

# **EAST ASIAN DEVELOPMENT NETWORK**



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## **Does Monetary Policy Influence Inflation, Economic Growth and Income Inequality in Indonesia?**

**Audrey Soedjito**

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*This study presents preliminary observations on the impact of Bank Indonesia's (BI) monetary policy on inflation, economic growth and income inequality. Using BI's interest rate, basic VAR models with exogenous variables are developed to provide sequential descriptions on monetary transmission to inflation and economic growth. Moreover, factors affecting the effectiveness of monetary policy transmission are identified based on the survey of literature and the descriptive analysis of macroeconomic indicators. Through this empirical exercise, it is postulated that BI's interest rate is not as efficient in influencing inflation, and its impact on economic growth is related to various other factors. Therefore, the investigation of monetary policy impact on income inequality should not be conducted via inflation channel – among other views considered, household income composition is likely to play a role in identifying the impact of monetary policy on income inequality.*

*Keywords: monetary policy, economic growth, monetary transmission channels, income distribution, VAR*

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## I. INTRODUCTION: MONETARY POLICY AND INEQUALITY

By the mandate prescribed in Bank Indonesia law, the current goal of monetary policy in Indonesia is to achieve price stability by managing inflation under an inflation-targeting framework. Therefore, it is plausible to believe that changes in Bank Indonesia's monetary policy stance are expected to shield the lowest income classes from poverty and inequality due to this stability objective. The most conventional instrument of monetary policy in Indonesia --- the central bank interest rate --- should ideally achieve its specific objective of maintaining price stability and therefore dampen income inequality via the management of inflation, if it is transmitted effectively to the economy.

In this setting, the impact of monetary policy on income inequality will be transmitted through changes in prices or inflation. The plausibility of this argument has been well-documented in the past, with several key literatures asserting that inflation does have a certain impact on inequality. Li and Zou (2002) found that inflation increases the income share of the rich and reduces the rate of economic growth<sup>1</sup>. Several studies cited in Walsh and Yu (2012) also revealed that higher inflation led to a lower share of income held by the poorest group in the population<sup>2</sup>. Albanesi (2007) and Coeure (2012) found that a higher inflation rate is positively correlated to greater income inequality. These findings are in line with the findings in Albanesi (2003), where inflation was found to have a positive relationship with income inequality due to the vulnerability of low-income households to inflation.

This leads to a plausible hypothesis that the impact of monetary policy on income inequality *ceteris paribus* could be measured as the impact of inflation on income inequality. In examining this hypothesis, the study will focus on discussing the impact of Bank Indonesia's interest rate on the dynamic of income distribution through inflation. An effective transmission of the central bank interest rate will bring inflation to the desired level, maintaining price stability and therefore will have a positive impact on income inequality. In the event of ineffective monetary policy transmission, the response of income distribution could depend more on the income composition of the household. Nevertheless, limited data on household income and wealth in Indonesia does not allow for a reliable empirical experiment to investigate such a perspective. Therefore, this study takes this area for future research<sup>3</sup>.

Additionally, taking into account the fact that the recent discussions on the channels of monetary policy to income inequality are focused on advanced economies (Coibion et al., 2012; Saiki and Frost, 2014), the study will also consider the depth of the financial sector in Indonesia<sup>4</sup> as the key differentiating factor that could explain the different results in the study.

The paper is organized as follows: Section II will focus on the theoretical framework underpinning the discussion on the impact of monetary policy changes to inflation, economic growth and income inequality. In Section III, the empirical exercise will focus on examining the effectiveness of monetary transmission channels in Indonesia, looking at both the impact of monetary policy on inflation and economic growth<sup>5</sup> in the basic VAR setting. The paper will be concluded in Section IV with a substantial

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<sup>1</sup> Both Li and Zou (2002) and Agénor (2004) establish the fact that the poor are more vulnerable to inflation due to fewer inflation hedges, nominally-defined income, and tendency to hold cash balances that lose value through the inflationary tax.

<sup>2</sup> Blejer and Guerrero (1990) for the Philippines, Datt and Ravallion (1998) for India, and Ferreira and Litchfield (2001) for Brazil

<sup>3</sup> Going beyond income inequality, Brunnermeier and Sannikov (2012) argue that heterogeneity in economic agents' asset holdings allows monetary policy to redistribute wealth. In this situation, the redistributive channel works through changes in asset prices and income flows.

<sup>4</sup> Financial sector in Indonesia lacked financial depth as asserted in Estrada, Park and Ramayandi (2010).

<sup>5</sup> With regards to the impact of economic growth on income inequality, Kuznets claimed that at the relatively low level of economic development with low levels of per-capita income, inequality may initially increase as the economy grows. However, the trend is likely to reverse as the economy reaches a certain level of income per capita. With regards to this, Nikoloski (2009) found that rising GDP per capita increases the level of inequality in the short run, and decreases inequality in the long run. Meanwhile, Kanbur and Zhuang (2013) used a sample of four countries (India, Indonesia, Philippines and China) to assert that urbanization may lead to an inverted U-curve. Additionally, Kanbur and

discussion on the specific characteristics of inflation and inequality Indonesia, and the factors unique to Indonesia that affect these dynamics of inflation and inequality.

## II. THEORETICAL FRAMEWORK

### A. Traditional Monetary Transmission Channel

The study focuses on the traditional channels of monetary policy based on Mishkin (1996), namely: the interest rate, credit, asset price, exchange rate and inflation expectation channels<sup>6</sup>. Bank Indonesia, hereby noted as BI<sup>7</sup>, considers all these channels in their monetary policy operations. The empirical study, however, will focus on the interest rate channel, asset price channel and bank lending channel in order to provide a realistic view on Indonesia.

#### Interest rate channel

According to Mishkin (1996), the traditional Keynesian view on the impact of monetary tightening to real output can be represented in the diagram below:

$$M \downarrow \rightarrow i \uparrow \rightarrow I \downarrow \rightarrow Y \downarrow \quad (1)$$

In (1), monetary tightening leads to an increase of the real interest rate, which will in turn raise the cost of capital. This will lead to a decrease in investment spending, which leads to a fall in aggregate demand and ultimately the decline of output. On the other hand, monetary expansion leads to a decrease of the real interest rate, which is subsequently followed by a decrease in the cost of capital and an increase in investment spending, boosting aggregate demand and output. This also applies to consumption (substitution/income effect):

$$M \uparrow \rightarrow i \downarrow \rightarrow \text{Consumption} \uparrow \rightarrow Y \uparrow \quad (2)$$

In light of the inflation-targeting framework with interest rate as the instrument, the central bank interest rate will first influence short-term interest rates. The change in the short-term nominal interest rate will then induce changes in real short- and long-term interest rates: a decrease of the central bank interest rate leads to a decrease in short-term real interest rate. By the expectations hypothesis of term structure<sup>8</sup>, the resulting lower short-term real interest rate will lead to a decrease in the long-term real interest rate. This will influence price variables in the financial market, real sector variables and finally inflation. Most importantly, the monetary policy transmission through interest rate channel stresses that the impact of investment and consumption decision is mainly due to the real interest rate, rather than nominal rate.

#### Credit channel

The existence of the credit channel of monetary transmission is founded on the existence of imperfections in the financial markets. Imperfections such as asymmetric information in the credit market give rise to the credit view (3) as referred to in Boivin, Kiley and Mishkin (2010).

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Zhuang (2013) also predicted that inequality in Indonesia is likely to decrease when the share of urban population falls in the range of 71.1 percent to 84.9 percent.

<sup>6</sup> <http://www.bi.go.id/en/moneter/transmisi-kebijakan/Contents/Default.aspx>

<sup>7</sup> Abbreviation for Bank Indonesia

<sup>8</sup> The hypothesis states that the long-run real interest rate is the average of expectations of future short-term interest rates

In this view, monetary policy will not only affect real interest rate, but will also affect the supply of bank loans. Expansionary monetary policy will lead to the increase of bank reserve and bank loans, which will lead to an increase in investment and consumption, ultimately boosting aggregate demand and consumption.

$$\mathbf{M \uparrow \rightarrow \text{bank deposits} \uparrow \rightarrow \text{bank loans} \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow} \quad (3)$$

On the other hand, a contractionary monetary policy leads to the decrease of bank reserves and bank deposits, prompting the decrease of bank loans and subsequently hindering consumption and investment. This then leads to the fall of aggregate demand and output.

$$\mathbf{M \downarrow \rightarrow \text{bank deposits} \downarrow \rightarrow \text{bank loans} \downarrow \rightarrow I \downarrow \rightarrow Y \downarrow} \quad (4)$$

The fact that banks play a less important role in credit markets in comparison to the 50s, 60s and 70s is the point of discussion in terms of the importance of the bank lending channel, as pointed out by Edwards and Mishkin (1995). In Indonesia's case, banks made up around 80 percent of Indonesia's financial sector. Therefore, it is suspected that the monetary transmission mechanism through the bank lending channel is still relevant compared to the asset price channel, although the effectiveness of the bank lending channel in Indonesia's case is a point for investigation.

### **Asset price channel**

Pertaining to monetary policy, asset price is important in two ways. First, it relays the information on the inflation path and expectation of future economic conditions. If cointegration exists between asset price and inflation, it is likely that the information conveyed through asset price is useful in providing a forecast for future economic conditions. While there are several studies, such as Borio (1994), that found a cointegrating relationship between asset price and inflation, this is likely to be very weak or even nonexistent in Indonesia's case, as the banking sector is more dominant compared to the capital market.

Secondly, asset price affects aggregate demand through Tobin's q effect and wealth effect. Asset price channels of monetary transmission in view of Tobin's q can be pictured below:

$$\mathbf{M \uparrow \rightarrow P_e \uparrow \rightarrow q \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow} \quad (5)$$

When q is high, the market price of firms also becomes high relative to the replacement cost of capital. This leads to a cheaper price of business investment (new plant and equipment capital are cheaper relative to the market value of business firms) and therefore boost the issuance of shares by companies, which results in an increase of investment. On the other hand, a contractionary monetary policy will lead to lower equity price or stock price, lowering q and ultimately leading to lower investment spending, and lower aggregate demand and output, as represented below:

$$\mathbf{M \downarrow \rightarrow P_e \downarrow \rightarrow q \downarrow \rightarrow I \downarrow \rightarrow Y \downarrow} \quad (6)$$

Meanwhile, in view of the wealth effect, Modigliani states that the lifetime resources of consumers that are made up of human capital, real capital and financial wealth do affect consumption. As contractionary monetary policy leads to the decline of stock prices, financial wealth will also decline. This in turn leads to a decline in consumption, resulting in the decline of aggregate demand and output.

## **B. Various Channels of the Impact of Monetary Policy on Inequality (Coibion et al., 2012)**

Coibion et al. (2012) laid out several channels in which the inequality response of monetary policy can be observed in the case of the United States. Two of the channels pertaining to income inequality are the income composition channel and earnings heterogeneity channel. In adopting the framework in Coibion et al. (2012), contractionary monetary policy is represented by an increase in BI's interest rate  $i$ , and expansionary monetary policy is represented by decrease in  $i$ . Coibion et al. (2012) found that contractionary monetary policy increases labor income inequality.

### **The income composition channel**

The scenario is:  $\downarrow i \Rightarrow \uparrow \pi, \uparrow wage$

In this scenario, two types of households are considered:

*Case 1.* HH with primary income from labor earnings

*Case 2.* HH with income not primarily from labor earnings, *e.g.* HH with a large percentage of income from business and financial income.

However, suppose that in *Case 2*  $\Delta\pi - \Delta wage > 0$ . This will lead to a disproportionate increase in profit for the firm owner, and therefore:

$\downarrow i \Rightarrow \uparrow \pi, \uparrow wage \Rightarrow \uparrow inequality$

### **The earnings heterogeneity channel**

In the case when a low-income household receives their income mostly from transfers (unemployment benefits, food stamps) compared to other households:

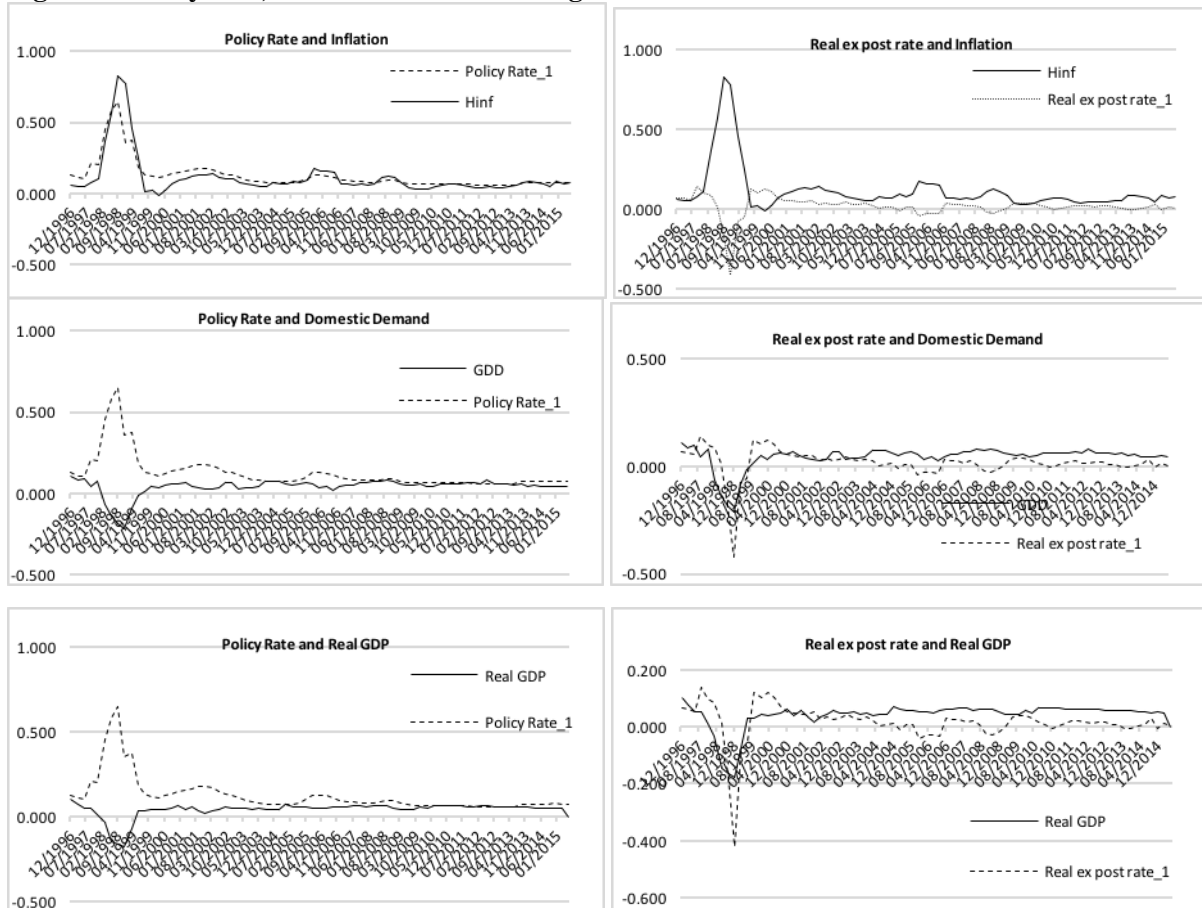
$\downarrow i \Rightarrow \uparrow economic\ growth \Rightarrow \downarrow transfer \Rightarrow \uparrow income\ inequality$

### III. EMPIRICAL RESULTS: THE EFFECTIVENESS OF MONETARY TRANSMISSION CHANNELS IN INDONESIA

*Note: for the list of variables, please look at Appendix A.*

Figure 1 gives a rough illustration of the central bank policy rate movements, headline inflation, domestic demand<sup>9</sup> and real GDP. Inflation moves in the same direction as policy rate<sup>10</sup>, while domestic demand and policy rate, as well as real GDP and policy rate, move in opposite directions. The latter is especially pronounced during and after the AFC. This suggests consistency in terms of monetary policy goals in different periods.

**Figure 1. Policy rate, inflation and economic growth**



*Source: CEIC, Bank Indonesia*

Another variable, the real ex post rate, is taken as the policy rate minus inflation, representing the rate of return in the economy, thus affecting the level of consumption and investment. As such, the real ex post rate will ultimately have influence on how monetary policy affects economic growth and inflation. Therefore, the study will use real ex post rate as opposed to policy rate in order to provide a more realistic illustration of the impact of monetary policy. Figure 1 also shows that the policy rate and real ex post rate

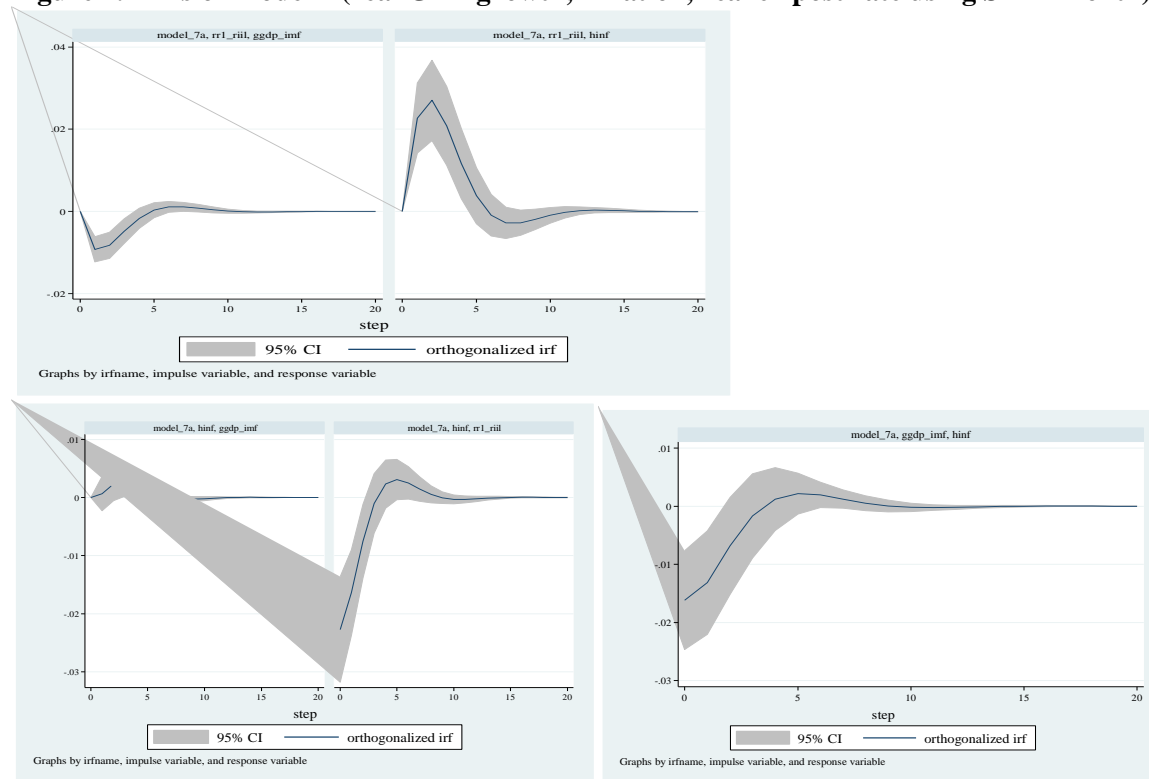
<sup>9</sup> Domestic demand is taken as the total of private consumption and investment.

<sup>10</sup> Policy Rate<sub>1</sub> uses SBI 1 month for periods before ITF.

move in opposite directions. Real ex post rate also moves in the opposite direction to domestic demand and real GDP after the AFC.

In the construction of an appropriate VAR model that represents the most basic monetary transmission mechanism in Indonesia, the study assumes that the decision on policy rate is affected by the level of actual inflation and output. Meanwhile, the level of output as well as the expectation of future levels of inflation will affect the level of inflation. If this assumption holds, the relevant VAR ordering will be: the growth of real GDP (or domestic demand), inflation, and real ex post rate. In the first model, the three variables used are real GDP growth, headline inflation and real ex post rate with SBI 1 month. The growth of non-fuel commodity price and dummy for AFC are used as exogenous variables in the model. Following the results of the lag selection criteria and stability test, lag 1 has been chosen for the model. The impulse response is shown in Figure 2.

**Figure 2. IRFs of Model 1 (real GDP growth, inflation, real ex post rate using SBI 1 month)**



Source: Author's own calculation

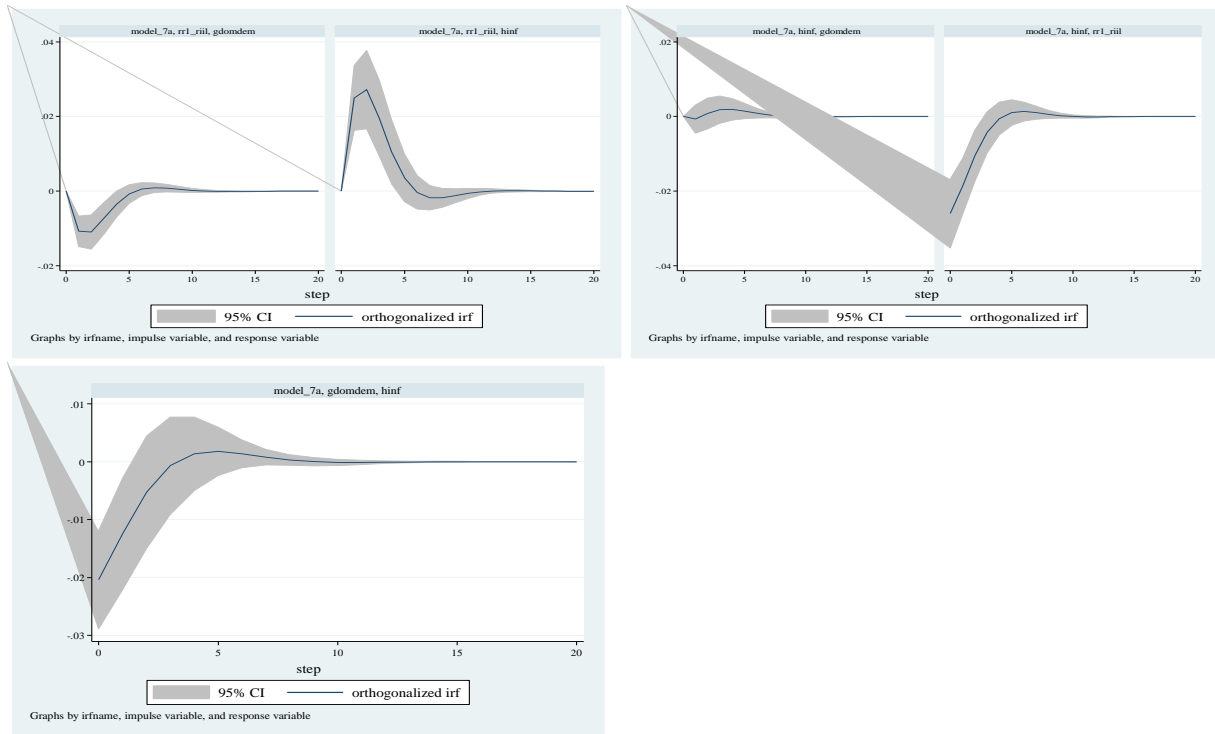
As seen in Figure 2, the response to inflation shock is a temporary increase in the real ex post rate for three quarters - this seems to be in line with the monetary strategy of Bank Indonesia. Additionally, the increase of real ex post rate leads to a temporary decline of real GDP growth for four quarters, which suggests that the monetary policy might have succeeded in curbing both investment and consumption.

However, the temporary increase of inflation for two quarters in response to the increase in real ex-post rate indicates some degree of failure of monetary policy. The high rate of return should attract deposits, especially when the currency is strong, and the economic outlook is positive. When the high rate of return is followed by high inflation, this indicates that people would rather spend their money rather than depositing it, thereby boosting consumption and investment, leading to higher inflation. There is a myriad of reasons why people are reluctant to hold their money in terms of deposits, and these reasons vary from regime to regime: weak domestic currency, low confidence in domestic currency (maybe due to low

international reserve), low credibility of monetary policy and overall low confidence in the economy, to name a few. These reasons nevertheless lead to inefficiency in the transmission process of the policy.

Therefore, it is likely that the rise of the central bank interest rate has been less than efficient in influencing inflation, but instead temporarily boosts consumption and investment when people decide that spending money gives a higher rate of return than holding deposits. This leads to the continuing growth of the overall economy output of an economy, albeit one that is slowing down. This scenario is further supported by the results of forecast error variance decomposition (FEVD), which shows that for Model 1, the real ex post rate contributes around 44 percent and 47 percent to the variance of real GDP growth and inflation respectively. Additionally, real GDP growth is driven by the growth of private consumption and investment, as evidenced by an identical VAR impulse response in Model 2, as compared to Model 1. The second model uses the same VAR ordering as in Model 1, but has instead replaced the growth of real GDP with the growth of domestic demand, taken as the total of private consumption and investment. After the lag selection procedure and stability test, the model is constructed using lag 1, with the impulse response in Figure 3.

**Figure 3. IRFs of Model 2 (growth of domestic demand, inflation, real ex post rate using SBI 1 month)**



Source: Author's own calculation

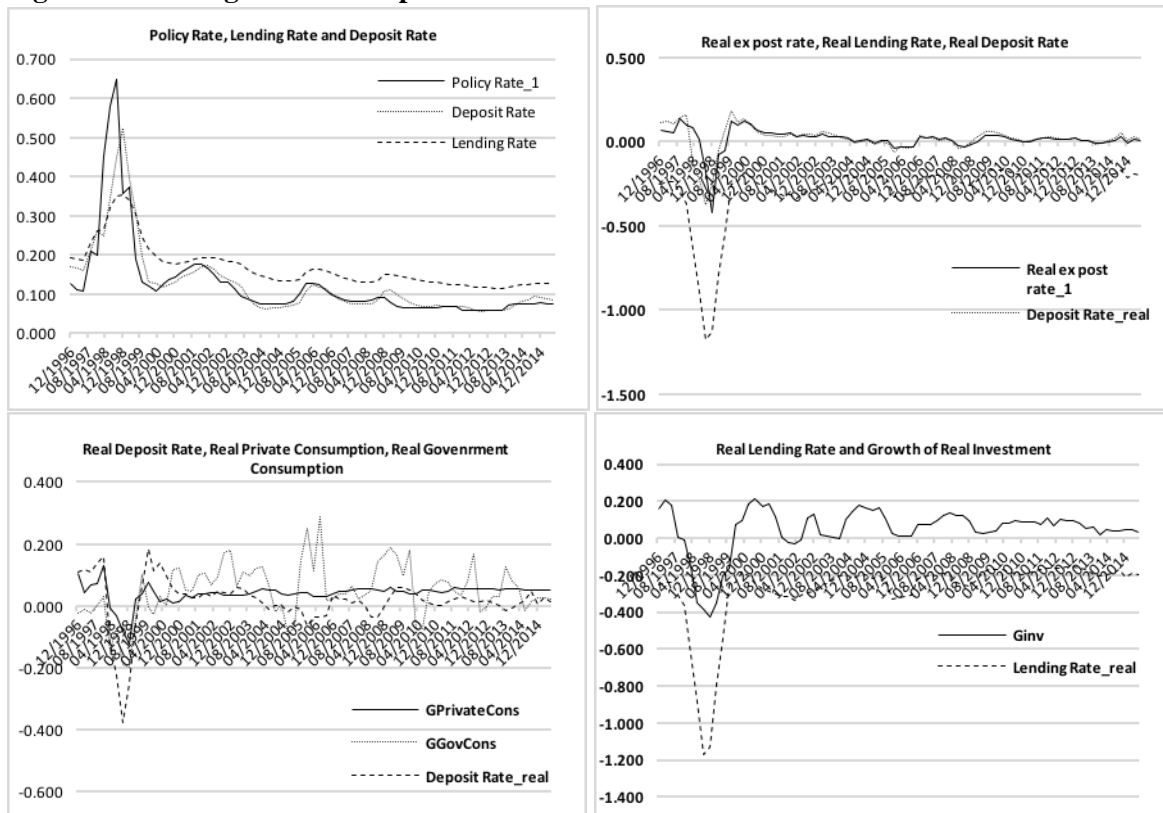
The results in the second model are similar to those of the first model (Figure 3). Real ex post rate shock does lead to a temporary decline of domestic demand for two quarters. An increase in real ex post rate leads to a temporary increase in inflation for two quarters. Meanwhile, inflation shock does not have a significant impact on the growth of domestic demand, while shock in the growth of domestic demand has a significant impact on inflation for the first two quarters. Inflation shock is also followed by a temporary increase in real ex post rate for three quarters. The results of forecast error variance decomposition (FEVD) show that for Model 2, the real ex post rate contributes around 39 percent and 46 percent to the variance of domestic demand and inflation respectively.

Based on these VAR results on the general transmission channel of the central bank interest rate, monetary policy has been less than efficient in influencing inflation. While it does influence economic growth to a certain degree, this is likely to be the aftereffect of other factors, such as the political situation, weak currency, low confidence in the monetary policy, and economic outlook. To delve deeper into this issue, the study will look further at the transmission of the central bank interest rate through the interest rate channel, credit channel and asset price channel.

### Interest Rate Channel

Figure 4 shows that the lending rate and deposit rate move in the same direction as the policy rate. Nevertheless, the lending rate follows the movement of policy rate with some lag, and the magnitude of change is rather small compared to the deposit rate. This shows that the signal from the central bank is transmitted to the banking sector, albeit delayed. Meanwhile, real lending rate and investment move in the same direction, albeit with lags.

**Figure 4. Lending rates and deposit rates**



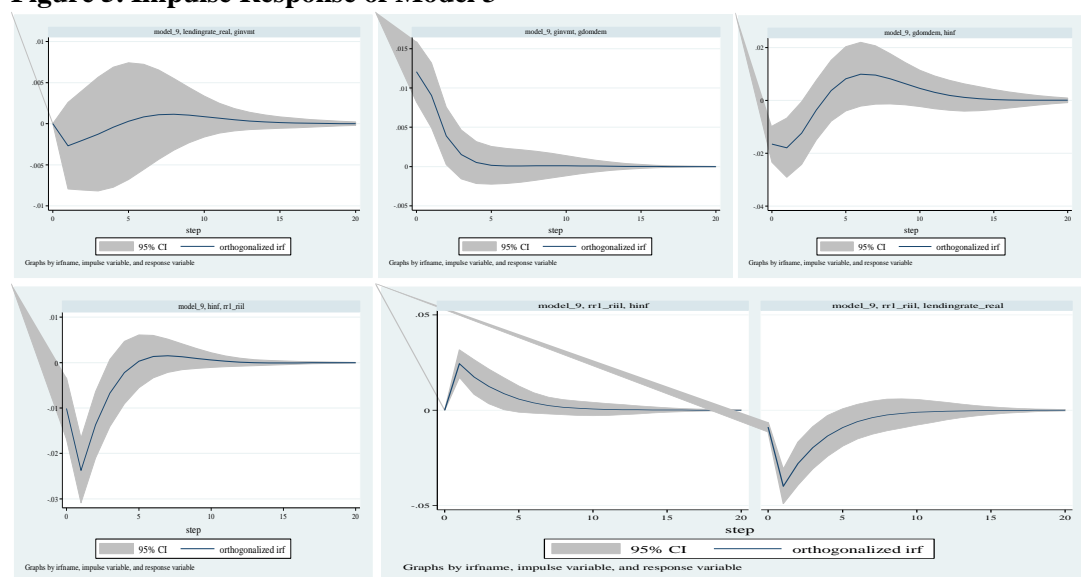
Source: IMF IFS, National Statistical Agency

### Cost of Capital – Model 3

The VAR ordering used in Model 3 is as follows: growth of investment, growth of domestic demand, headline inflation, real ex post rate and real lending rate. The dummy for crisis and the growth of non-fuel

commodity prices are used as exogenous variables. Lag 1 is used for the model. The impulse response is illustrated in Figure 5.

**Figure 5. Impulse Response of Model 3**



Source: Author's own calculation

In line with the previous findings using the VAR model of the general transmission of the central bank interest rate, an increase in real ex post rate results in an increase in inflation for four quarters. A shock in the growth of domestic demand affected inflation negatively, and the negative impact persists for three quarters. Additionally, the variance of inflation is mostly explained by domestic demand and real ex post rate based on FEVD.

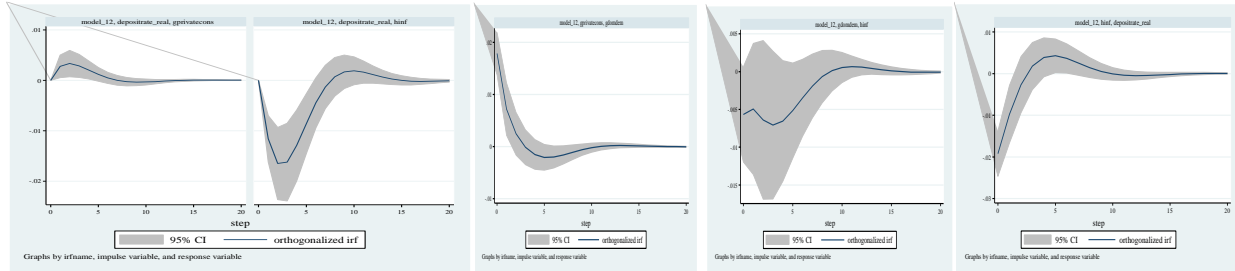
Meanwhile, investment and real ex post rate explain 29.4 percent and 20.7 percent of the variance in the domestic demand growth, further supporting the fact that, while investment is one of the drivers of economics growth in Indonesia, it is not the key driver.

Based on FEVD, real ex post rate contributes as little as 37 percent to the variance of the lending rate. Additionally, the impulse response in Figure 5 shows that the shock in real lending rate does not have a significant impact on investment growth. This is consistent with reality, if indeed companies rely more on self-financing than bank credit.

#### *Substitution Effect – Model 4*

The VAR ordering used in Model 4 is as follows: the growth of private consumption, growth of domestic demand, headline inflation, and real deposit rate. The dummy for crisis and the growth of non-fuel commodity prices are used as exogenous variables. Lag 1 is used for the model. The impulse response is illustrated in Figure 6.

**Figure 6. Impulse Response of Model 4**



Source: Author's own calculation

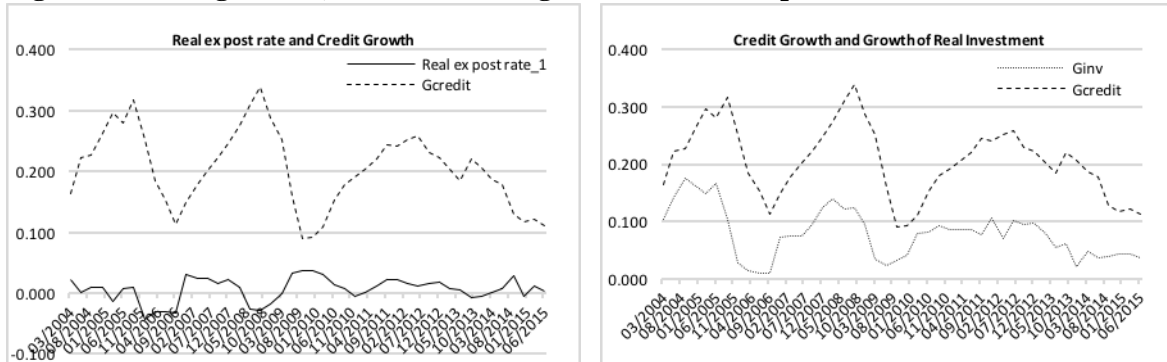
In line with the previous findings on the general monetary transmission, the rise in the deposit rate is not enough to attract deposits and therefore cannot curb consumption. Figure 6 shows that a shock in real deposit rate is responded to positively by the growth in private consumption. On the other hand, a shock in real deposit rate is responded to negatively by inflation. In both cases, the impact persists over five quarters.

Model 4 also shows that private consumption is the key driver of economic growth, as evidenced from the impulse response in Figure 6 and the corresponding FECV. The shock in private consumption growth leads to an increase in the growth of domestic demand for two quarters, while FEVD also shows that private consumption contributes 52.7 percent of variance in domestic demand. Additionally, inflation is largely explained by private consumption.

### Credit Channel

Data of total banking loans from financial services authority is only available from 2003 onwards. Hence, this section uses fewer data that is from 2003-2015.

**Figure 7. Credit growth<sup>11</sup>, real investment growth and real ex post rate**



Source: Financial Services Authority, CEIC

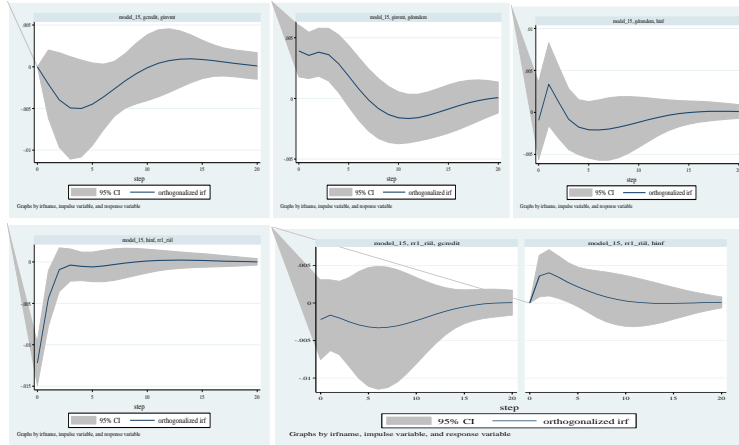
Figure 7 shows that from 2003 to 2015, credit growth and real ex post rate move in opposite directions. These findings are realistic. For one, during a stable economic period (2003-2015), a rise in the rate of return in the economy should propel more savings and as such, incentives to take a loan for investment

<sup>11</sup> Total credit = Total bank loans to third party (non-bank)

might be lower. Meanwhile, credit growth and investment growth move in the same direction, consistent with the framework in Mishkin (1996) in section I, representation (3).

The credit channel is modelled using the following VAR ordering (Model 5): investment growth, growth of domestic demand, headline inflation, real ex post rate, and credit growth. Lag 1 is used in the model. Figure 8 illustrates the impulse response for Model 5.

**Figure 8. Impulse Response for Model 5**



Source: Author's own Calculation

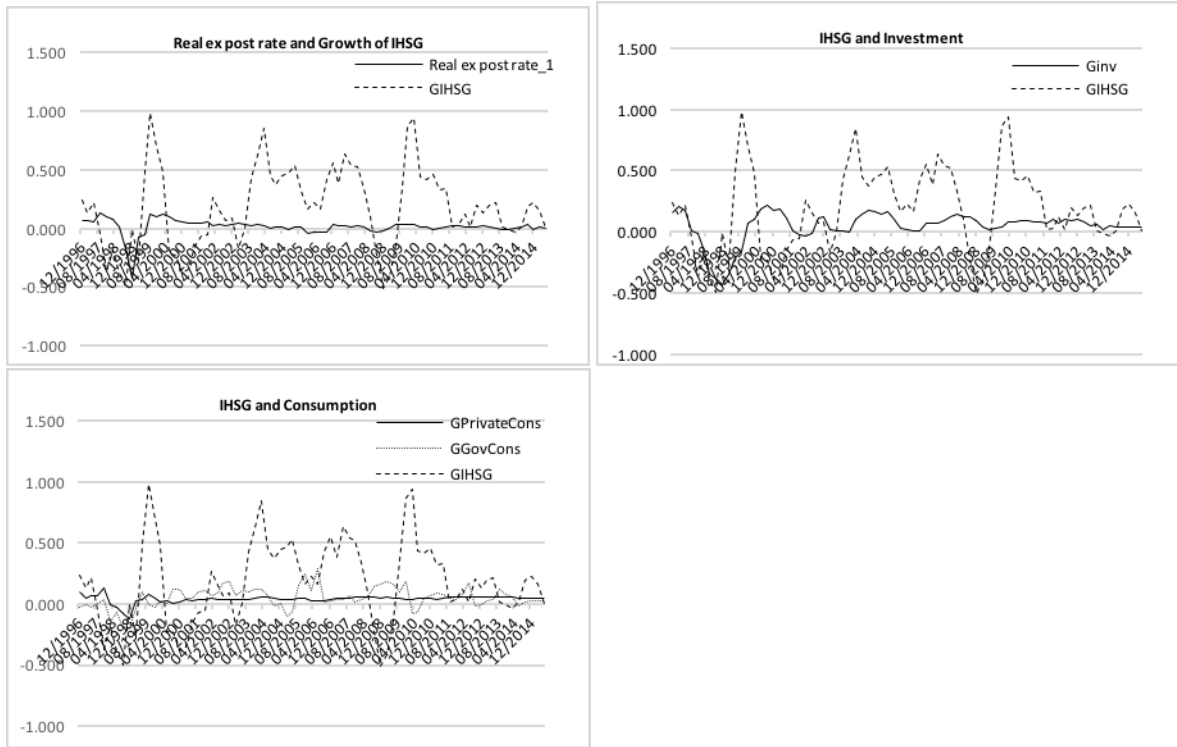
In line with the previous findings in Model 3, the increase in investment growth is responded to by the increase in the growth of domestic demand. A shock in the real ex post rate does not have a significant impact on credit growth, consistent with the findings from Model 3, in which the lending rate does not respond to the shock in real ex post rate.

Nevertheless, Figure 8 shows that a shock in credit growth is not significant in influencing the growth of investment. This is probably due to the fact that in most companies, a large portion of project financing does not come from bank loans.

### Asset Price Channel

There is no clear relationship between IHSG and real ex post rate in Figure 9. This is due to many other factors that affect IHSG, such as market sentiment and economic growth. Similarly, there seems to be an unclear relationship between IHSG and both investment and consumption. As such, asset price channel might not be a strong transmission channel of monetary policy in the case of Indonesia.

**Figure 9. IHSG, real ex post rate, investment and consumption**

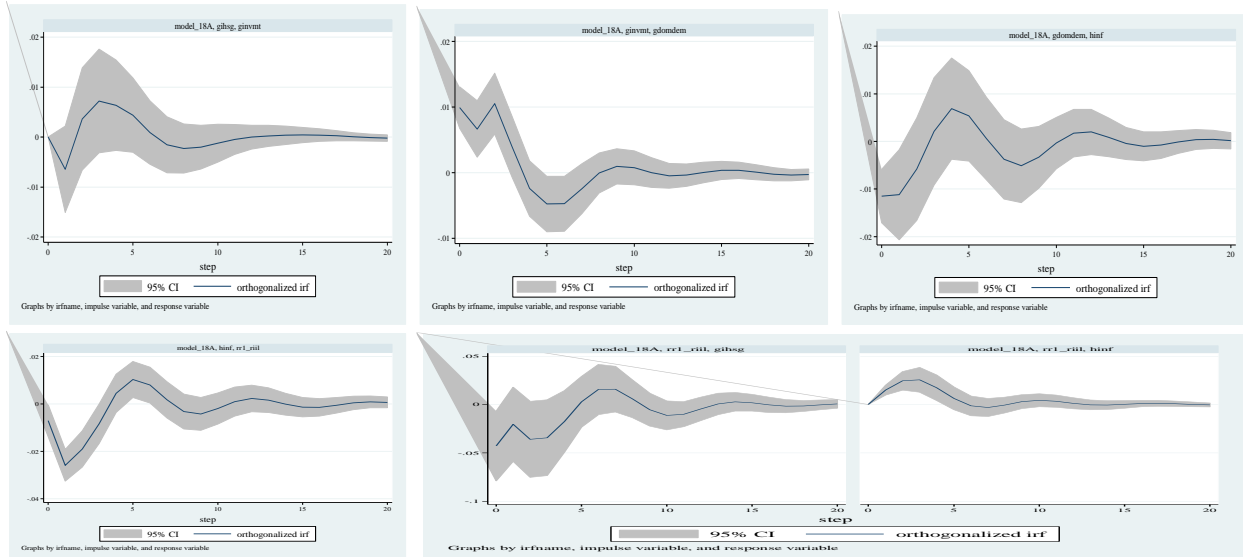


Source: BI, CEIC

*Investment Effect*

Model 6 is used to examine the monetary transmission through asset price channel in view of investment effect. The VAR ordering is as follows: investment growth, growth of domestic demand, headline inflation, real ex post rate, and the growth of Jakarta Composite Index (IHSG). Lag 2 is used in the model. The impulse response for Model 6 is shown in Figure 10.

**Figure 10. Impulse response for Model 6**



Source: Author's own calculation

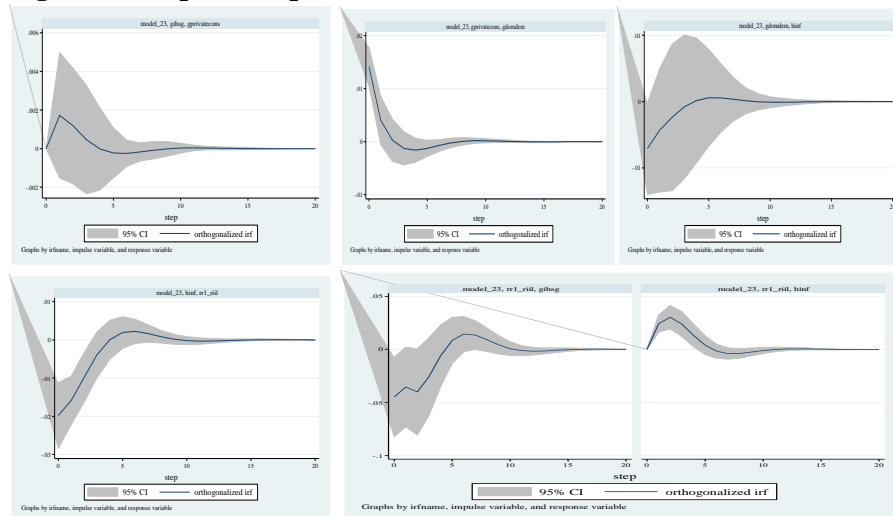
Consistent with previous findings, the shock in investment growth is responded to positively by the growth of domestic demand for roughly three quarters, while the shock in real ex post rate is responded to by the rise of inflation for five quarters.

Based on Figure 10, the shock in real ex post rate does not have a significant impact on the growth of IHSG, and in turn, a shock in the growth of IHSG does not have a significant impact on the growth of investment. Additionally, FEVD also shows that IHSG contributes very little to the overall variance of inflation and domestic demand. As such, the asset price channel in view of investment effect is unlikely to be a representative channel of monetary transmission in Indonesia.

### Wealth Effect

In view of wealth effect, the VAR ordering in Model 7 is as follows: private consumption growth, growth of domestic demand, headline inflation, real ex post rate, and the growth of Jakarta Composite Index (IHSG). Lag 1 is used in the model. The impulse response for Model 7 is shown in Figure 11.

**Figure 11. Impulse response for Model 7**



Source: Author's own calculation

The impulse response of Model 7 shows consistency with previous models. It also shows that the increase in the growth of private consumption was responded to positively by the growth of domestic demand for one quarter. Meanwhile, the increase in real ex post rate is responded to by an increase in inflation for five quarters. FEVD also shows that private consumption growth largely explains the variance of domestic demand growth.

The findings from the impulse response shows that asset price channel in view of wealth is not a representative channel for monetary transmission in Indonesia. Figure 11 shows that shock in real ex post rate does not have a significant impact on the growth of IHSG, and in turn, the shock in the growth of IHSG does not have a significant impact on private consumption. Overall, IHSG contributes less than one percent to the variance of each variable in Model 7, based on FEVD.

This finding is plausible due to several reasons. For one, it is likely that the proportion of shares in household wealth in Indonesia is relatively small. There should be a large proportion of the population with no bank account, and with zero understanding of securities and financial assets. Additionally, a large proportion of investors in the capital market are foreigners, and therefore unlikely to use the income they gain from shares for consumption in Indonesia.

#### IV. CONCLUSION

The initial hypothesis of the study is that monetary policy in Indonesia influences income inequality via inflation. That is, by managing inflation within a targeted level, Bank Indonesia achieves its price stability objective and therefore monetary policy has a positive impact on income inequality.

However, VAR models show that monetary policy (as represented by Bank Indonesia's interest rate) has been less than efficient in influencing inflation, and therefore has no significant impact on income inequality via inflation in Indonesia's case. This is shown in all VAR models, in which an increase in the real ex post rate is always responded to by an increase in inflation that persists for several quarters. Additionally, a shock in the growth of domestic demand (mainly driven by private consumption as opposed to investment) affected inflation negatively and persisted for several quarters. Meanwhile, its impact on economic growth is likely to be the result of other factors, such as the political situation, weak currency, low confidence in the monetary policy, and economic outlook.

The study has nevertheless defined several key features of monetary transmission channels in Indonesia based on the VAR models. Firstly, monetary policy has no significant impact on inflation and economic growth through the interest rate channel. Persistent excess of liquidity and the lack of response from the supply side certainly reduce the effectiveness of monetary policy transmission to real sector and undermine the effectiveness of monetary policy via the interest rate channel.

Secondly, monetary transmission through the asset price channel does not take place due to a couple of reasons: a small proportion of shares in household wealth composition, little to zero understanding of securities and financial assets in a large fraction of the population, and large foreign ownership in the capital market.

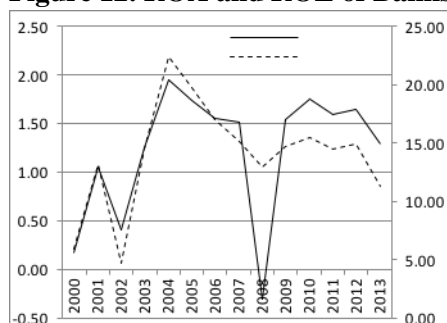
Thirdly, the central bank interest rate is transmitted with considerable lags to banking systems, as evidenced in Model 3 and 4. Once transmitted, the change in lending rate does little to spur investment, which might be due to the fact that companies rely on self-financing more bank loans (Model 3 and Model 5). Similarly, the change in deposit rate is not attractive enough to attract savings.

The ineffective transmission of the central bank rate via the credit channels is to be expected, as Indonesia's financial sector needs more depth (access to financial institutions and financial products are not equal in every part of Indonesia) and are mostly comprised of banks with low efficiency.

By 2012, the size of non-bank financial institutions' assets to GDP in Indonesia is only around 5.79 percent, while the size of bank deposits to GDP is 34.56 percent. After the AFC, several initiatives were implemented by the government in order to save the Indonesia's banking system, namely Bank Indonesia liquidity assistance, government blanket guarantee on January 26, 1998, and Establishment of National Bank Restructuring Agency (IBRA) on January 27, 1998. In 2003, Bank Indonesia formulated the Indonesia Banking Architecture aimed to produce a healthy, robust and efficient banking system. These

policies resulted in the improved performance of the banking sector in Indonesia. Figure 12 shows an increase in ROA and ROE after 1999. Additionally, the ROA and ROE of banks in Indonesia were the highest in the ASEAN region by 2009.<sup>12</sup> At the same time, the net interest margin (NIM) of Indonesian banks was likewise the highest in the region.

**Figure 12. ROA and ROE of Banks in Indonesia**



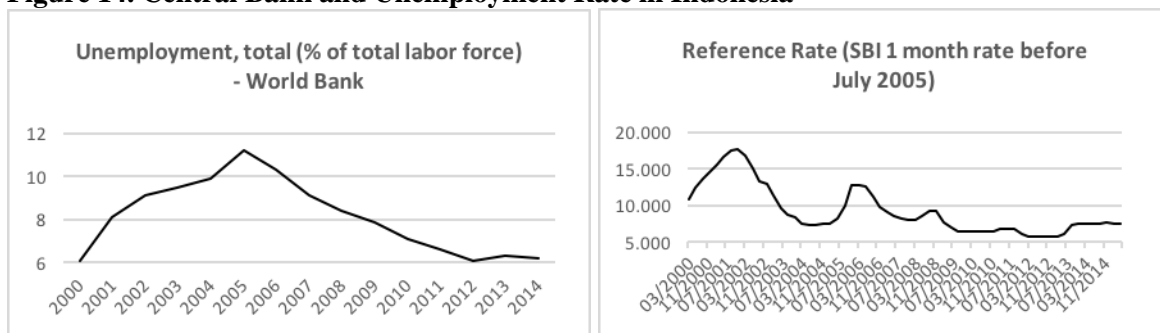
Source: FRED

However, the banking efficiency in Indonesia is still low, which is reflected in the high ratio of operating costs compared to operating income (BOPO), which reached above 70 percent by 2014. This somewhat undermines the effectiveness of the credit channel.

Despite the inefficient monetary transmission to inflation and economic growth, the impact of monetary policy on income inequality could be viewed from income composition and earnings heterogeneity channels (Coibion et al., 2012). One of the aspects that should be looked at is the unemployment rate, as it pertains to the relationship between BI's interest rate and income inequality. To a certain degree, the movement of BI's interest rate is also reflected in the unemployment rate after 2000. The unemployment rate went down as the reference rate was cut, and went up as the reference rate went up (Figure 14).

<sup>12</sup> At the time, the average of ROA for banks in Indonesia was higher than Singapore (1.1 percent), Japan (0.2 percent), UK (-0.1 percent), American (0.1 percent), and China (1.1 percent). Similarly, the ROE of Indonesian banks was higher than Malaysia (13 percent), Singapore (11.1 percent), and China (17.1 percent).

**Figure 14. Central Bank and Unemployment Rate in Indonesia**



Source: World Bank and Bank Indonesia

This is best explained by the following argument: suppose companies rely on borrowed funds to finance their medium- to long-term investments. When short- and long-term interest rates decline, the cost of borrowing also declines and therefore will spur such investments to expand businesses. Additionally, households are more willing to buy goods and services, resulting in an increase in demand of goods. Firms, in response to this surge of demand, increases its production and hires more workers, which result in persistent lower unemployment rate in the coming years (Figure 14).

Although the National Statistical Agency neither publishes nor sells the Indonesian household income data, it could be asserted by common knowledge that labour earnings occupy the largest percentage of most household incomes in Indonesia, especially in the last decade. Thus, any changes in the central bank interest rate that affects the unemployment rate will therefore affect labour earnings, and subsequently income inequality (if the households with income mostly from businesses do not experience a change in their overall income level).

However, in light of these findings, it is crucial to note several limitations in the study. First, the VAR models do not at all times satisfy normality assumption, and several variables in the models are serially correlated at lags 3 and 4, even with additional lags. This might lead to some inconsistencies found in the impulse responses<sup>13</sup>. With regards to persisting serial correlation, it is likely due to seasonal adjustment, as investments exhibit strong seasonality. This variable is used in generating the variables *gdomdem* and *ginvmt*. With regards to normality assumption, this could probably be overcome by using a larger sample, which is likely to yield a much better result due to possible inconsistencies that could be found in the larger period. Secondly, the linkage from the central bank reference rate to the production and employment of an economy is influenced by a range of factors, which makes it difficult to precisely identify the effect of monetary policy on the economy.

<sup>13</sup> Initially, several models were tested and, using lag criteria, a suitable lag length was chosen. If the resulting impulse response was unstable, the lag was reduced to a level that still allowed for a stable model.

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## Appendix A. Stationarity of Variables

Variable	Description	Source	p-value	Significance	Lag
rr1	Policy rate (with SBI 1 month)	Bank Indonesia	0.0055	***	2
rr2	Policy rate (with SBI 3 month)	Bank Indonesia	0.0072	***	3
gdomdem	Growth of Domestic Demand	National Statistical Agency	0.0004	***	2
ggdp_imf	Growth of Real GDP	National Statistical Agency	0.0045	***	1
hinf	Headline Inflation	CEIC	0	***	1
ginv	Growth of Real Investment	National Statistical Agency	0	***	3
deposirate_real	Real Deposit Rate	IMF IFS	0	***	2
lendingrate_real	Real Lending Rate	IMF IFS	0.0146	**	5
gprivatecons	Growth of Private Consumption	National Statistical Agency	0.0001	***	0
gihsg	growth of IHSG	CEIC	0.0258	**	4

## Appendix B. FEVD

Table 1. FEVD - gen

		<i>ggdp_imf</i>	<i>gdomdem</i>	<i>hinf</i>	<i>rr1_riil</i>
Model 1	<b>ggdp_imf</b>	51.14		4.73	44.13
	<b>hinf</b>	12.62		40.31	47.08
	<b>rr1_riil</b>	11.385		29.20	59.41
Model 2	<b>gdomdem</b>		59.6	1.44	38.96
	<b>hinf</b>		14.94	38.88	46.18
	<b>rr1_riil</b>		5.485	38.21	56.30

Table 2. FEVD – int - coc

	<i>ginvmt</i>	<i>gdomdem</i>	<i>hinf</i>	<i>rr1_riil</i>	<i>lendingrate_real</i>
<b>ginvmt</b>	87.81	0.6	6.04	5	0.5
<b>gdomdem</b>	29.41	41.29	3.03	20.74	5.53
<b>hinf</b>	6.54	24.95	37.29	25.25	5.96
<b>rr1_riil</b>	2.1	38.99	23.83	22.965	12.11
<b>lendingrate_real</b>	4.84	25.025	22.61	37.17	10.36

Table 3. FEVD – int - se

	<i>gprivatecons</i>	<i>gdomdem</i>	<i>hinf</i>	<i>depositerate_real</i>
<b>gprivatecons</b>	90.83	2.89	0.71	5.57
<b>gdomdem</b>	52.74	37.72	1.5	8.04
<b>hinf</b>	43.06	5.31	30.25	21.38
<b>depositerate_real</b>	33.13	5.9	16.4	44.57

Table 4. FEVD credit

	<i>ginvmt</i>	<i>gdomdem</i>	<i>hinf</i>	<i>rr1_riil</i>	<i>gcredit</i>
<b>ginvmt</b>	89.59	1.27	0.73	1.37	7.05
<b>gdomdem</b>	52.4	32.42	5.56	3.71	5.92
<b>hinf</b>	50.24	3.62	30.86	5.48	9.81
<b>rr1_riil</b>	41.4	5.62	40.77	3.46	8.71
<b>gcredit</b>	76.74	3	0.87	2.15	17.23

Table 5. FEVD asset price – investment effect

	<i>ginvmt</i>	<i>gdomdem</i>	<i>hinf</i>	<i>rr1_riil</i>	<i>gihsg</i>
<b>ginvmt</b>	68.78	2.09	15.15	8.975	5.015
<b>gdomdem</b>	36.76	21.39	10.63	25.69	5.52
<b>hinf</b>	22.1	7.07	35.88	30.7	4.25
<b>rr1_riil</b>	20.15	7.71	34.86	30.49	6.79
<b>gihsg</b>	9.835	2.515	11.74	10.3	65.6

Table 6. FEVD asset price – wealth effect

	<i>gprivatecons</i>	<i>gdomdem</i>	<i>hinf</i>	<i>rr1_riil</i>	<i>gihsg</i>
<b>gprivatecons</b>	55.04	1.63	1.36	41.205	0.76
<b>gdomdem</b>	30.09	34.3	0.91	34.14	55
<b>hinf</b>	18.155	1.64	28.985	50.68	0.54
<b>rr1_riil</b>	19.425	1.425	22.14	56.45	0.55
<b>gihsg</b>	3.095	22.28	6.74	11.01	0.57

## Appendix C. VAR Models

			Name in Paper	Lag				
				AIC	HQIC	SBIC	Own choice	
general transmission		Model 3	Model 1			2		
		Model 4		8				
		Model 5			4			
		Model 6				3		
		Model 6a					2	
		Model 7				3	3	
		Model 7a	Model 2					1
interest rate	cost of capital	Model 8				2		
		Model 9	Model 3, lag 1					1
	substitution effect	Model 10			3			
		Model 11				2		1
		Model 12	Model 4, lag 1					1
credit		Model 13		3	3			
		Model 14					2	
		Model 15	Model 5, lag 1				1	
asset	investment effect	Model 16A				4		
		Model 17A					3	
		Model 18A	Model 6					2
		Model 19A						1
	wealth effect	Model 20		4	4	4		
		Model 21						3
		Model 22						2
		Model 23	Model 7					