic polynomial

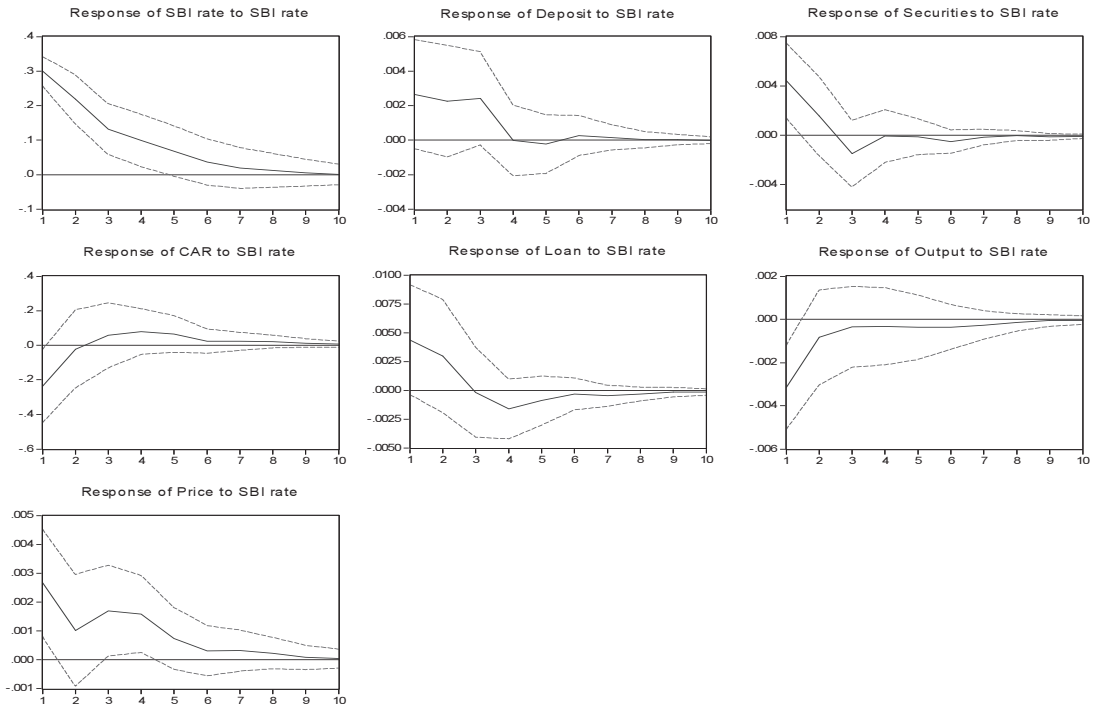


series, this study chooses a lag order of 2 as optimal in order to obtain a better dynamic movement of the variables. In addition, we find that the estimated VAR with a lag order of 2 is stable (stationary) for all roots smaller than 1 and that it is on the unit circle (figure 4).

3. The Impulse Response

Figure 5 reports the impulse responses of variables in the VAR to a monetary shock measured by the SBI rates. Bank deposits show a positive response for the first months and a decrease due to monetary shock after three periods. The securities holdings of commercial banks immediately decreased after the first month and were negative in the second period. Interestingly, bank loans displayed the same pattern with bank securities that decreased immediately after the first period and were followed by a negative response after the third period. This behavior can be interpreted as an indication that banks use their securities hold-

Figure 5: The Effect of Monetary Shocks on Bank Loans



ings as a buffer to offset monetary policy shocks. In addition, outputs show a positive, negative and gradually decaying response, while prices have a positive response in the first month and decrease after three periods. The response of the above variables to the monetary policy shock indicates a finding consistent with the presence of bank lending channels. If we consider the confidence level, however, we do not find that all of the variables show a significant response-especially deposits and securities.

Because this study is only concerned with the dynamic response movement of the variables, we stick to the stability of the VAR system only and continue the analysis by looking at the role of the CAR in the system. The CAR shows a negative and gradually decaying response, which suggests a plausible response to monetary policy shock. A monetary policy shock that leads to an increase in loan interest rates may result in greater non-performing loans that in

turn will reduce bank net-worth and the CAR level of the bank.

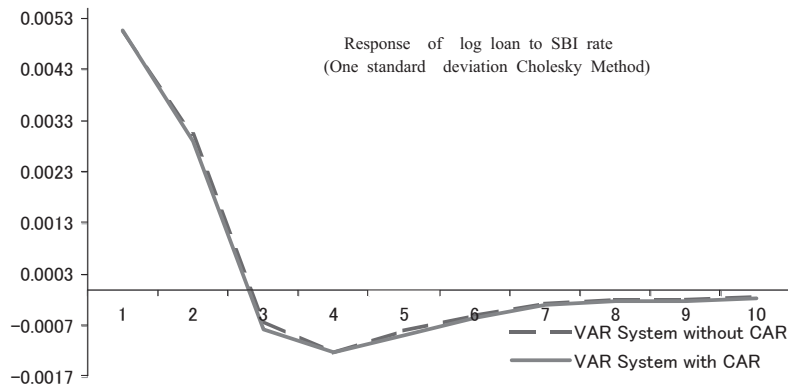
Based on the analysis of variance decomposition in table 4, bank loans are the most important bank portfolio variables in the equation system that explains the changes in the SBI rate. Meanwhile, the role of the CAR in explaining changes in the SBI rate is less important than securities but more important than deposits. Although the CAR is not the most important factor for changes in the SBI rate, the importance of the CAR in explaining the changes in the SBI rate has increased.

To investigate the role of the CAR in the bank lending channels, we re-estimate the first difference VAR system without incorporating the CAR variable with the same ordering, and we then compare the dynamic response of loan variables within the two systems. Figure 6 shows the response of bank loans to a one standard deviation shock of the monetary policy variable. Although the

Table 4: Variance Decomposition of the SBI Rate

Period	S.E.	SBI rate	Deposit	Securities	CAR	Loan	Output	Price
1	0.300	100.000	-	-	-	-	-	-
2	0.381	92.658	0.054	0.029	0.059	0.041	0.040	7.119
3	0.424	83.827	0.091	1.813	1.311	5.641	1.003	6.313
4	0.446	80.869	0.474	2.437	1.629	6.677	2.169	5.745
5	0.456	79.357	0.512	2.452	1.975	6.965	3.062	5.677
6	0.461	78.231	0.569	2.510	2.268	7.192	3.638	5.593
7	0.463	77.756	0.614	2.535	2.379	7.298	3.869	5.549
8	0.464	77.567	0.629	2.541	2.431	7.330	3.967	5.535
9	0.464	77.483	0.636	2.544	2.453	7.341	4.014	5.529
10	0.464	77.455	0.638	2.545	2.460	7.344	4.032	5.527

Figure 6: The Response of Bank Loans to Monetary Policy Shocks



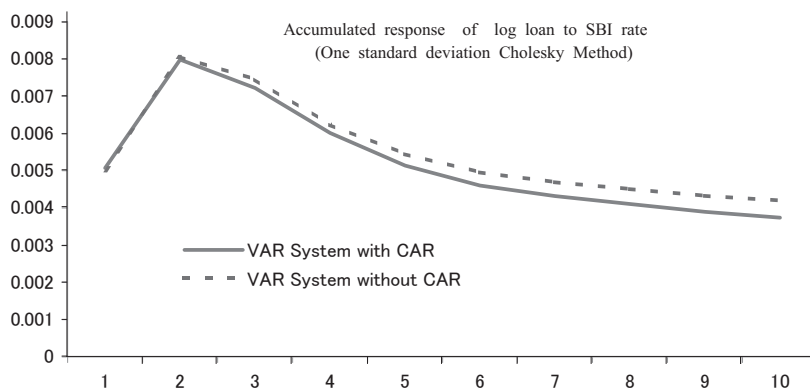
response pattern of bank loans is almost unchanged, we can see that there is a difference in the response.

From the accumulated response graph, we can see clearly that the response of bank loans in the VAR system with a CAR is lower than the VAR system without a CAR (figure 7). This finding indicates that the presence of a CAR leads to a lower response of bank loans to the shock of the monetary policy. The lower response of bank loans is in accord

with the fact that banks maintain their capital requirements ratio at a very high level of approximately 17%, which is far above the 8% required in the provisions. In this sense, we may suspect that banks remain very cautious in extending credit, as evidenced in the higher CAR ratio.

The weak result of bank lending channel with regard to the capital requirement seems to be consistent with the prediction by Thakor (1996). A loose monetary policy may not be effective

Figure 7: Accumulated Responses of Bank Loans to Monetary Policy Shocks



when it works through lowering short-term interest rate by more than long-term rates. In this situation the expected return from holding securities and the credit rationing probability due to a reduce in expected return from lending may increase that in turn encourages bank to shift and maintain its portfolio in the form of securities.

Thakor's (1996) adds that as the presence of a risk-based capital requirement increase the cost of lending (r_E), a reduce in bank expected return of lending is become more likely that result in a higher probability that the borrower will be rationed, which in turn constrains an expanded monetary policy and results in less supply of loans. This may explain why banks in Indonesia still tend to put their funds into safe portfolios such as government bonds and SBIs that do not carry capital requirements implication instead of providing loans.

V. Conclusion

This paper provides evidence of the impact of bank capital requirements on bank loan and on monetary policy in Indonesia. Referring the findings of bank's loan and monetary policy in Indonesia to the Thakor's (1996) model, we identify the enforcement of capital requirements lowers bank lending and hamper the effectiveness of a loose monetary policy to support the availability of

bank lending after the 1997 crisis.

Furthermore, using VAR analysis we find the impact of capital requirements on the transmission of monetary policy through bank lending channels in Indonesia. The CAR shows a negative and gradually decaying response. With the existing CAR, it is observed that there are fewer numbers of bank loans, indicating that bank lending responses to monetary policy shocks is decreasing—even though the CAR does not make much of a difference on the pattern of monetary transmissions. These findings support the theoretical predictions of Thakor's (1996) model that states in the presence of capital requirements, a loose monetary policy that works through lowering short-term interest rate by more than long-term rates could encourage bank to shift its investment from lending to securities, so that the aggregate supply of loans decrease.

Finally, this paper contributes an additional empirical finding to the long debate on the role of the Capital Adequacy Ratio. Considering that the data in this study are aggregated, further studies, particularly those that analyze individual data banks, may provide better evidence and a more detailed perspective.

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Notes

- 1) For further discussion, see Dewatripont and Tirole (1994), Freixas and Rochet (1997), and Bario and Zhu (2008).
- 2) For the new bank rules, see http://www.bis.org/list/press_releases/index.htm.
- 3) See Jackson et al. (1999), Bario and Zhu (2008) for comprehensive references.
- 4) Peydro (2010) also stated that the empirical literature on the effects that bank capital have on the credit supply is thin.
- 5) To avoid redundancy, we do not explain the models. See Thakor (1996) for his model in detailed.
- 6) For further explanation see <http://www.bi.go.id/web/en/Perbankan/Implementasi+Basel+II>.
- 7) Before the Asian financial crisis in 1997,

Indonesia did not have any government bonds, and the Central Bank of Indonesia used SBIs as monetary instruments to maintain liquidity in the money market. At that time, there were no incentives for banks to hold SBIs in any significant amount.

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