WORKING PAPER

EVALUATION OF BANK INDONESIA POLICY MIX TRANSMISSION

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The conclusions, opinions and views of the authors in this paper are those of the authors alone and do not constitute the official conclusions, opinions, and views of Bank Indonesia.
Evaluation of Bank Indonesia Policy Mix Transmission

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Abstract

This paper examines how the policies of Bank Indonesia are transmitted in the economy, especially towards the final targets for inflation and the stability of the financial system. In this study, the policies analysed include monetary and macro-prudential policy. Empirically, monetary policy is able to influence inflation and the stability of the financial system with a lag of 18 and 10 months respectively. The monetary policy transmission channels that are identified with the interest rate channel are the most dominant in transmitting monetary policy toward inflation, while the asset prices channel is the most dominant in transmitting the BI rate toward stability of the financial system. Macro-prudential policy, in general, can affect intermediate targets in accordance with the policy goals on a moderate scale albeit temporarily. However, macro-prudential policy tightening has not yet been effective in influencing final targets such as inflation and financial system stability. From estimates of the balance sheet channel it can be seen that monetary policy can also be effectively transmitted through company balance sheets. The balance sheet coefficient indicator is increasingly sensitive following tight monetary policy. This signifies the closer association between internal funding and investment in line with the greater difficulty of obtaining external funds. This was the case for smaller companies which typically face financial constraints. When monetary policy is loose, by contrast, the balance sheet coefficient is increasingly insensitive, meaning that the role of internal funding on investing is not as strong as it is under other conditions besides being an indication that it is easier to obtain external funding.

Key Words : Transmission Mechanism, SFAVAR, Panel Data
JEL Classification : C32, E52, E58

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I. PREFACE

1.1. Background

The structural changes which have taken place in the Indonesian economy over recent decades, such as the Global Financial Crisis in 2008 and factors related to rapid changes arising from globalisation, have implications for Bank Indonesia’s monetary policy. In its development, monetary policy has continuously evolved to meet the challenges faced. The GFC was a lesson for the central bank to better understand the relationships between the financial sector and monetary policy, especially given the importance of the role of the financial sector in creating macroeconomic stability.

The post-GFC challenges faced by the monetary authorities require them to be more flexible in responding to economic uncertainty and strengthening the framework of monetary policy and financial system stability. In part, this is achieved by using a more expansive policy mix and operational procedures (Juhrdo, 2014). Juhrdo and Goelntom (2012) explained that the Inflation Targeting Framework (ITF) that has already been implemented since 2005 needs to be developed by incorporating policy mix in order to minimize financial system risks.

Bank Indonesia already has a policy mix (of monetary policy and macro-prudential policy) which includes interest rate instruments of monetary policy, Statutory Reserves (GWM), Net Open Positions (NOP), Minimum-Holding-Periods (MHP), and the Loans-to-Value ratio (LTV). How the policy mix affects economic activity is a fundamental question that needs to be answered by Bank Indonesia. The formulation and implementation of policies is impossible without understanding the transmission or channels which transmit these policies to the economy. Besides the various transmission channels, the impact of policies on the economy also needs time which may be lengthy and varied. As such, understanding the transmission mechanism is key to formulating policies at the present time in influencing the economy in the future.

Research on the effectiveness of Bank Indonesia’s monetary policy transmission channels has been undertaken intensively since 2002, especially to examine the effectiveness of the monetary policy interest rate. Nonetheless, there have not yet been many studies which have measured the effectiveness of the policy mix. This is mainly because of differences in the monetary policy literature (which clearly explains the function of instruments, transmission and the effectiveness of measurement) and the lack of widely available literature on macro-prudential policy such that it is not yet well understood or mutually agreed upon.
The latest research on the effectiveness of macro-prudential policy, either individually or on Bank Indonesia’s policy mix, was carried out by Wimanda, et al. (2012). This study concludes that most macro-prudential policy is effective in overcoming existing problems. Using the DSGE simulation model, they show that monetary and macro-prudential policy that is conducted in an integrated manner is the best combination.

As such, this study will examine the effectiveness of the policy mix transmission mechanism in Indonesia which is not only limited to interest rate policy, but also extends to macro-prudential policy instruments. As far as we know, this research is the first study to empirically analyse the policy mix (monetary and macro-prudential) in a comprehensive manner. This study will use the SFAVAR methodology which can accommodate many variables. In this way, all transmission channels can be analysed simultaneously.

1.2. Research Goals

This study seeks to provide answers to the three following questions:

1. Does each instrument of monetary and macro-prudential policy (BI Rate, GWM Prime, GWM Secondary, GWM Foreign Exchange (Forex), GWM Loan to Deposit Ratio (LDR), NOP, MHP, and LTV) effectively influence the final targets (inflation and the Index of Financial System Stability-ISSS) and the intermediate targets (interest rates, exchange rate, credit, asset prices, economic growth, and expected inflation)?

2. Which channels are most dominant in affecting the final targets (inflation and ISSK)?

3. Is monetary policy effectively transmitted through company balance sheets? Is there a difference in the response from large companies and small companies at the time when monetary policy is tight/loose?

1.3. Study Limitations

There are some limitations in the scope of this study, including:

1. Monetary policy that was analysed only in terms of changes in the BI Rate. The macro-prudential policy instruments which can be analysed include GWM requirements, either GWM prime, secondary, foreign exchange, or GWM LDR, MHP requirements, NOP requirements, and LTV requirements. Meanwhile, exchange rate policy in the form of foreign exchange intervention is not analysed since the data is not available (confidential).
2. The transmission of monetary policy through the credit channel is only carried out for public companies with the latest data up to 2013. Meanwhile, the credit channel through banking is not done in this study.

1.4. Writing organization

This study will be divided into five chapters which start with Chapter 1 concerning the introduction and objectives, followed by Chapter 2 which contains literature studies and Chapter 3 which outlines the method and data which are used in writing this study. In Chapter 4 the empirical results and analysis will be presented, ending with the conclusions and recommendations in Chapter 5.
II. LITERATURE STUDIES

2.1. Previous Studies

Up to the present time, there have not been any studies devoted to measuring the effectiveness of the policy mix on the economy. The research previously done focuses more on examining the transmission of monetary policy. Warjiyo & Agung (2002) examined each transmission channel using the SVAR methodology and found that post-crisis in 1998 the channels which had an influential impact on the economy were interest rates, expectations, and bank lending. Revisiting the effectiveness of monetary policy was done by Dewati, Surjaningsih, and Chawwa (2009) for all channels except the exchange rate and balance sheet channels. This study found that the effective channel was interest rates, whereas the other channels were not significant. Revisiting the effectiveness of monetary policy post-GFC was undertaken by Harahap, et al. (2013) using the FAVAR methodology. Their finding was that the effective channel was interest rates, while the exchange rate channel and the credit channel were less responsive on an historical comparison. An evaluation of the macro-prudential policy already adopted in Indonesia was undertaken by Wimanda et al. (2012). This evaluation found that most macro-prudential policies were effective in overcoming the existing problems. Meanwhile, the simulation results of the DSGE model showed that conducting monetary policy and macro-prudential policies in an integrated way were the best combination.

At the level of policy framework, Agung (2010) stated that monetary policy played an active role in supporting stability of the financial system (SSK) through its influence on the behaviour of economic actors in risk taking and its effect on financial conditions. Monetary policy through balance sheets, bank lending, bank capital, and risk-taking channels justified the role of monetary policy as a response to potential instability caused by the financial sector. Macro-prudential policy designed to mitigate pro-cyclicality in the economy can support monetary policy in controlling fluctuations in output and inflation. As such, the Inflation Targeting Framework (ITF) already implemented by Bank Indonesia is still considered appropriate, although it needs to be adjusted to accommodate financial system stability.

A study of the balance sheet channel in Indonesia was carried out by Agung et al. (2002) on 219 non-financial companies listed on the Indonesian Stock Exchange in the period 1992-1999. This study found that balance sheet conditions influenced corporate investment decisions. When monetary policy is tight, the balance sheet channel is identified when the total debt variable and debt ratio are increasingly sensitive. Nonetheless, this study did not find clear evidence that small companies were more affected by monetary policy than large companies. The study on the
balance sheet channel carried out in the United States by Oliner and Rudebusch (1996) found that tight monetary policy was especially transmitted through small companies. In this study, the sample comprised 7,000 manufacturing companies from 1958 to 1992. Following implementation of monetary tightening, there was a closer relationship between internal funding and investment for companies which faced financial constraints, thereby highlighting the difficulties in obtaining external funds. Similar findings were obtained in studies in the UK conducted by Angelopoulou and Gibson (2007) and in Malaysia by Karim (2010).
III. METHODOLOGY AND DATA

3.1. Structural Factor-Augmented Vector Autoregression

The VAR model is often used in identifying and examining the impact of monetary policy on innovations on macroeconomic variables. The VAR approach has advantages regarding its ability to generate a credible empirical response from macroeconomic variables on monetary policy without having to apply excessive restrictions on the dynamic structure of the model (Soares, 2011). Nevertheless, VAR is a small-scale model with a limited information set. Bernanke et al. (2005) stated that, in general, the VAR model rarely uses more than 6 to 8 variables. Thus, the number of variables that can be included in the VAR model most likely do not represent an information set that is monitored by the central bank when formulating policies. Omitting a lot of relevant information in VAR analysis might lead to the problem of omitted variables and lead to biased VAR coefficient estimates. Besides that, a limited number of variables leads to the selection of variables representing economic concepts that seem "arbitrary".

Based on the problems mentioned above, Bernanke et al. (2005) proposed a Factor-Augmented VAR (FAVAR) methodology, namely VAR with factor analysis. Research on the dynamic factor model states that information from a large information series can be summarized by the estimated index or by a fewer number of factors. The argument of Bernanke et al. (2005) is that if the factor can effectively summarize the information from large data, then the natural solution from the problem of the degree of freedom in VAR analysis is to use factors in the VAR model. The number of variables which can be included in the FAVAR system is not restricted, such that the possibility for model misspecification to examine the impact of monetary policy is significantly reduced (Soares, 2011).

To form factors which have economic significance, in this study we will implement the Structural Factor-Augmented Vector Autoregression (SFAVAR) model which makes reference to the study by Belviso and Milani (2006). In SFAVAR, restrictions are imposed on the variables-forming factors; for example, the inflation factor is only formed from inflation variables. Because of that, the factors formed are expected to be more economically meaningful.

3.1.1. Principal Components

In simple terms, principal components analysis is a technique that aims to reduce the dimensions (number of variables) in the initial data set by retaining as much of its variance as possible. This Principal Components methodology makes reference to Stock and Watson (1998),
who developed a nonparametric approach to model dynamic factors based on static principal components.

3.1.2. SFAVAR Methodology

The FAVAR model has $X_t$ representing $N \times 1$ vectors from a time series of economic variables, $Y_t$ representing $M \times 1$ vectors from macroeconomic variables that are observable which are part of $X_t$, and $F_t$ representing $K \times 1$ vectors from unobserved factors which capture most of the information in $X_t$. According to Bernanke et al. (2005), the dynamic relationship $(F_t, Y_t)$ can be represented in the equation below:

$$
\begin{bmatrix}
F_t \\
Y_t
\end{bmatrix} = \Phi^*(L) \begin{bmatrix}
F_{t-1} \\
Y_{t-1}
\end{bmatrix} + v_t, \leftrightarrow \Phi(L) \begin{bmatrix}
F_t \\
Y_t
\end{bmatrix} = v_t
$$

(1)

with $\Phi(L) = I - \Phi^*(L)L = I - \Phi_1 L - \cdots - \Phi_d L^d$ being the polynomial lag from the finite order $d$ in the operator lag $L$, $\Phi_j (j = 1, \ldots, d)$ being the matrix coefficient, and $v_t$ being the error term with mean zero and covariant matrix $Q$. Equation (1) is defined by Bernanke et al. (2005) as the factor-augmented vector autoregression or FAVAR. Because the factor is unobserved, equation (1) cannot be estimated directly. Nonetheless, the factor along with the observable variables can be interpreted as common forces which encourage economic dynamics, such that the relationship between time series variable information $X_t$, observable variable $Y_t$ and factor $F_t$ can be summarized in a dynamic factor model as follows:

$$
X_t = \Lambda^f F_t + \Lambda^y Y_t + e_t
$$

(2)

$\Lambda^f$ is the matrix measuring $N \times K$ which are factor loadings, $\Lambda^y$ measuring $N \times M$, and $e_t$ is the matrix error term measuring $N \times 1$ weakly cross-sectionally and serially correlated with mean zero.

To overcome the weakness of common factors which have no economic interpretation, this research refers to Belviso and Milani (2006), who apply restrictions in the formation of factors, so that an economic interpretation can be obtained from common factors. The vectors $X^i_t, X^i_t, \ldots, X^i_t$ from $X_t$, with $X^i_t$ being the vector with $N^i \times 1$ dimensions, $I$ representing the number of different “economic concepts” that are in the data set and $\sum_{i=1}^I N^i = N$. It is assumed that each $X^i_t$ can be explained exclusively with one “economic concept”. At the same time, vector $F^i_t, F^i_t, \ldots, F^i_t$ from vector $F_t$, $F^i_t$ explains the dynamics of $X^i_t$ for all $i$. Thus, equation (1) and (2) can be stated as follows:
\[
\begin{bmatrix}
F_t^1 \\
F_t^2 \\
\vdots \\
F_t^i \\
Y_t
\end{bmatrix}
= \Phi(L)
\begin{bmatrix}
F_{t-1}^1 \\
F_{t-1}^2 \\
\vdots \\
F_{t-1}^i \\
Y_{t-1}
\end{bmatrix}
+ v_t
\]

\[
\begin{bmatrix}
X_t^1 \\
X_t^2 \\
\vdots \\
X_t^i
\end{bmatrix}
= \begin{bmatrix}
\Lambda_1^f & 0 & \cdots & 0 \\
0 & \Lambda_2^f & \cdots & 0 \\
0 & 0 & \ddots & \cdots \\
0 & 0 & \cdots & \Lambda_i^f
\end{bmatrix}
\begin{bmatrix}
F_t^1 \\
F_t^2 \\
\vdots \\
F_t^i
\end{bmatrix}
+ \epsilon_t
\]

\[E(\epsilon_t^1|\epsilon_t^1) = 0 \text{ for all } i, j = 1, \ldots, I \text{ and } i \neq j. \]

With the given restriction, if vector \(X_t\) is divided into subsets which have the same “economic concept”, then the common factors which move each subset have an economic interpretation. For example, the common factor which is constructed from variables such as the production index, sales index, and the unemployment rate can be interpreted as an “economic activity” factor. In this research, vector \(X_t\) is divided into eight factors which have “economic concepts” as follows: interest rates, credit, the exchange rate, real output, asset prices, expected inflation, inflation, and global economic conditions.

Following Bernanke et al. (2005), Harahap et al. (2013), and Fonseca and Pereira (2014), this research will use the two-step approach with PCA. Based on the two-step approach, the first phase which is carried out in making estimates is estimating the factor (\(F_t^1, F_t^2, \ldots, F_t^I\)). These factors are the principal component first obtained from each subset of variables. Once these factors are obtained, the second stage is to estimate these factors in the VAR system, as represented in the equation (3), to obtain \(\Phi(L)\).

To estimate the impact of the policy mix on the economy, SFAVAR estimates are conducted using two different channels. The impact on the final inflation target will be examined through the transmission of monetary policy, i.e. through the channels of interest rates, asset prices, the exchange rate, credit, and expected inflation. From now on, this channel is called the inflation channel. Nonetheless, the impact on the final target of financial system stability (SSK) is represented by the Financial System Stability Index (ISSK). Henceforth, this channel is called the SSK channel. It comprises the channels of interest rates, asset prices, the exchange rate and credit.

To view the dynamics of the policy mix, all monetary and macro-prudential policy instruments are included in the SFAVAR system. When examining the impact of interest rate policy shock, all macro-prudential policy instruments are grouped into a single factor. Meanwhile, when analysing the impact of one macro-prudential policy, for example GWM Prime, then interest rate
policy subsequently becomes one factor and all macro-prudential policies other than GWM Prime are another factor which are called other macro-prudential policies.

3.1.3. Macro-economy Data

The data used comprises a balanced panel of 155 macroeconomic variables with monthly frequency from January 2006 to March 2014. These variables represent the categories of interest rates, credit, the exchange rate, asset prices, real output, expected inflation, and inflation. Besides that, Financial System Stability Index data is also used. The policy mix instruments used comprise the BI Rate, GWM prime, GWM secondary, GWM foreign exchange, GWM LDR, NOP, MHP, and LTV. Data is transformed so that it is stationary. In general, all interest rate variables are stationary at level, while other variables are transformed to become “the first difference in log” if the variable is stationary in the first difference. To group other macro-prudential policies, averages from the macro-prudential policy mix are used with the data processed under the following framework:

\[
\text{Macro - prudential Policy}_t = \frac{1}{n} \sum_{i=1}^{n} P_{it}
\]

\(P_{it}\) is macro-prudential policy type \(i\) at time \(t\) which is normalized. The value of macro-prudential policy is the average from the policies of GWM Prime, GWM secondary, GWM foreign exchange, GWM LDR, NOP, MHP, and LTV.

3.1.4. Financial System Stability Index data

In this research, the Financial System Stability Index (ISSK) was also used as constructed by Gunadi, Taruna, and Harun (2013). The ISSK reflects conditions concerning the stability of Indonesia’s financial system, whereby a higher value of the ISSK indicates greater instability in Indonesia’s financial system. As shown in Figure 1, up to the end of the first half of 2014, the stability of Indonesia’s financial system was relatively good. This is reflected in the position of the ISSK at the end of the first half of 2014 when it stood at 0.84, or lower than its position at the end of the second half of 2013 of 1.10. The ISSK is formed from two indices, namely the Financial Markets Stability Index (ISPK) and the Financial Institutions Stability Index (ISIK), as can be seen in Figure 2.
Keterangan Warna:
Hijau: Normal; Kuning: Waspada; Orange: Siaga; Merah: Krisis

Source: Department of Macroprudential Policy (2014)
Figure 1. Financial System Stability Index

Figure 2. ISSK components
ISSK only represents conditions of banking stability. This is because the assets composition of financial institutions in Indonesia\(^2\) is still dominated by banks (78.6%). ISSK reflects three banking indicators, namely: pressure, intermediation, and efficiency. In determining the weights to construct the ISSK, the turning point analysis method is used.

### 3.2. Dynamic Panel Data

#### 3.2.1. The Panel Model Which is Used

To identify the balance sheet channel, the investment equation which will be estimated refers to the research of Agung et al. (2002), as follows:

\[
IK\_{i,t} = \beta_1 IK_{i,t-1} + \beta_2 SK_{i,t-1} + \beta_3 B_{i,t-1} + \alpha_i + \delta_t + \epsilon_{it} \tag{6}
\]

\[
IK\_{i,t} = \beta_1 IK_{i,t-1} + \beta_2 SK_{i,t-1} + \beta_3 B_{i,t-1} + \beta_4 (M_t x B_{i,t-1}) + \alpha_i + \delta_t + \epsilon_{it} \tag{7}
\]

Equation (6) estimates the role of the balance sheet factor (\(\beta_3\)) in explaining investment. Equation (7) explains whether corporate balance sheet sensitivity (\(\beta_4\)) increases when monetary policy is tightened. The coefficient \(\beta_3 + \beta_4\) depicts corporate balance sheet sensitivity when monetary policy is tightened or eased.

In the neoclassical model with perfect capital markets, the level of investment is determined by the discounted value of expected future returns on capital. Empirical studies show that the proxy from unobserved variables is sales growth - and with a small role from the cost of capital (Oliner and Rudebusch, 1996). To study the dynamics of investment, investment variables in the previous period are used. To represent corporate balance sheets, the variables used are cash flow, total debt, and short term debt.

Because one of the independent variables is the lagged value of the dependent variable, this indicates that there is a correlation between the regressor and the error term because the lag from investment depends on its error. To handle this problem of endogeneity, this study uses the GMM estimator of first difference that was developed by Arellano-Bond (1991) and which was first proposed by Holtz-Eakin, Newey and Rosen (1988).

---

\(^2\) Based on data up to June 2014.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Source</th>
<th>Description</th>
<th>Expected Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1K_{i,t}$</td>
<td>BEI</td>
<td>Ratio to capital stock where</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Investment ($I$) is proxied by the equation. $I_t = K_t - K_{t-1} + DEP_t$.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• $DEP_t$ is depreciation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Capital stock ($K$) is proxied by net fixed assets.</td>
<td></td>
</tr>
<tr>
<td>$SK_{i,t-1}$</td>
<td>BEI</td>
<td>Ratio of sales to capital stock</td>
<td>+</td>
</tr>
<tr>
<td>$B_{i,t-1}$ $(\beta_3$)</td>
<td>BEI</td>
<td>Corporate balance sheet position which can be measured where:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• $CK_{i,t}$ is the ratio of cash flow to capital stock where cash flow is proxied by profits after tax and depreciation (net income).</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• $DK_{i,t}$ is the ratio of total debt to capital stock where total debt is the amount of long term and short term securities and loans.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• $SD_{i,t}$ is the ratio of short term debt to total debt.</td>
<td>-</td>
</tr>
<tr>
<td>$\beta_4$ $(M_t \times B_{i,t-1})$</td>
<td>BI</td>
<td>Multiplication of tight/loose monetary policy and balance sheet variables. When monetary policy is tight, this coefficient is expected to be increasingly sensitive so that it has the same sign as the variable $\beta_3$. Meanwhile, the cash flow variable will be positive, and the total debt and short term debt ratio will be negative. When monetary policy is loose, this variable will be increasingly insensitive and have the opposite sign to variable $\beta_3$.</td>
<td></td>
</tr>
<tr>
<td>$M_t$</td>
<td>BI</td>
<td>The dummy variable when there is tightening or loosening of monetary policy.</td>
<td></td>
</tr>
</tbody>
</table>

$\alpha_i$ is the firm specific effect; $\delta_i$ is the time specific effect; $\varepsilon_{it}$ is the serially uncorrelated error term.
3.2.2. Panel Data

Dynamic panel data estimators for the balance sheet channel come from the annual reports of 207 non-finance companies which were listed on the Indonesia Stock Exchange in the period 2000–2013. The data used is unbalanced panel data for which companies have at least 3 straight years of data. Companies with growth in sales and net fixed assets of more than 10 times in consecutive years are considered as outliers. Based on this criteria, there are 185 companies included in the sample. To group companies according to their size, total assets are used. Companies with total assets exceeding the median value are called large companies, while the others are called small companies.

3.2.3. Monetary Policy Stance Data

The measurement of monetary policy stance is done by measuring the difference between the actual real interest rate and the natural rate of interest (NRI). Calculating the NRI is done by using the Kalman Filter method in the small macroeconomic model which updates the research of Wimanda, Wibowo, and Idham (2011). There are two models which are used in this measurement, namely the output gap that is not estimated (KF1) and the output gap that is estimated (KF2).

The determination of a period of tight, loose or normal monetary policy stance is based on the size of the gap between the real interest rate (actual) and the real interest rate estimated by the KF1 and KF2 models. While the gap is still in the neutral band (± 0.23%), then the policy is categorised as neutral. If the gap is bigger than ±0.23%, then the policy is categorised as tight, and if the gap is smaller than -0.23%, it is categorised as loose.

![Figure 3. Monetary Policy Stance](image-url)
IV. RESULTS AND ANALYSIS

4.1. Policy Mix Transmission

In this Chapter, we will elaborate on the analysis of the empirical results, namely the Impulse Response, which is produced by the SFAVAR model as described in Chapter 3.

4.1.1. Impact of Interest Rates Policy Shock

The impact of interest rates will be analysed on all intermediate targets and the final targets (namely inflation and ISSK). The output and inflation targets will be analysed through all monetary policy transmission channels (the inflation channel), while the ISSK variable will be analysed through the SSK channel.

4.1.1.1. Impact of Interest Rates Policy Shock on Inflation

To see the impact of tightening in monetary policy on the economy, an analysis was done of the positive impact of one standard deviation BI Rate shock. Identification of the shock was done by assuming macro-prudential policy variables (MP) as variables that are most exogenous and followed by the variables of monetary policy, interest rates, credit growth, the exchange rate, asset prices, real activity, expected inflation, and inflation with the details as follows:

\[
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & a_4 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
a_1 & 0 & a_8 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
a_2 & a_5 & a_9 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\
a_3 & 0 & a_{10} & 0 & a_{11} & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & a_{12} & 0 & 1 & 0 & 0 & 0 \\
0 & a_6 & 0 & 0 & a_{13} & 0 & 0 & 1 & 0 & 0 \\
0 & a_7 & 0 & 0 & a_{14} & 0 & a_{15} & a_{16} & 1 & 1
\end{bmatrix}
\begin{bmatrix}
\epsilon_{MP} \\
\epsilon_{BI Rate} \\
\epsilon_{Interest Rate} \\
\epsilon_{Credit} \\
\epsilon_{NER} \\
\epsilon_{Asset Price} \\
\epsilon_{Real Activity} \\
\epsilon_{Expectation} \\
\epsilon_{Inflation}
\end{bmatrix}
= 
\begin{bmatrix}
b_1 \\
b_2 \\
b_3 \\
b_4 \\
b_5 \\
b_6 \\
b_7 \\
b_8 \\
b_9
\end{bmatrix}
\begin{bmatrix}
\epsilon_{MP} \\
\epsilon_{BI Rate} \\
\epsilon_{Interest Rate} \\
\epsilon_{Credit} \\
\epsilon_{NER} \\
\epsilon_{Asset Price} \\
\epsilon_{Real Activity} \\
\epsilon_{Expectation} \\
\epsilon_{Inflation}
\end{bmatrix}
\]

The impulse response analysis is the accumulated impulse response to the shock to see the dynamics at level (Decimus and Hermansyah, 2011). Figure 4 shows the Impulse Response Function (IRF) to factors which are estimated due to a one standard deviation increase in the BI rate. All factors which represent all transmission channels appeared to respond as expected. The increase in the BI Rate by one standard deviation will trigger an increase in interest rates in the first month. Nonetheless, the increase in interest rates is not immediately followed by a decline in loans. The amount of new loans will decline in the 7th month after the increase in the BI Rate.

The increase in the BI Rate also triggered a decline in asset prices in the first month - having a peak impact in the 6th month. The exchange rate will appreciate in the first month, yet
in the following months the impact is not seen as significant. The impact of exchange rate appreciation starts to be significant again in the 16th month. The decline in the amount of credit in the 7th month contributed to a decline in real activity in the same period. Along with the increase in the policy rate, expected inflation going forward start to decline in the 3rd month. The level of inflation will be seen to significantly decline after the 18th month, which in the early months depicts the “price puzzle” phenomenon.

Accumulated Response to Structural One S.D. Innovations ± 0.9 S.E.

Figure 4. Response of Factors to BI Rates Shock (Inflation)

4.1.1.2. Impact of Interest Rates Policy Shock on Stability of the Financial System

Further analysis of the impact of the increase in the BI Rate by one standard deviation on the stability of the financial system is done by estimating the SFAVAR model but with different model specifications. Identification of the shock is done by assuming macroprudential policy as the most exogenous variable and followed by the variables of monetary policy, interest rates, credit growth, exchange rate, asset prices, and ISSK with the details as follows:

\[
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & a_1 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & a_2 & 1 & 0 & 0 & 0 \\
0 & a_3 & a_7 & 0 & 1 & 0 & 0 \\
0 & a_4 & a_8 & a_{11} & 1 & 0 & 0 \\
0 & a_5 & a_9 & a_{10} & a_{12} & a_{13} & 1 \\
\end{bmatrix}
\begin{bmatrix}
\epsilon_{MP} \\
\epsilon_{BI\ Rate} \\
\epsilon_{Interest\ Rate} \\
\epsilon_{Credit} \\
\epsilon_{NER} \\
\epsilon_{Asset\ Price} \\
\epsilon_{ISSK} \\
\end{bmatrix} =
\begin{bmatrix}
b_1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & b_2 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & b_3 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & b_4 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & b_6 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & b_7 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & b_8 \\
\end{bmatrix}
\begin{bmatrix}
\epsilon_{MP} \\
\epsilon_{BI\ Rate} \\
\epsilon_{Interest\ Rate} \\
\epsilon_{Credit} \\
\epsilon_{NER} \\
\epsilon_{Asset\ Price} \\
\epsilon_{ISSK} \\
\end{bmatrix}
\]
Error! Reference source not found. shows the response of each factor toward the tightening of monetary policy. In general, all factors responded in line with expectations. The interest rates factor increased significantly starting in the first month and asset prices will experience a significant decline peaking in the 7th month. In turn, the amount of credit declined significantly starting in the 14th month in line with the increase in interest rates. The exchange rate appreciated significantly in the first two months in line with the attractiveness of Indonesia’s interest rate compared to that of other countries. Monetary policy tightening appeared to trigger an increase in pressure in the financial system as seen in the increase in the value of the ISSK. Nonetheless, this pressure started to decline in the 10th month, which means that the stability of the financial system significantly improved (as marked by the decline in the ISSK).

Figure 5. Response of Factors Toward BI Rate Shock (SSK)

4.1.2. Impact of GWM Prime Policy Shock

Like the impact of interest rates, the impact of GWM Prime Policy will be analysed on all intermediate and final targets. The output and inflation targets will be analysed through the inflation channel while the ISSK target will be analysed through the SSK channel.
4.1.2.1. Impact of GWM Prime Policy Shock On Inflation

To analyse the impact of each macro-prudential policy, monetary policy (the BI Rate) and other macroprudential policies are included as factors in the model. Identification of shocks is done by assuming the Prime GWM policy variable is the most exogenous variable which is followed by the variables of other macroprudential policies, monetary policy interest rates, credit growth, the exchange rate, asset prices, real activity, expected inflation, and inflation.

\[
\begin{pmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & a_3 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & a_2 & 0 & a_{10} & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & a_3 & a_6 & a_{13} & 0 & 1 & 0 & 0 & 0 & 0 \\
0 & a_4 & 0 & a_{12} & 0 & a_{15} & 1 & 0 & 0 & 0 \\
0 & 0 & a_7 & a_{12} & a_{14} & a_{16} & a_{19} & 1 & 0 & 0 \\
0 & 0 & a_8 & 0 & 0 & a_{17} & 0 & 1 & 0 & 0 \\
0 & 0 & a_9 & 0 & 0 & a_{18} & 0 & a_{20} & a_{21} & 1
\end{pmatrix}
\begin{pmatrix}
\varepsilon_{GWM\ Primer} \\
\varepsilon_{Other\ MP} \\
\varepsilon_{BI\ Rate} \\
\varepsilon_{Interest\ Rate} \\
\varepsilon_{Credit} \\
\varepsilon_{NER} \\
\varepsilon_{Asset\ Price} \\
\varepsilon_{Real\ Activity} \\
\varepsilon_{Expectation} \\
\varepsilon_{Inflation}
\end{pmatrix}

= \begin{pmatrix}
b_1 \\
b_2 \\
b_3 \\
b_4 \\
b_5 \\
b_6 \\
b_7 \\
b_8 \\
b_9 \\
b_{10}
\end{pmatrix}

Accumulated Response to Structural One S.D. Innovations ± 0.9 S.E.

Figure 6. Response of Factors toward GWM Prime Policy Shock (Inflation)

Figure 6 shows the response of each factor toward GWM Prime policy tightening by one standard deviation. It can also be seen that only the factors of credit and asset prices responded significantly toward GWM Prime policy shock. Credit growth will decline significantly after the 10th month. Asset prices declined significantly after the third month and had its peak impact in the 4th month. Meanwhile, the final target variable, namely inflation, did not respond significantly toward the GWM Prime policy shock.
4.1.2.2. Impact of GWM Prime Policy Shock on the Stability of the Financial System

To see the impact of GWM Prime policy on the stability of the financial system, a simulation of tightening in GWM Prime policy by one standard deviation was conducted. Identification of the shock was done by assuming GWM Prime policy as the most exogenous variable with the details as follows:

\[
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & a_4 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
a_1 & 0 & 0 & a_8 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & a_5 & a_9 & 0 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & a_6 & a_{10} & 0 & a_{13} & 1 & 0 & 0 & 0 \\
a_2 & a_3 & a_7 & a_{11} & a_{12} & a_{14} & a_{15} & 1 & 0 & 0 \\
\end{bmatrix}
\begin{bmatrix}
\epsilon_{\text{GWM Primer}} \\
\epsilon_{\text{Other MP}} \\
\epsilon_{\text{BI Rate}} \\
\epsilon_{\text{Interest Rate}} \\
\epsilon_{\text{Credit}} \\
\epsilon_{\text{NER}} \\
\epsilon_{\text{Asset Price}} \\
\epsilon_{\text{ISSK}} \\
\end{bmatrix}
= 
\begin{bmatrix}
b_1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & b_2 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & b_3 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & b_4 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & b_5 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & b_6 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & b_7 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & b_8 \\
\end{bmatrix}
\]

Accumulated Response to Structural One S.D. Innovations ± 0.9 S.E.

Figure 7. Response of Factors toward GWM Prime Policy Shock (SSK)

From Figure 7 it can be seen that ISSK does not respond significantly to tightening in GWM Prime policy. Nonetheless, several intermediate targets such as interest rates, credit, and asset prices responded significantly toward the GWM Prime shock. Interest rates will increase from the first month until the 6th month. Credit growth will decline significantly starting in the 10th month. Asset prices will experience a significant decline in the 3rd month and have a peak impact in the 4th month.
4.1.3. Impact of GWM Secondary Policy Shock

4.1.3.1. Impact of GWM Secondary Policy Shock On Inflation

Identification of the shock was done by assuming GWM Secondary policy as the most exogenous variable in the inflation channel with the details as follows:

\[
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & a_6 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & a_2 & 0 & a_{10} & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & a_3 & a_6 & a_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & a_4 & 0 & a_{12} & 0 & a_{15} & 0 & 0 & 0 & 0 \\
0 & 0 & a_7 & a_{13} & a_{14} & a_{16} & a_{19} & 1 & 0 & 0 \\
0 & 0 & a_8 & 0 & a_{17} & 0 & 0 & 1 & 0 & 0 \\
0 & 0 & a_9 & 0 & 0 & a_{18} & 0 & a_{20} & a_{21} & 1 \\
\end{bmatrix}
\begin{bmatrix}
b_1 \\
b_2 \\
b_3 \\
b_4 \\
b_5 \\
b_6 \\
b_7 \\
b_8 \\
b_9 \\
b_{10} \\
\end{bmatrix}
= 
\begin{bmatrix}
\varepsilon_{GWM Sekunder} \\
\varepsilon_{Other MP} \\
\varepsilon_{BI Rate} \\
\varepsilon_{Interest Rate} \\
\varepsilon_{Credit} \\
\varepsilon_{NIR} \\
\varepsilon_{Asset Price} \\
\varepsilon_{Real Activity} \\
\varepsilon_{Expectation} \\
\varepsilon_{Inflation} \\
\end{bmatrix}
\]

Figure 8 shows the response of each factor toward an increase in GWM Secondary policy by one standard deviation. All variables, whether final targets or intermediate targets, did not show a significant response toward GWM Prime shock.

![Response of Factors Toward Secondary GWM Policy Shock (Inflation)](image)

4.1.3.2. Impact of Secondary GWM Policy Shock on the Stability of the Financial System

Identification of the shock was done by assuming GWM Secondary policy as the most exogenous variable in the SSK channel with the details as follows:
Figure 9 shows the response of each factor toward an increase in GWM Secondary policy by one standard deviation. All variables, whether final targets or intermediate targets, did not show a significant response toward GWM Secondary shock.

4.1.4. Impact of GWM Foreign Exchange Policy Shock

4.1.4.1. Impact of GWM Foreign Exchange Policy Shock On Inflation

Identification of the shock was done by assuming GWM Foreign Exchange policy as the most exogenous variable in the inflation channel with the details as follows:
In Figure 10 it can be seen that the final inflation target did not respond significantly. Nevertheless, an increase in GWM Foreign Exchange policy can affect the exchange rate. The rupiah will appreciate temporarily for three months, starting from the first month and reaching its peak in the 2nd month.

4.1.4.2. Impact of GWM Foreign Exchange Policy Shock on the Stability of the Financial System

Identification of the shock was done by assuming GWM Foreign Exchange policy as the most exogenous variable in the SSK channel with the details as follows:
As can be seen in Figure 11, the final target variable, namely ISSK, did not respond significantly toward an increase in GWM Foreign Exchange policy by one standard deviation. Nonetheless, the intermediate target variable, namely the exchange rate, responded significantly in the first month. The rupiah exchange rate will appreciate for 4 months with a peak in the 2nd month. Asset prices are seen to increase for 3 months. This may be due to improved sentiment on economic conditions stemming from appreciation of the exchange rate.

### 4.1.5. Impact of GWM LDR Policy Shock

#### 4.1.5.1. Impact of GWM LDR Policy Shock On Inflation

Identification of the shock was done by assuming the GWM LDR policy variable as the most exogenous variable in the inflation channel with the details as follows:
An increase in GWM LDR policy by one standard deviation did not trigger a decline in inflation (Figure 12). Nevertheless, a number of intermediate target variables such as the exchange rate and expected inflation did respond significantly to the GWM LDR shock. The rupiah will appreciate from the 3rd month to the 5th month after the increase in GWM LDR policy. Expected inflation are seen to decline temporarily, that is in the 3rd month to the 4th month.

4.1.5.2. The Impact of the GWM LDR Policy Shock on Stability of the Financial System

Identification of the shock was done by assuming the GWM LDR policy variable as the most exogenous variable in the SSK channel with the details as follows:
The impact of the increase in the GWM LDR policy variable on ISSK is shown in Figure 13. The GWM LDR shock by one standard deviation triggers a significant decline instability of the financial system starting in the 2\textsuperscript{nd} month until the 16\textsuperscript{th} month with its peak impact in the 3\textsuperscript{rd} month. Credit growth will decline with its peak impact in the 3\textsuperscript{rd} month in response toward the increase in the GWM LDR policy. The exchange rate will appreciate from the 3\textsuperscript{rd} month until the 18\textsuperscript{th} month.

![Accumulated Response of Factors to Structural One S.D. Innovations ± 0.9 S.E.](image)

Figure 13. Response of Factors toward GWM LDR Policy Shock (SSK)

4.1.6. Impact of NOP Policy Shock

4.1.6.1. Impact of NOP Policy Shock On Inflation

Identification of the shock was done by assuming the NOP policy variable as the most exogenous variable in the inflation channel with the details as follows:

\[
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & a_9 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
a_1 & a_2 & 0 & a_9 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & a_5 & a_6 & a_{10} & 0 & 1 & 0 & 0 & 0 & 0 \\
0 & a_5 & a_6 & a_{11} & 0 & a_{12} & 1 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & a_{15} & 0 & 1 & 0 & 0 & 0 \\
0 & 0 & a_7 & 0 & a_{14} & 0 & 0 & 1 & 0 & 0 \\
0 & 0 & a_6 & 0 & a_{15} & 0 & a_{16} & a_{17} & 1 & 0
\end{bmatrix}
\begin{bmatrix}
\epsilon_{\text{NOP}} \\
\epsilon_{\text{OtherMP}} \\
\epsilon_{\text{BI Rate}} \\
\epsilon_{\text{Interest Rate}} \\
\epsilon_{\text{Credit}} \\
\epsilon_{\text{NER}} \\
\epsilon_{\text{Asset Price}} \\
\epsilon_{\text{Real Activity}} \\
\epsilon_{\text{Expectation}} \\
\epsilon_{\text{Inflation}}
\end{bmatrix}
= \begin{bmatrix}
b_2 \\
b_3 \\
b_4 \\
b_5 \\
b_6 \\
b_7 \\
b_8 \\
b_9 \\
b_{10}
\end{bmatrix}

26
Figure 14. Response of Factors toward NOP Policy Shock (Inflation)

Tightening of NOP policy by one standard deviation did not trigger a decline in inflation (Figure 14). Nonetheless, several intermediate target variables such as credit growth and asset prices responded significantly to the NOP shock. Credit growth will decline until the 2nd month and asset prices will decline steadily starting in the 6th month.

4.1.6.2. Impact of the NOP Policy Shock on Financial System Stability

Identification of the shock was done by assuming the NOP policy variable as the most exogenous variable in the SSK channel with the details as follows:

\[
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & a_4 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
a_5 & 0 & 0 & a_8 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & a_5 & a_9 & 0 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & a_6 & a_{10} & 0 & a_{13} & 1 & 0 & 0 & 0 \\
a_7 & a_9 & a_{11} & a_{12} & a_{14} & a_{15} & 1 & 0 & 0 & 0 \\
\end{bmatrix}
\begin{bmatrix}
\epsilon_{\text{NOP}} \\
\epsilon_{\text{Other MP}} \\
\epsilon_{\text{BI Rate}} \\
\epsilon_{\text{Interest Rate}} \\
\epsilon_{\text{Credit}} \\
\epsilon_{\text{NER}} \\
\epsilon_{\text{Asset Price}} \\
\epsilon_{\text{ISSK}} \\
\end{bmatrix}
= \begin{bmatrix}
b_1 \\
b_2 \\
b_3 \\
b_4 \\
b_5 \\
b_6 \\
b_7 \\
b_8 \\
\end{bmatrix}
\begin{bmatrix}
\epsilon_{\text{NOP}} \\
\epsilon_{\text{Other MP}} \\
\epsilon_{\text{BI Rate}} \\
\epsilon_{\text{Interest Rate}} \\
\epsilon_{\text{Credit}} \\
\epsilon_{\text{NER}} \\
\epsilon_{\text{Asset Price}} \\
\epsilon_{\text{ISSK}} \\
\end{bmatrix}
\]

Tightening of NOP policy was not seen to significantly affect ISSK (as can be seen in Figure 15). Nonetheless, this policy was seen to significantly affect credit growth and asset prices. Credit growth declined until the 3rd month, while asset prices declined until they were stable in the 6th month.
4.1.7. Impact of MHP Policy Shock

4.1.7.1. Impact of MHP Policy Shock on Inflation

Identification of the shock was done by assuming the MHP policy variable as the most exogenous variable in the inflation channel with the details as follows:

$$
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\
\end{bmatrix}
\begin{bmatrix}
\epsilon_{\text{MHP}} \\
\epsilon_{\text{Other MP}} \\
\epsilon_{\text{BI Rate}} \\
\epsilon_{\text{Interest Rate}} \\
\epsilon_{\text{Credit}} \\
\epsilon_{\text{NER}} \\
\epsilon_{\text{Asset Price}} \\
\epsilon_{\text{Real Activity}} \\
\epsilon_{\text{Expectation}} \\
\epsilon_{\text{Inflation}} \\
\end{bmatrix}
= 
\begin{bmatrix}
b_1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & b_2 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & b_3 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & b_4 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & b_5 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & b_6 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & b_7 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & b_8 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & b_9 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & b_{10} \\
\end{bmatrix}
$$

Tightening of MHP policy by one standard deviation did not trigger a decline in inflation (Figure 16). Nonetheless, MHP was seen to be effective in influencing the rupiah exchange rate. The rupiah appreciated with the peak impact in the 5th month. Along with the rupiah’s appreciation, inflation expectations declined temporarily. Meanwhile, asset prices rose until the 5th month, seemingly due to improving sentiment on economic conditions stemming from rupiah exchange rate appreciation.
Figure 16. Response of Factors toward MHP Policy Shock (Inflation)

4.1.7.2. Impact of MHP Policy Shock on Financial System Stability

Identification of the shock was done by assuming the MHP policy variable as the most exogenous variable in the SSK channel with the details as follows:

\[
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & a_4 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\
0 & 0 & a_6 & a_{10} & 0 & a_{13} & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
a_2 & a_3 & a_7 & a_{11} & a_{12} & a_{14} & a_{15} & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\end{bmatrix}
\begin{bmatrix}
\epsilon_{MHP} \\
\epsilon_{Other MP} \\
\epsilon_{BI Rate} \\
\epsilon_{Interest Rate} \\
\epsilon_{Credit} \\
\epsilon_{NER} \\
\epsilon_{Asset Price} \\
\epsilon_{ISSK} \\
\end{bmatrix}
= 
\begin{bmatrix}
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & b_2 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & b_3 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & b_4 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & b_5 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & b_6 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & b_7 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & b_8 \\
\end{bmatrix}
\]

Tightening of MHP policy was not seen to significantly affect ISSK (as can be seen in Figure17). Nonetheless, this policy was seen to significantly affect the rupiah exchange rate. The rupiah appreciated with a peak impact in the 5th month. Asset prices were seen to increase until the 5th month as sentiment improved on the back of rupiah appreciation.
4.1.8. Impact of LTV Policy Shock

4.1.8.1. Impact of LTV Policy Shock on Inflation

Identification of the shock was done by assuming the LTV policy variable as the most exogenous variable with the details as follows:

\[
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & a_5 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & a_2 & 0 & a_{20} & 1 & 0 & 0 & 0 \\
0 & a_5 & a_6 & a_{21} & 0 & 1 & 0 & 0 & 0 \\
0 & a_0 & 0 & a_{12} & 0 & a_{15} & 1 & 0 & 0 \\
0 & 0 & a_7 & a_{13} & a_{14} & a_{16} & a_{19} & 1 & 0 \\
0 & 0 & a_8 & 0 & 0 & a_{17} & 0 & 0 & 1 \\
0 & 0 & a_9 & 0 & 0 & a_{18} & 0 & a_{20} & a_{21}
\end{bmatrix}
\begin{bmatrix}
\epsilon_{LTV} \\
\epsilon_{Other MP} \\
\epsilon_{BI Rate} \\
\epsilon_{Interest Rate} \\
\epsilon_{Credit} \\
\epsilon_{EER} \\
\epsilon_{Asset Price} \\
\epsilon_{Real Activity} \\
\epsilon_{Expectation} \\
\epsilon_{Inflation}
\end{bmatrix}
= 
\begin{bmatrix}
b_1 \\
b_2 \\
b_3 \\
b_4 \\
b_5 \\
b_6 \\
b_7 \\
b_8 \\
b_9 \\
b_{10}
\end{bmatrix}
\begin{bmatrix}
\epsilon_{LTV} \\
\epsilon_{Other MP} \\
\epsilon_{BI Rate} \\
\epsilon_{Interest Rate} \\
\epsilon_{Credit} \\
\epsilon_{EER} \\
\epsilon_{Asset Price} \\
\epsilon_{Real Activity} \\
\epsilon_{Expectation} \\
\epsilon_{Inflation}
\end{bmatrix}
\]

Figure 18 shows the increase in LTV policy by one standard deviation was followed by a significant decline in credit volume since the 3rd month. Nonetheless, tightening of LTV policy was not significant in affecting real activity and inflation.

30
4.1.8.2. Impact of LTV Policy Shock on Financial System Stability

Identification of the shock was done by assuming the LTV policy variable as the most exogenous variable with the details as follows:

\[
\begin{align*}
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & a_8 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & a_{10} & 0 & a_{13} & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & a_{10} & 0 & a_{13} & a_{11} & a_{12} & a_{14} & a_{15} & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\end{bmatrix}
\begin{bmatrix}
\epsilon_{\text{LTV}} \\
\epsilon_{\text{Other MP}} \\
\epsilon_{\text{BI Rate}} \\
\epsilon_{\text{Interest Rate}} \\
\epsilon_{\text{Credit}} \\
\epsilon_{\text{NER}} \\
\epsilon_{\text{Asset Price}} \\
\epsilon_{\text{ISSK}}
\end{bmatrix}
= 
\begin{bmatrix}
b_1 \\
b_2 \\
b_3 \\
b_4 \\
b_5 \\
b_6 \\
b_7 \\
b_8
\end{bmatrix}
\begin{bmatrix}
\epsilon_{\text{LTV}} \\
\epsilon_{\text{Other MP}} \\
\epsilon_{\text{BI Rate}} \\
\epsilon_{\text{Interest Rate}} \\
\epsilon_{\text{Credit}} \\
\epsilon_{\text{NER}} \\
\epsilon_{\text{Asset Price}} \\
\epsilon_{\text{ISSK}}
\end{bmatrix}
\]

An increase in LTV policy was not seen to affect the final targets, i.e. financial system stability. Nonetheless, credit growth was seen to decline since the 14\textsuperscript{th} month.
Accumulated Response to Structural One S.D. Innovations ± 0.9 S.E.

Acc. Response of LTV to LTV
Acc. Response of Oth. Macroprudential to LTV
Acc. Response of BI Rate to LTV

Acc. Response of Interest Rate Factor to LTV
Acc. Response of Credit Factor to LTV
Acc. Response of Asset Price Factor to LTV

Acc. Response of Exchanging. Rate Factor to LTV
Acc. Response of ISSK to LTV

Figure 19. Response of Factors toward LTV Policy Shock (SSK)

4.1.9. Résumé

From the above explanations it can be concluded that BI Rate monetary policy is effective in influencing economic variables, either intermediate targets such as interest rates, credit, the exchange rate, asset prices, and expectations or final targets such as output, inflation, and ISSK. The effectiveness of the BI rate is seen either through the monetary policy transmission channel or financial system stability channel.

Meanwhile, individual macro-prudential policies were able to influence the intermediate targets which were intended to be in accordance with the policy goals. Some examples are LTV policy which successfully reduced mortgage lending, policies on Prime GWM and LDR which managed to reduce loans, and MHP policy which managed to affect the exchange rate. The Policy unable to affect all variables was Secondary GWM, either through the inflation channel or the SSK channel. Meanwhile, no impact was seen from macro-prudential policies on final variables such as output, inflation, and ISSK. Another feature of macro-prudential policy in general was its relatively small and temporary impact on economic variables. Based on the results above, the impact of each policy instrument on intermediate targets and final targets can be tabulated as follows:
<table>
<thead>
<tr>
<th>No.</th>
<th>Final Target and Intermediate Target</th>
<th>Effective Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inflation</td>
<td>BI Rate</td>
</tr>
<tr>
<td>2</td>
<td>Financial System Stability (SSK)</td>
<td>BI Rate, GWM LDR</td>
</tr>
<tr>
<td>3</td>
<td>Economic Growth (GDP)</td>
<td>BI Rate</td>
</tr>
</tbody>
</table>
| 4   | Interest Rate                       | • BI Rate (Inflation and SSK Channels)  
• GWM Prime (SSK)  |
| 5   | Exchange Rate                       | • BI Rate (Inflation and SSK Channels)  
• GWM Forex (Inflation and SSK Channels)  
• GWM LDR (Inflation and SSK Channels)  
• MHP (Inflation and SSK Channels)  |
| 6   | Asset Prices                        | • BI Rate (Inflation and SSK Channels)  
• GWM Prime (Inflation and SSK Channels)  
• NOP (Inflation and SSK Channels)  |
| 7   | Credit                              | • BI Rate (Inflation and SSK Channels)  
• GWM Prime (Inflation and SSK Channels)  
• GWM LDR (SSK channel)  
• NOP (Inflation and SSK Channels)  
• LTV (Inflation and SSK Channels)  |
| 8   | Inflation Expectations              | • BI Rate  
• GWM LDR  
• MHP  |

4.2. The Dominant Channels Affecting the Final Inflation and SSK Targets

To see the dominant channels affecting the final inflation and SSK targets, Variance Decomposition was undertaken – as previously done by Tahir (2012). As can be seen in section 4.9, the only policy instrument which can affect the final inflation and SSK targets is the BI Rate. Because of that, Variance Decomposition analysis is only done to identify the most dominant channel in transmitting the BI Rate to inflation (the inflation channel) and SSK (through the SSK channel).
Table 3 shows the three most dominant channels in transmitting the BI Rate to the economy, either toward inflation or SSK.

<table>
<thead>
<tr>
<th>Policy Variables</th>
<th>Inflation</th>
<th>SSK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BI Rate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest rate</td>
<td>2.86</td>
<td>Asset Prices</td>
</tr>
<tr>
<td>Credit</td>
<td>2.59</td>
<td>Credit</td>
</tr>
<tr>
<td>Asset Prices</td>
<td>2.52</td>
<td>Exchange Rate</td>
</tr>
</tbody>
</table>

Based on variance decomposition, the interest rates channel was the most dominant in transmitting the BI Rate to inflation. Furthermore, the credit channel and the asset prices channel were quite dominant in transmitting the BI Rate, while the impact of the BI Rate on SSK was most dominantly transmitted through the asset prices channel, followed then by the credit channel and the exchange rate channel.

4.3. Transmission of Monetary Policy through the Credit Channel (Balance Sheet Channel)

The balance sheet channel is identified by seeing the change in the impact of company balance sheet variables on corporate investment after a monetary policy shock. The baseline investment equation is equation (6) and post the monetary policy shock it is equation (7). For the
baseline equation, the results can be seen Table 4, 5 and 6 respectively, for the balance sheet cash flow, total debt, and short term debt indicators.

All coefficients have signs that are as expected. The lag from investment and sales significantly affected the current investment. The balance sheet variables have the expected signs, i.e. when the cash flow affects the investment positively, the total debt and short term debt have negative signs for all samples. Nonetheless, the balance sheet coefficients for small companies are found to be more sensitive than those for large companies. For cash flow, the coefficient for small companies is more positive, while for total debt and short debt term, the coefficient for small companies is more negative compared to the coefficient for large companies. The balance sheet variable in the investment equation is generally more sensitive for companies which have financial constraints to access the capital market (Oliner and Rudebusch, 1996). This indicates that small companies have more limited access to the capital markets so that balance sheet conditions have a greater impact on their funding and investment.

### Table 4. Equation Estimates with the Cash Flow Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Entire Sample</th>
<th>Small Company</th>
<th>Large Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>$IK_{t,t-1}$</td>
<td>0.26***</td>
<td>0.17*</td>
<td>0.17*</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.10)</td>
<td>(0.10)</td>
</tr>
<tr>
<td>$SK_{t,t-1}$</td>
<td>0.50**</td>
<td>0.96***</td>
<td>1.04***</td>
</tr>
<tr>
<td></td>
<td>(0.25)</td>
<td>(0.32)</td>
<td>(0.32)</td>
</tr>
<tr>
<td>$CK_{t,t-1}$</td>
<td>0.18*</td>
<td>0.31**</td>
<td>0.22*</td>
</tr>
<tr>
<td></td>
<td>(0.11)</td>
<td>(0.13)</td>
<td>(0.12)</td>
</tr>
<tr>
<td>AB Test AR(1)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>AB Test AR(2)</td>
<td>0.78</td>
<td>0.58</td>
<td>0.35</td>
</tr>
<tr>
<td>Sargan/Hansen</td>
<td>0.34</td>
<td>0.45</td>
<td>0.17</td>
</tr>
</tbody>
</table>

- ***/**/*: Significant difference from zero at 1%, 5% and 10%; Number in parentheses is the standard error
- AR(2) tests the second order serial correlation error.
- Sargan/Hansen tests the independent over identifying instrument toward error.
### Table 5. Equation Estimates with the Total Debt Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Entire Sample</th>
<th>Small Company</th>
<th>Large Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>$IK_{t,t-1}$</td>
<td>0.26*</td>
<td>0.11*</td>
<td>0.14**</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(0.07)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>$SK_{t,t-1}$</td>
<td>0.76***</td>
<td>1.42***</td>
<td>0.85***</td>
</tr>
<tr>
<td></td>
<td>(0.27)</td>
<td>(0.45)</td>
<td>(0.28)</td>
</tr>
<tr>
<td>$DK_{t,t-1}$</td>
<td>-0.29*</td>
<td>-0.39*</td>
<td>-0.25**</td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td>(0.20)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>AB Test AR(1)</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>AB Test AR(2)</td>
<td>0.89</td>
<td>0.93</td>
<td>0.26</td>
</tr>
<tr>
<td>Sargan/ Hansen</td>
<td>0.15</td>
<td>0.78</td>
<td>0.34</td>
</tr>
<tr>
<td>Exogeneity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hansen</td>
<td>0.15</td>
<td>0.95</td>
<td>0.35</td>
</tr>
<tr>
<td>Difference</td>
<td>0.35</td>
<td>0.63</td>
<td>0.29</td>
</tr>
</tbody>
</table>

### Table 6. Equation Estimates with the Short Term Debt Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Entire Sample</th>
<th>Small Company</th>
<th>Large Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>$IK_{t,t-1}$</td>
<td>0.25**</td>
<td>0.27*</td>
<td>0.28**</td>
</tr>
<tr>
<td></td>
<td>(0.10)</td>
<td>(0.15)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>$SK_{t,t-1}$</td>
<td>0.95***</td>
<td>1.14***</td>
<td>0.63***</td>
</tr>
<tr>
<td></td>
<td>(0.24)</td>
<td>(0.42)</td>
<td>(0.28)</td>
</tr>
<tr>
<td>$SD_{t,t-1}$</td>
<td>-0.28*</td>
<td>-0.32*</td>
<td>-0.20**</td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td>(0.19)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>AB Test AR(1)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>AB Test AR(2)</td>
<td>0.92</td>
<td>0.94</td>
<td>0.45</td>
</tr>
<tr>
<td>Sargan/ Hansen</td>
<td>0.13</td>
<td>0.78</td>
<td>0.17</td>
</tr>
<tr>
<td>Exogeneity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hansen</td>
<td>0.13</td>
<td>0.72</td>
<td>0.14</td>
</tr>
<tr>
<td>Difference</td>
<td>0.35</td>
<td>0.92</td>
<td>0.52</td>
</tr>
</tbody>
</table>

Identification of the balance sheet channel is done by seeing the difference in coefficients in balance sheet variables between the normal period and when the monetary policy shock takes place. The equation which will be tested is the equation (7) that the expectation is the balance sheet variable will become increasingly sensitive when monetary policy is tightened and increasingly less sensitive when monetary policy is loosened.
In Table 7, Table 8, and Table 9, it can be seen that at the time of monetary policy tightening, there is increased sensitivity in the cash flow, total debt, and short term debt coefficients. The dummy interaction variable of monetary policy with cash flow is positive and significant, while total debt/short term debt is negative and significant.

Table 7. Equation Estimates with Cash Flow Variable When Policy is Tight

<table>
<thead>
<tr>
<th>Variable</th>
<th>Entire Sample</th>
<th>Small Company</th>
<th>Large Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>$IK_{t,t-1}$</td>
<td>0.29*</td>
<td>0.18**</td>
<td>0.19***</td>
</tr>
<tr>
<td></td>
<td>(0.15)</td>
<td>(0.09)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>$SK_{t,t-1}$</td>
<td>0.26</td>
<td>0.64</td>
<td>0.97***</td>
</tr>
<tr>
<td></td>
<td>(0.32)</td>
<td>(0.36)</td>
<td>(0.31)</td>
</tr>
<tr>
<td>$CK_{t,t-1}$</td>
<td>0.37*</td>
<td>0.30*</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>(0.19)</td>
<td>(0.16)</td>
<td>(0.10)</td>
</tr>
<tr>
<td>$M \times CK_{t,t-1}$</td>
<td>0.11*</td>
<td>0.13**</td>
<td>-0.06</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.06)</td>
<td>(0.05)</td>
</tr>
</tbody>
</table>

AB Test AR(1) | 0.00          | 0.00          | 0.00          |
AB Test AR(2)  | 0.45          | 0.40          | 0.17          |
Sargan/Hansen  | 0.89          | 0.43          | 0.16          |

Table 8. Equation Estimates with Total Debt Variable When Policy is Tight

<table>
<thead>
<tr>
<th>Variable</th>
<th>Entire Sample</th>
<th>Small Company</th>
<th>Large Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>$IK_{t,t-1}$</td>
<td>0.35**</td>
<td>0.14*</td>
<td>0.15**</td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td>(0.08)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>$SK_{t,t-1}$</td>
<td>0.80**</td>
<td>1.56***</td>
<td>0.47*</td>
</tr>
<tr>
<td></td>
<td>(0.32)</td>
<td>(0.48)</td>
<td>(0.29)</td>
</tr>
<tr>
<td>$DK_{t,t-1}$</td>
<td>-0.41**</td>
<td>-0.55**</td>
<td>-0.22</td>
</tr>
<tr>
<td></td>
<td>(0.19)</td>
<td>(0.25)</td>
<td>(0.24)</td>
</tr>
<tr>
<td>$M \times DK_{t,t-1}$</td>
<td>-0.20**</td>
<td>-0.32**</td>
<td>-0.30*</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.13)</td>
<td>(0.18)</td>
</tr>
</tbody>
</table>

AB Test AR(1) | 0.00          | 0.00          | 0.00          |
AB Test AR(2)  | 0.97          | 0.88          | 0.45          |
Sargan/Hansen  | 0.28          | 0.85          | 0.21          |
Exogeneity     |               |               |               |
Hansen         | 0.28          | 0.98          | 0.17          |
Difference     | 0.36          | 0.78          | 0.80          |
When separate estimates are conducted, the cash flow interaction coefficient for small companies is positive and significant while for large companies it is not. This indicates that small companies face an increased cost of external funds compared to internal funds, which then raises dependency on internal funds to finance the investment. Meanwhile, large companies do not experience a relative increase in costs. The same was also the case for the total debt and short term debt variables whose interaction coefficients for small companies were more negative and significant compared to those of large companies. This means that the position of leverage for small firms is more influenced by access to capital markets than is the case for large companies. This finding identifies the balance sheet channel, i.e. the monetary policy shock is transmitted through corporate balance sheets which finally affects investment.

Table 9. Equation Estimates with Short Term Debt Variable When Policy is Tight

<table>
<thead>
<tr>
<th>Variable</th>
<th>Entire Sample</th>
<th>Small Company</th>
<th>Large Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>$IK_{t,t-1}$</td>
<td>0.49**</td>
<td>0.09*</td>
<td>0.21***</td>
</tr>
<tr>
<td></td>
<td>(0.19)</td>
<td>(0.06)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>$SK_{t,t-1}$</td>
<td>0.88**</td>
<td>1.24***</td>
<td>0.55***</td>
</tr>
<tr>
<td></td>
<td>(0.41)</td>
<td>(0.37)</td>
<td>(0.20)</td>
</tr>
<tr>
<td>$SD_{t,t-1}$</td>
<td>-0.48*</td>
<td>0.19</td>
<td>-0.04</td>
</tr>
<tr>
<td></td>
<td>(0.28)</td>
<td>(0.12)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>$M \times SD_{t,t-1}$</td>
<td>-0.15*</td>
<td>-0.18**</td>
<td>-0.08</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>AB Test AR(1)</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>AB Test AR(2)</td>
<td>0.70</td>
<td>0.59</td>
<td>0.80</td>
</tr>
<tr>
<td>Sargan/ Hansen</td>
<td>0.26</td>
<td>0.15</td>
<td>0.24</td>
</tr>
<tr>
<td>Exogeneity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hansen</td>
<td>0.20</td>
<td>0.19</td>
<td>0.26</td>
</tr>
<tr>
<td>Difference</td>
<td>0.55</td>
<td>0.19</td>
<td>0.22</td>
</tr>
</tbody>
</table>

Estimates are also undertaken by using the dummy variable monetary easing which refers to equation (7) where the dummy variable of monetary policy is 1 if loose policy. As can be seen in Table 10, Table 11 and Table 12 to sample all companies, the balance sheet coefficients are increasingly insensitive. The dummy interaction variables of loose monetary policy and cash flow are negative and significant while with total debt/short term debt they are positive and significant.

When separate estimates are conducted of small and large companies, the balance sheet coefficient for small companies is generally more significant in reducing the sensitivity of balance sheet variables toward investment compared to that of large companies. This indicates that loose
monetary policy reduces the problem of information asymmetries in line with improving corporate cash flow positions and net worth. Small companies find it relatively easier to get external funding to finance their investments in that condition compared to normal conditions. This means that the shock of loose monetary policy is transmitted through corporate balance sheets.

Table 10. Equation Estimates with Cash Flow Variable When Policy is Loose

<table>
<thead>
<tr>
<th>Variable</th>
<th>Entire Sample</th>
<th>Small Company</th>
<th>Large Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>$IK_{t,t-1}$</td>
<td>0.16**</td>
<td>0.19*</td>
<td>0.17*</td>
</tr>
<tr>
<td></td>
<td>0.08</td>
<td>0.11</td>
<td>0.10</td>
</tr>
<tr>
<td>$SK_{t,t-1}$</td>
<td>0.99***</td>
<td>0.97***</td>
<td>1.02***</td>
</tr>
<tr>
<td></td>
<td>0.27</td>
<td>0.34</td>
<td>0.32</td>
</tr>
<tr>
<td>$CK_{t,t-1}$</td>
<td>0.18**</td>
<td>0.27**</td>
<td>0.25**</td>
</tr>
<tr>
<td></td>
<td>0.09</td>
<td>0.15</td>
<td>0.11</td>
</tr>
<tr>
<td>$E \times CK_{t,t-1}$</td>
<td>-0.07**</td>
<td>-0.25***</td>
<td>-0.03</td>
</tr>
<tr>
<td></td>
<td>0.03</td>
<td>0.09</td>
<td>0.05</td>
</tr>
<tr>
<td>AB Test AR(1)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>AB Test AR(2)</td>
<td>0.82</td>
<td>0.42</td>
<td>0.42</td>
</tr>
<tr>
<td>Sargan/ Hansen</td>
<td>0.13</td>
<td>0.51</td>
<td>0.17</td>
</tr>
<tr>
<td>Exogeneity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hansen</td>
<td>0.14</td>
<td>0.45</td>
<td>0.25</td>
</tr>
<tr>
<td>Difference</td>
<td>0.22</td>
<td>0.56</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Table 11. Equation Estimates with Total Debt Variable When Policy is Loose

<table>
<thead>
<tr>
<th>Variable</th>
<th>Entire Sample</th>
<th>Small Company</th>
<th>Large Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>$IK_{t,t-1}$</td>
<td>0.34***</td>
<td>0.12*</td>
<td>0.13**</td>
</tr>
<tr>
<td></td>
<td>0.15</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>$SK_{t,t-1}$</td>
<td>0.12</td>
<td>0.99**</td>
<td>0.59</td>
</tr>
<tr>
<td></td>
<td>0.40</td>
<td>0.47</td>
<td>0.33*</td>
</tr>
<tr>
<td>$DK_{t,t-1}$</td>
<td>-0.68</td>
<td>-0.38*</td>
<td>-0.47</td>
</tr>
<tr>
<td></td>
<td>0.26***</td>
<td>0.22</td>
<td>0.16***</td>
</tr>
<tr>
<td>$E \times DK_{t,t-1}$</td>
<td>0.39*</td>
<td>0.48*</td>
<td>-0.07</td>
</tr>
<tr>
<td></td>
<td>0.18</td>
<td>0.27</td>
<td>0.15</td>
</tr>
<tr>
<td>AB Test AR(1)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>AB Test AR(2)</td>
<td>0.86</td>
<td>0.91</td>
<td>0.33</td>
</tr>
<tr>
<td>Sargan/ Hansen</td>
<td>0.32</td>
<td>0.37</td>
<td>0.10</td>
</tr>
<tr>
<td>Exogeneity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hansen</td>
<td>0.53</td>
<td>0.38</td>
<td>0.11</td>
</tr>
<tr>
<td>Difference</td>
<td>0.27</td>
<td>0.27</td>
<td>0.23</td>
</tr>
<tr>
<td>Variable</td>
<td>Entire Sample</td>
<td>Small Company</td>
<td>Large Company</td>
</tr>
<tr>
<td>----------</td>
<td>---------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>$IK_{t,t-1}$</td>
<td>0.14*)</td>
<td>0.23*)</td>
<td>0.27**)</td>
</tr>
<tr>
<td></td>
<td>0.08</td>
<td>0.13</td>
<td>0.11</td>
</tr>
<tr>
<td>$SK_{t,t-1}$</td>
<td>0.39</td>
<td>0.89*)</td>
<td>0.63**</td>
</tr>
<tr>
<td></td>
<td>0.31</td>
<td>0.54</td>
<td>0.31</td>
</tr>
<tr>
<td>$SD_{t,t-1}$</td>
<td>-0.25**)</td>
<td>-0.01</td>
<td>-0.20*)</td>
</tr>
<tr>
<td></td>
<td>0.26</td>
<td>0.38</td>
<td>0.11</td>
</tr>
<tr>
<td>$E \times SD_{t,t-1}$</td>
<td>0.24**)</td>
<td>0.57*)</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>0.18</td>
<td>0.32</td>
<td>0.05</td>
</tr>
<tr>
<td>AB Test AR(1)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>AB Test AR(2)</td>
<td>0.28</td>
<td>0.49</td>
<td>0.45</td>
</tr>
<tr>
<td>Sargan/ Hansen</td>
<td>0.12</td>
<td>0.56</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Exogeneity
- Hansen: 0.16 | 0.91 | 0.17
- Difference: 0.17 | 0.10 | 0.28

Table 12. Equation Estimates with Short Debt Variable When Policy is Loose
V. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

From the discussions in the previous chapters, a number of conclusions can be made which are as follows:

1. Monetary policy, in this case represented by interest rates policy (the BI Rate), is empirically able to influence inflation and the index of financial system stability through all channels (interest rates, credit, the exchange rate, asset prices, and inflation expectations). Nonetheless, a lag is found in the transmission of monetary policy toward inflation and SSK; that is by 18 and 10 months, respectively.

2. Macro-prudential policy in general can affect intermediate targets in accordance with policy goals. Tightening of GWM Prime, GWM LDR, and LTV policies can reduce loans, while MHP, GWM Forex, and GWM LDR policies can affect the exchange rate. At the same time, however, the tightening of macro-prudential policy is not yet seen as being effective in affecting final targets such as inflation and ISSK. Another feature is that macro-prudential policy tends to affect economic variables on a moderate scale and temporary.

3. In influencing inflation, the most dominant channels transmitting the BI Rate are the interest rates, credit, and asset prices channels. While in influencing SSK, the most dominant channels transmitting the BI Rate are the asset prices, credit, and exchange rate channels.

4. The empirical results of the balance sheet channel show that the balance sheet channel particularly transmits monetary policy through companies which have financial constraints. The results indicate that the coefficient balance sheet indicator is increasingly sensitive following tight monetary policy. The interaction coefficients cash flow and tight monetary policy are found to be positive, signifying a closer association between internal funds and investment as well as indications of a scarcity in external funds. The interaction coefficients total debt and short term debt and tight monetary policy are increasingly negative due to high corporate leverage which reduces access to credit markets.

5. At the time when monetary policy is loose the opposite is found to be the case; that is the balance sheet coefficient indicator is increasingly insensitive. The cash flow coefficient became increasingly insensitive signifying an increasingly smaller association between internal funds and investment in line with the greater ease in obtaining external funds. The interaction coefficients total debt and short term debt along with monetary policy
were also less sensitive, signifying that corporate leverage did not reduce access to credit markets.

6. A change in the response of balance sheet coefficients when monetary policy is tight and loose is particularly found in small companies, not in large companies. This indicates the problem of financial constraints in small companies that are not faced by large companies. This is inline with the theory which states that the balance sheet channel works to transmit monetary policy because there are financial constraints in companies which, in this research, are represented by small-sized companies.

In the realm of policy transmission research, this study makes several contributions as follows:

1. Researching policy mix transmission (monetary and macro-prudential) by using the SFAVAR methodology, thus making it possible to analyse all channels which represent intermediate targets and final targets. Recent research concerning monetary policy transmission was conducted in 2013. This research used the FAVAR method and was exclusively to analyse monetary policy.

2. Researching the balance sheet channel in transmitting monetary policy (either tightening or easing monetary policy) through large companies and small companies. Recent research on the balance sheet channel was conducted in 2002 without distinguishing the monetary policy stance.

5.2. Recommendations

From the discussions and conclusions above, a number of recommendations can be made as follows:

1. To encourage the creation of financial system stability, Bank Indonesia needs to explore and adopt other macro-prudential policy instruments including capital flows management; for example, the Countercyclical Capital Buffer (CCB), the Debt to Income Ratio (DTI), and Unremunerated Reserve Requirements (URR).

2. To be able to explain corporate investment more comprehensively, the next study can use the user cost of capital variable in each corporate sector. The use of this variable can also be useful to look at how the interest rates channel influences corporate investment activities.
BIBLIOGRAPHY


Tahir, M.N. (2012). Relative Importance of Monetary Transmission Channels: A Structural Investigation; Case of Brazil, Chile and Korea. Universite de Lyon.

