Jejak Vol 11 (1) (2018): 189-206 DOI: https://doi.org/10.15294/jejak. v11i1.12385

JEJAK

Jurnal Ekonomi dan Kebijakan

http://journal.unnes.ac.id/nju/index.php/jejak

Effectiveness of Monetary Policy Transmission Mechanism in Indonesia

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Permalink/DOI: https://doi.org/10.15294/jejak. v11i1.12385

Received: October 2017; Accepted: January 2017; Published: March 2018

Abstract

This research aimed to analyse monetary mechanism effectivity to manage inflation in Indonesia through interest rate channel, credit channel, and expectation inflation channel. The research used Vector Error Correction Model (VECM) to analyze effectiveness of monetary policy transmission mechanism in Indonesia. The most effective channel was measured by result of Impulse Response Function and Variance Decomposition. They are: (1). The fastest time lag needed since the shock of monetary instruments (rSBI) until the realization of final target of monetary policy (inflation). (2). How strong the variables in each channel response the shock of SBI interest rate and other variable. The data used in this research is quarterly time series dara from 2005Q1 until 2016Q4. The results of this research show that the most effective channel in managing inflation during 2005Q1 until 2016Q4 is inflation expectation channel.

Key words : Inflation Rate, Monetary Policy Transmission Mechanism

How to Cite: Mentari N, R., Hayati, B., & A G, E. (2018). Effectiveness of Monetary Policy Transmission Mechanism in Indonesia. JEJAK: Jurnal Ekonomi dan Kebijakan, 11(1), 189-206. doi:https://doi.org/10.15294/jejak. v11i1.12385

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p-ISSN 1979-715X
e-ISSN 2460-5123

INTRODUCTION

The impact of monetary policy implementation on inflation is not immediate, but there is time lag through the monetary policy transmission mechanism. The effectiveness of the path of monetary policy transmission mechanism is important. It is to find out how strong and the length of grace period of each transmission line works. The effectiveness of the Monetary Policy Transmission Mechanism (MTKM) is measured by two indicators: first, how fast it is (time lag), second, how strong the variable power in determining economic variable and which financial variables which are the strongest to be leading indicator of inflation movement and the operational target of monetary policy are (Warjiyo, 2004).

The changes in financial and banking sector also greatly affect the speed of monetary policy transmission. A substantial decrease of BI rate will be slowly responded by banks to avoid economic risks. When banks consolidate to improve their capital, the decline in lending rates may not necessarily be responded by increasing credit distribution which will lead to instability. Therefore, the control of inflation requires the active role of banking sector, the financial sector and the real sector in determining whether the monetary policy transmission process is in line with the central bank's target or not (Sir, 2012).

Bank Indonesia uses the BI rate instrument as the main target to achieve the ultimate goal of inflation. The mechanism of working the change in BI rate which affects inflation is called the monetary policy transmission mechanism (MTKM) (Yusuf, 2014). Based on the current phenomenon and trends which are characterized by the increasing effectiveness of banking intermediation function, the increasing of bank credit in the business world, and a better formation of inflation expectation, it is necessary to analyze MTKM interest rate, credit line and inflation expectation path.

Then, several previous studies have shown different outcomes about which path is most effective in influencing inflation. Alfian (2011) concludes that the interest rate channel did not effectively reach the target between monetary policies in Indonesia during the period 2005: 07 - 2010: 06. While Natsir (2009a, 2009b) concludes that the channel rate channel path and inflation expectation path effectively reached the final target of monetary policy in 1990: 2 - 2007: 1. Again, Wulandari (2012) finds that the interest rate path is more effective for controlling inflation, while the credit line is more effective to influence economic growth. Regarding to previous researches above, the research gaps indicate that a research on which paths are most effective in MTKM is still relevant to do. Therefore, this study would like to re-examine which path is most effective among the interest rate, credit line and inflation expectations line in achieving the inflation target in Indonesia during the period 2005Q1 - 2016Q4.

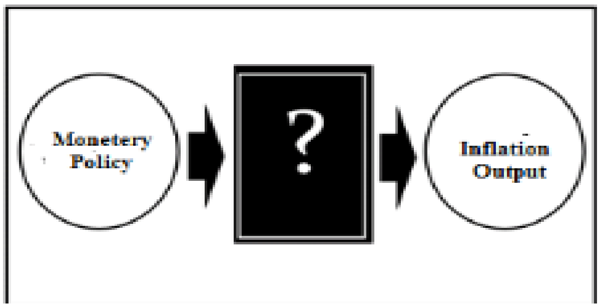

Figure 1. The Monetary Transmission Mechanism as a "Black Box"
Source: (Warjiyo, 2004)

As well as a roadmap, the Monetary Policy Transmission Mechanism (MTKM) demonstrates a process of how the monetary policy adopted by the central bank influences various economic and financial activities which are going to be achieved, namely price stability and economic growth (Warjiyo, 2004).

Figure 1 shows a black box which is a monetary policy transmission mechanism, the paths which monetary policy passes through to affect the ultimate goal of inflation. These lines include interest rate, credit, exchange rate, and asset price and inflation expectation path.

Furthermore, the interest rate applicable to each sale of SBI is determined by market mechanism based on the auction system. Since early July 2005, BI announced the target of its interest rate of SBI for auction at a certain period which is called ad BI rate.

Then, it becomes the reference of market participants in following the auction. In February 2008, the operational targets of monetary policy (refinement of the Inflation Targeting Framework) were reflected in the development of the Overnight Interbank Money Market Rate (PUAB O/N). The movement of PUAB interest rate is expected to be followed by the development of deposit interest rate and then affect the interest rate of credit (Alfian, 2011).

The relationship between operational and the ultimate goals of monetary policy is indirect, complex and it requires a long time lag. Central bank monetary experts and practitioners designed simple rules to assist in the implementation of monetary policy by adding an indicator called intermediate objectives.

The target which is well known is the money offer or money supply which is measured by one of the monetary aggregates (Alfian, 2011).

The ultimate goal of monetary policy in Indonesia refers to Article 7 paragraph (1) of Law Number 3 of 2004 which explicitly states that the ultimate goal of monetary policy is to achieve and maintain stability of Rupiah (monetary stability in the case of low and stable inflation and non volatile exchange rate) (Warjiyo quoted by Alfian, 2011).

When BI raises the SBI rate, the increase will encourage the rise of interbank money market rate, deposit rate, bank credit, asset prices, exchange rates and inflation expectations in society. This development reflects the operation of monetary transmission lines which will subsequently affect consumption, investment, exports and imports which are components of external demand and aggregate.

The operational framework of interest rate lines emphasizes that monetary policy is influenced by changes in interest rates. The main focus of this pathway is short-term interest rate changes that then in the long run affect investment and consumption, which will drive aggregate demand and be able to achieve the ultimate goal of inflation.

Meanwhile on the credit lines, the policies which are in order to influence aggregate demand are based on quantity or availability of credit. A monetary policy will encourage asset prices, so the value of collateral that backs up a guarantee will be affected and will eventually change the borrower's access to the bank. Futher, the investment activity increases as well as the output and there will be an increase in aggregate demand.

On the path of inflation expectations stresses that monetary policy can be directed to influence the formation of inflation and economic expectations. It can then be a consumption and investment decision which in turn will drive changes in aggregate demand and inflation. The operational framework of the asset price path emphasizes changes in asset prices and public wealth and will affect investment and consumption.While the exchange rate emphasizes the importance of changes in the price of financial assets in the form of foreign exchange in various economic activities.

This study aims to analyze the effectiveness of MTKM through Interest Rate Line, Credit Line and Expectation Line Inflation. In the interest rate channel, expansionary monetary policy causes a decline in real interest rates. The expansive monetary policy by raising the SBI interest rate will be followed by an increase in the interbank money market rate which is then responded by decreasing output gap and inflation.

On credit lines, banks have a special role in the financial system because they are able to overcome asymmetric information problems in credit markets. The expansive monetary policy by raising the SBI interest rate will be followed by an increase in bank reserves which is then responded by increasing credit disbursement and output gap so that it will raise the inflation rate. On the inflation expectations line, monetary policy changes through monetary policy instrument shock (rSBI) may affect public inflation expectations toward inflation targets. Again the expansive monetary policy by raising the SBI interest rate will be responded by the strengthening of the exchange rate (appreciation), so that inflation rises.

The effectiveness of MTKM whish is measured by two indicators will respond to the shock of monetary policy instruments, namely the Interest Rate of Bank Indonesia Certificates (rSBI) and other variables until the ultimate goal of monetary policy is realized. Both indicators are obtained from Impulse Response Function (IRF) Test and Variance Decomposition (VD) Test

RESEARCH METHODS

This study used Vector Autoregression Model (VAR) which assumes that all equality models are endogenous, then it is estimated simultaneously (Gujarati, 2004). The estimation used unrestricted VARs if the data in the variable indicated stationary at a current level, or use VAR indifference if the data were arnon-stationary but not integrated on the same degree. If the data on all non-stationary variables but occured cointegration on the same degree then the model estimation used Vector Error Correction Model (VECM).
If the VAR model can be written as follows:

$$Z_t = \sum_{i=1}^{k} \Pi_1 Z_{t-i} + u_t \quad \text{.........................(1)}$$

Based on equation (1), the first-difference form for VECM estimates would be as follows:

$$\Delta Z_t = \Pi_i Z_{t-i} + \sum_{i=1}^{k-1} \Gamma_i \Delta Z_{t-1} + u_t \quad \text{.....................(2)}$$

Notes:

ΔZ_{t-1} : First-difference vector matrix
Π : Cointegrating matrix vector x matrix coefficient
Γ_i : Coefficient matrix
u_t : Vector error matrix

In this study, the analysis used is Vector Error Correction Model (VECM). It was firstly introduced by Engle and Granger (1983). The objective of VECM is to correct short-term disequilibrium against the long-term. Furthermore, VECM will reset long-term behavioral relationships between variables in order to be convergent into cointegration relationships but still allow short-term changes.

This study used ten variables consisting of one dependent variable and nine independent variables with research period about 2005 quarter 1 to 2016 quarter 4. The data used comes from Indonesian Economic and Financial Statistics (SEKI), BI Annual Report, IMF Financial Statistics, and Indonesian Banking Statistics. The variables used in this research are:

Inflation (INF) which is based on the CPI measured in percent units. Interest rate of Bank Indonesia Certificates (rSBI) which is the interest rate imposed by BI on the issuance of SBI's measured in percentage units. Interbank Money Market interest rate (rPUAB) which is the interest rate charged by the bank to another which do the loan measured in percent units.

Deposit interest rate (rDEPO) which is the interest given as a consideration for the customer who keeps the money in the bank as measured in percentage units.

The loan interest rate (rKRDT) which is the price to be paid by the borrower's customer to the bank which is measured in percentage units. Inflation expectations (SKDU) that is one of the indicators of inflation expectations that have information on the price level measured in percent units.

Bank reserves (CB) which is part of the bank's assets in the form of a liquid instrument to face the possibility of customer account withdrawal as measured in billion rupiah. Loans (KRDT) which are loans extended by commercial banks to various economic sectors (third parties or other banks) measured in billion rupiah.

The exchange rate (ER) that is the price of a foreign currency (US dollar) in the domestic currency as measured in thousands of rupiah. Output Gap (OG) that is the difference between actual GDP and potential GDP. Potential GDP is proxyed from actual GDP trends calculated by the Hodrick-Prescott Filter (HPF) method measured in billion rupiah.

The equation model of interest rate, credit line and inflation expectation path (Appendix A) in this study are estimated using Vector Error Correction Model (VECM) analysis tool which requires some tests such as: Stationarity Test (Root Unit Test), Granger Causality Test, Cointegration Test (Johansen Method), Lag Determination (Optimal Lag) and Model Stability Test. Furthermore, to test the effectiveness of MTKM, this study used Impulse Response Function (IRF) analysis and Variance Decomposition (VD) analysis..

RESULTS AND DISCUSSION

The results of this study show that the transmission mechanism of interest rates can be explained as follows: First, the transmission in the monetary sector starts from the change in the SBI rate responded by changes in the interbank rates, time deposit rates and lending rates. Second, the transmission from the financial sector to the real sector depends on the influence of interest rates (deposit rates, lending rates) on consumption and investment. It affects the aggregate demand and the aggregate supply (output gap). Then, the output gap pressure will affect the inflation rate.

The interest rate transmission process takes approximately 47 quarters to get back to the initial equilibrium point before the shock on the SBI rate (IRF test result). The variable that has the greatest influence in the interest rate channel is the PUAB interest rate (from 10.65% in the event of SBI rate shock to 19.79% in the fifty-fifth period). This result indicates that PUAB interest rate has a strong relationship with SBI interest rate, so that PUAB interest rate fulfills the requirement as operational target of monetary policy to reach the final target that is inflation.

These results are in line with Warjiyo's (2003) study which suggests that the monetary policy transmission mechanism through the interest rate channel emphasizes that monetary policy can affect aggregate demand through interest rate changes. Natsir's research (2009b), Maski (2005), Yusuf (2014), Dyahningrum (2016), and Judge (2001) prove that MTKM in Indonesia through effective interest rate and the role of interbank interest rate has a strong influence on long-term interest rate deposit rates and as operational targets.

In addition, the results of this study show the transmission mechanism on the credit line which can be explained as follows: the transmission begins from changes in the SBI rate responded by changes in deposit rates and bank reserves.

Changes in bank reserves affect the size of the loans granted by the bank. Meanwhile, the influence of deposit and lending rates has an impact on consumption and investment as deposit rates represent components of community income and lending rates as consumption financing. Loan interest rates are also a component of capital costs for the amount of investment.

The influence of interest rates on consumption and subsequent investments will have an impact on the amount of aggregate increases. If aggregate demand is not balanced with aggregate supply, an output gap will occur. Eventually, the output gap pressure will affect the inflation rate.

Moreover, the credit line transmission process takes approximately 36 quarters to get back to the initial equilibrium point before the shock on the SBI rate (IRF test result). The variable that has the greatest influence in the credit line is the deposit rate (from 0.038% in the event of the shock of the SBI interest rate to 45.82% in the next fifty quarters). These results indicate that the deposit rate has a strong relationship with the SBI rate so that the deposit rate meets the requirements as the operational target of monetary policy to reach the final target of inflation.

There are several other studies which focus on monetary policy transmission mechanisms through credit lines affecting the real sector, such as Oliner's (1996) research which finds that credit lines are more relevant for developing countries because they are based on premises, as well as the researches conducted by Azali (1999) with a case study in Malaysia, and Ramlogan (2007) in Trinidad and Tobago. For more, Nuryati (2004) and Wulandari (2012) studies with case studies in Indonesia note that credit lines play an important role in MTKM in maintaining inflation, while credit lines effectively affect economic growth.

The result of this study shows that the transmission mechanism in the inflation expectations path can be explained as follows: the transmission begins from the shock of SBI rate instrument announced by Bank Indonesia to the public which is expected it can influence inflation expectation toward inflation target and also become the nominal anchor for the perpetrators business activities in creating business planning. Changes in SBI interest rate policy instruments will also affect the stability of the domestic currency exchange rate. The higher the domestic interest rate will attract capital inflow so that the appreciation of the rupiah, and vice versa. Exchange rate changes will respond to changes in inflation expectations by economic actors. If inflation expectations do not match with the exchange rate, it will result the output gap. In addition, the change in output gap affects the ultimate goal of monetary policy (inflation).

The process of transmitting the inflation expectation path takes approximately 34 quarters to get back to the initial equilibrium point before the shock on the SBI rate (IRF test result). The variable that has the greatest influence in the inflation expectation path is the deposit rate (from 0.056% in the event of SBI rate shock to 10.58% in the next fifty quarters). These results indicate that the deposit rate has a strong relationship with the SBI rate so that the deposit rate meets the requirements as the operational target of monetary policy to reach the final target of inflation.

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The process of transmitting the inflation expectation path takes approximately 34 quarters to get back to the initial equilibrium point before the shock on the SBI rate (IRF test result). The variable that has the greatest influence in the inflation expectation path is the deposit rate (from 0.056% in the event of SBI rate shock to 10.58% in the next fifty quarters). These results indicate that the deposit rate has a strong relationship with the SBI rate, so that the deposit rate meets the requirements as the operational target of monetary policy to reach the final target of inflation. Transmission mechanism through inflation expectation channel emphasizes that monetary policy can be directed to influence the formation of expectations concerning inflation and economic activity. Research on inflation expectations among others was conductd by Anwar (2008). Since the ITF was occured, market participants have started to follow inflation target set by the government and BI. People increasingly have a rational expectation, so any announcement of government policy and Bank Indonesia is able to influence expectations directly and thereby reduce inflation without necessarily causing a recession. Research of Ranchhod (2003), Tjahjono and Purwato (2012) and Natsir (2009a) found that the transmission of monetary policy through the inflation expectations path is effective in controlling inflation. Some statistical tests performed include stationary test, granger causality test, cointegration test and optimum lag determination presented in the following discussion: The stationarity test is performed according to the shape of the trends which contained in each variable.

The result of the ADF stationarity test is influenced by the length of slowness that can be done through the criteria of Akaike Information Crirterion (SIC) or with other criteria. In determining whether stationary time series data or not is by comparing the statistical value of ADF test with the critical value of MacKinnon statistical distribution.

If the absolute value of ADF is statistically greater than MacKinnon Critical Value, it can be concluded that the series data is stationary. Conversely, if the absolute value of the ADF is statistically smaller than the critical value of the MacKinnon distribution, the time series data is not stationary at a real 5% level. Time series data from root unit test results show seven of ten stationary variables at first-difference level, two stationary variables at the second-difference level and one variable have been stationary at current level. That is, the time series data can continue for cointegration testing.

The optimum lag is a way to choose how much lag we use in the research before performing cointegration tests, granger causality test, VAR and VECM. Its objective is to know how long it takes a variable to respond to changes in other variables. In VAR or VECM analysis, it is necessary to firstly determine the optimal lag length, because VAR or VECM analysis is very sensitive to the length of the data lag used. Indeed, the lag used in this study is four in accordance with the lowest value of Akaike Information Criteria (AIC).

Table 1. Root Unit Test Results

Data	Rate	t-statistics	Prob.	Stasionary
INF	1st diff	-6.100842	0.0000	Stasionary
rSBI	1st diff	-3.728881	0.0067	Stasionary
rPUAB	1st diff	-5.076352	0.0001	Stasionary
rDEPO	Level	-3.963541	0.0035	Stasionary
rKRDT	1st diff	-3.593784	0.0097	Stasionary
SKDU	1st diff	-9.065891	0.0000	Stasionary
LnCB	2nd diff	-14.16005	0.0000	Stasionary
LnKRDT	2nd diff	-2.354531	0.0198	Stasionary
LnER	1st diff	-5.629133	0.0000	Stasionary
LnOG	1st diff	-4.737146	0.0004	Stasionary

Source: Primary Data, processed

The cointegration test is performed to find out if each variable in the equation has a long-term relationship or not. Before conducting a cointegration test, deterministic criteria are determined based on the AIC and SIC criteria to obtain an appropriate cointegration model. Furthermore, the Johansen cointegration test is performed by comparing the value of trace statistic or maximum eigenvalue which is smaller than the value of critical value, as the result the data has short-term balance.

Table 2. Granger Level Pathway Causality Test

No	Inter-variable Relationship	Description
1	rSBI → rPUAB	There is a one way causal relationship between rSBI and rPUAB
2	rPUAB → rDEPO	There is a one-way causal relationship between rPUAB and rDEPO
3	rDEPO → rKRDT	Both variables are not related at all
4	LNOG → rKRDT	There is a one-way causal relationship between LNOG and rKRDT
5	LNOG → INF	Both variables are not related at all
6	rSBI → INF	There is a one way causal relationship between rSBI and INF

Source: Primary Data, processed

Then, the test of causality between variables is intended to know and prove the direction of short-term relationships between variables (Widarjono, 2016). The granger causality test in the study is divided into three transmission mechanisms, namely the interest rate path, credit line and inflation expectations path.

Table 2 shows that the relationship between rSBI and rPUAB variables, rPUAB and rDEPO, LNOG and rKRDT, and rSBI and INF is a one-way relationship.

Table 3. Credit Line Granger Causality Test

No	Inter-variable Relationship	Description
1	rSBI → rDEPO	There is a one-way causal relationship between rSBI and rDEPO
2	rDEPO — LNCB	Both variables are not related at all
3	LNCB ↔ LNKRDT	There is a two-way causal relationship between LNCB and LNKRDT
4	LNOG ↔ LNKRDT	There is a two-way causal relationship between LNOG and LNKRDT
5	LNOG — INF	Both variables are not related at all
6	rSBI → INF	There is a one way causal relationship between rSBI and INF

Source: Primary Data, processed

While there is no relation at all in the causality test between rDEPO with rKRDT and LNOG with INF. It means that there is no interdependence (no causality).

Table 4. Granger Causality Test of Inflation Expectation Path

No	Inter-variable Relationship	Description
1	rSBI → rDEPO	There is a one-way causal relationship between rSBI and rDEPO
2	SKDU → rDEPO	There is a one way causal relationship between SKDU and rDEPO
3	SKDU → LNER	Both variables are not related at all
4	LNER → LNOG	Both variables are not related at all
5	LNOG → INF	Both variables are not related at all
6	rSBI → INF	There is a one way causal relationship between rSBI and INF

Source: Primary Data, processed

Table 4 shows that the relationship between rSBI and rDEPO, SKDU with rDEPO, and rSBI with INF is a one-way relationship. While the causality test between SKDU and LNER, LNER with LNOG, and LNOG with INF, there is no relationship between the two variables. In brief, there is no interdependence (no causality).

The results of impulse response test shows response through the interest rate channel from RSBI to inflation is positive.

The results show that the shock caused by RSBI in the early period quickly responded by changes in inflation. Besides, the inflation began to stabilize in the 47th period. So, inflation on the interest rate line takes about 47 quarters to get back to the balance point when shock occurs.

The Effectiveness of Monetary Policy Transmission Mechanism: Impulse Response Test Result (IRF).

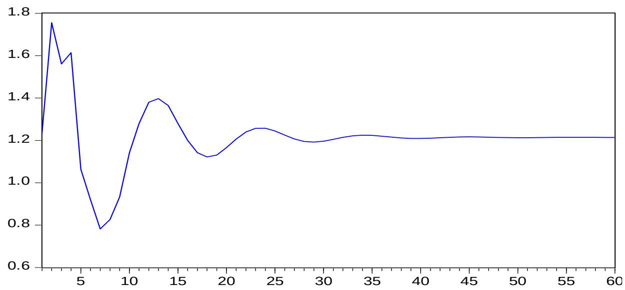

Figure 2. Impulse Response Function Line of Interest Rate

Source : Primary data, Processed

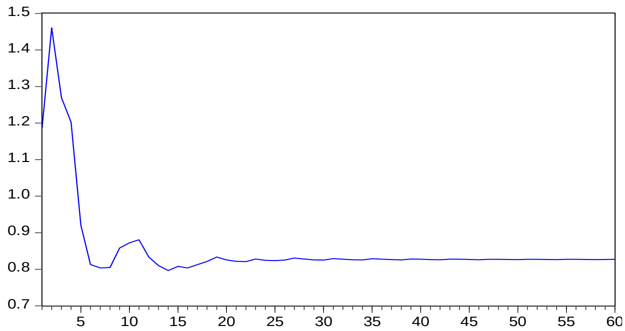

Figure 3. Impulse Response Function Path

Source : Primary Data, Processed

Based on the figure above, the impulse response test result shows response through credit line from RSBI to inflation is positive. The results show that the shock caused by RSBI in the early period quickly responded by changes in inflation. Inflation began to stabilize in the period of 36. So, inflation on the credit line takes about 36 quarters to get back to the balance point when shock occurs.

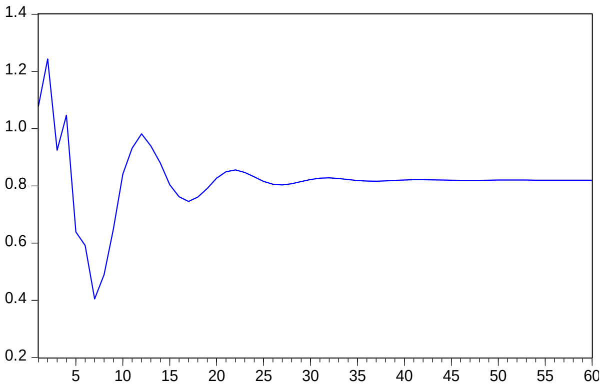

Figure 4. Impulse Response Function Line Inflation Expectation
Source : Primary Data

Regarding to the figure above, the results of impulse response test show response through inflation expectations of RSBI towards inflation is positive. The results show that the shock caused by RSBI in the early period quickly responded by changes in inflation. Inflation began to stabilize in the period of 34. So, inflation in the expectation path takes about 34 quarters to get back to the balance point when shock occurs.

The Effectiveness of Monetary Policy Transmission Mechanism: Variance Decomposition Test Result (VD). First, in the interest rate, the effect of each variable used is SBI interest rate (50.54%), interbank money market rate (10.65%), deposit interest rate (0.161%), interest rate (8,327 %), and output gap (0.169%) in shock at SBI rates up to the fiftieth period, the portion of inflation variation explained by rPUAB increased to 19.79% and rDEPO slightly increased to 0.30% B).

Second, in the credit line, the effect given by each variable used are SBI interest rate (49.25%), deposit interest rate (0.038%), bank reserves (0.149%), loans (2.691%), and output gap (0.003%) when shock in SBI rates while in the fiftieth period, the portion of inflation variations that can be explained by rDEPO increased to 45.82% and LNKRDT increased to 3.31% (Appendix B).

Third, in the inflation expectation, the effect of each variable used are SBI interest rate (41.13%), deposit interest rate (0.056%), SKDU (0.605%), exchange rate (3.99%), and the output gap (0.031%) when a shock on the SBI interest rate which leads to an increase in inflation and up to the fiftieth period, the portion of inflation variations that can be explained by rDEPO increased to 10.58% and LNOG increased to 9.32% (Appendix B).

CONCLUSION

Based on the results of Impulse Response Function and Variance Decomposition test, it can be concluded that the most effective monetary policy transmission mechanism is the inflation expectation path, since the time required to achieve the inflation target is for 34 quarters from 2005Q1 - 2016Q4. Based on the result of variance decomposition test, the variable which has strong relation with the SBI interest rate in the inflation expectation path is the deposit interest rate. It means that the deposit rate meets the requirement of "ability to affect the ultimate target" as the operational target of monetary policy in Indonesia. Above all, the policy implication of this study is that Bank Indonesia should prioritize the transmission mechanism of inflation expectation path rather than the interest rate and credit line in achieving the inflation target. The Government and Bank Indonesia are suggested to use the deposit interest rate instrument as the operational target of monetary policy to achieve the ultimate target (inflation) because the variable can quickly and strongly respond shock SBI interest rate and able to explain the variation of inflation significantly.

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APPENDIX

Interest Rate Eqution Model

$$\Delta rSBI_t = \alpha_1 + \sum_{i=1}^{j} \alpha_{2n}\, \Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{3n}\, \Delta rPUAB_{t-1} + \sum_{i=1}^{j} \alpha_{4n}\, \Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{5n}\, \Delta rKRDT_{t-1} + \sum_{i=1}^{j} \alpha_{6n} \Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{7n} \Delta INF_{t-1} + \varepsilon_{1t}$$

$$\Delta rPUAB_t = \alpha_{11} + \sum_{i=1}^{j} \alpha_{12n}\, \Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{13n}\, \Delta rPUAB_{t-1} + \sum_{i=1}^{j} \alpha_{14n}\, \Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{15n}\, \Delta rKRDT_{t-1} + \sum_{i=1}^{j} \alpha_{16n} \Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{17n} \Delta INF_{t-1} + \varepsilon_{2t}$$

$$\Delta rDEPO_t = \alpha_{21} + \sum_{i=1}^{j} \alpha_{22n}\, \Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{23n}\, \Delta rPUAB_{t-1} + \sum_{i=1}^{j} \alpha_{24n}\, \Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{25n}\, \Delta rKRDT_{t-1} + \sum_{i=1}^{j} \alpha_{26n} \Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{27n} \Delta INF_{t-1} + \varepsilon_{3t}$$

$$\Delta rKRDT_t = \alpha_{31} + \sum_{i=1}^{j} \alpha_{32n}\, \Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{33n}\, \Delta rPUAB_{t-1} + \sum_{i=1}^{j} \alpha_{34n}\, \Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{35n}\, \Delta rKRDT_{t-1} + \sum_{i=1}^{j} \alpha_{36n} \Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{37n} \Delta INF_{t-1} + \varepsilon_{4t}$$

$$\Delta LnOG_t = \alpha_{41} + \sum_{i=1}^{j} \alpha_{42n}\, \Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{43n}\, \Delta rPUAB_{t-1} + \sum_{i=1}^{j} \alpha_{44n}\, \Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{45n}\, \Delta rKRDT_{t-1} + \sum_{i=1}^{j} \alpha_{46n} \Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{47n} \Delta INF_{t-1} + \varepsilon_{5t}$$

$$\Delta INF_t = \alpha_{51} + \sum_{i=1}^{j} \alpha_{52n}\, \Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{53n}\, \Delta rPUAB_{t-1} + \sum_{i=1}^{j} \alpha_{54n}\, \Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{55n}\, \Delta rKRDT_{t-1} + \sum_{i=1}^{j} \alpha_{56n} \Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{57n} \Delta INF_{t-1} + \varepsilon_{6t}$$

Credit Line Equation Model

$$\Delta rSBI_t = \alpha_{61} + \sum_{i=1}^{j} \alpha_{62n}\, \Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{63n}\, \Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{64n}\, \Delta LnCB_{t-1} + \sum_{i=1}^{j} \alpha_{65n}\, \Delta LnKRDT_{t-1} + \sum_{i=1}^{j} \alpha_{66n} \Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{67n} \Delta INF_{t-1} + \varepsilon_{7t}$$

$$\Delta rDEPO_t = \alpha_{71} + \sum_{i=1}^{j} \alpha_{72n}\, \Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{73n}\, \Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{74n}\, \Delta LnCB_{t-1} + \sum_{i=1}^{j} \alpha_{75n}\, \Delta LnKRDT_{t-1} + \sum_{i=1}^{j} \alpha_{76n} \Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{77n} \Delta INF_{t-1} + \varepsilon_{8t}$$

$$\Delta LnCB_t = \alpha_{81} + \sum_{i=1}^{j} \alpha_{82n}\, \Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{83n}\, \Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{84n}\, \Delta LnCB_{t-1} + \sum_{i=1}^{j} \alpha_{85n}\, \Delta LnKRDT_{t-1} + \sum_{i=1}^{j} \alpha_{86n} \Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{87n} \Delta INF_{t-1} + \varepsilon_{9t}$$

$$\Delta LnKRDT_t = \alpha_{91} + \sum_{i=1}^{j} \alpha_{92n}\, \Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{93n}\, \Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{94n}\, \Delta LnCB_{t-1} + \sum_{i=1}^{j} \alpha_{95n}\, \Delta LnKRDT_{t-1} + \sum_{i=1}^{j} \alpha_{96n} \Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{97n} \Delta INF_{t-1} + \varepsilon_{10t}$$

$$\Delta LnOG_t = \alpha_{101} + \sum_{i=1}^{j} \alpha_{102n}\, \Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{103n}\, \Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{104n}\, \Delta LnCB_{t-1} + \sum_{i=1}^{j} \alpha_{105n}\, \Delta LnKRDT_{t-1} + \sum_{i=1}^{j} \alpha_{106n} \Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{107n} \Delta INF_{t-1} + \varepsilon_{11t}$$

$$\Delta INF_t = \alpha_{111} + \sum_{i=1}^{j} \alpha_{112n}\, \Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{113n}\, \Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{114n}\, \Delta LnCB_{t-1} + \sum_{i=1}^{j} \alpha_{115n}\, \Delta LnKRDT_{t-1} + \sum_{i=1}^{j} \alpha_{116n} \Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{117n} \Delta INF_{t-1} + \varepsilon_{12t}$$

Inflation Expecttion Equation Model

$$\Delta rSBI_t = \alpha_{121} + \sum_{i=1}^{j} \alpha_{122n}\,\Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{123n}\,\Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{124n}\,\Delta SKDU_{t-1} + \sum_{i=1}^{j} \alpha_{125n}\,\Delta LnER_{t-1} + \sum_{i=1}^{j} \alpha_{126n}\Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{127n}\Delta INF_{t-1} + \varepsilon_{13t}$$

$$\Delta rDEPO_t = \alpha_{131} + \sum_{i=1}^{j} \alpha_{132n}\,\Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{133n}\,\Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{134n}\,\Delta SKDU_{t-1} + \sum_{i=1}^{j} \alpha_{135n}\,\Delta LnER_{t-1} + \sum_{i=1}^{j} \alpha_{136n}\Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{137n}\Delta INF_{t-1} + \varepsilon_{14t}$$

$$\Delta SKDU_t = \alpha_{141} + \sum_{i=1}^{j} \alpha_{142n}\,\Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{143n}\,\Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{144n}\,\Delta SKDU_{t-1} + \sum_{i=1}^{j} \alpha_{145n}\,\Delta LnER_{t-1} + \sum_{i=1}^{j} \alpha_{146n}\Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{147n}\Delta INF_{t-1} + \varepsilon_{15t}$$

$$\Delta LnER_t = \alpha_{151} + \sum_{i=1}^{j} \alpha_{152n}\,\Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{153n}\,\Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{154n}\,\Delta SKDU_{t-1} + \sum_{i=1}^{j} \alpha_{155n}\,\Delta LnER_{t-1} + \sum_{i=1}^{j} \alpha_{156n}\Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{157n}\Delta INF_{t-1} + \varepsilon_{16t}$$

$$\Delta LnOG_t = \alpha_{161} + \sum_{i=1}^{j} \alpha_{162n}\,\Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{163n}\,\Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{164n}\,\Delta SKDU_{t-1} + \sum_{i=1}^{j} \alpha_{165n}\,\Delta LnER_{t-1} + \sum_{i=1}^{j} \alpha_{166n}\Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{167n}\Delta INF_{t-1} + \varepsilon_{17t}$$

$$\Delta INF_t = \alpha_{171} + \sum_{i=1}^{j} \alpha_{172n}\,\Delta rSBI_{t-1} + \sum_{i=1}^{j} \alpha_{173n}\,\Delta rDEPO_{t-1} + \sum_{i=1}^{j} \alpha_{174n}\,\Delta SKDU_{t-1} + \sum_{i=1}^{j} \alpha_{175n}\,\Delta LnER_{t-1} + \sum_{i=1}^{j} \alpha_{176n}\Delta LnOG_{t-1} + \sum_{i=1}^{j} \alpha_{177n}\Delta INF_{t-1} + \varepsilon_{18t}$$

Variance Decomposition Test Results
Interest Rate Variance Decomposition Results

Inflation of Variance Decomposition							
Periode	S.E.	RSBI	RPUAB	RDEPO	RKRDT	LNOG	INF
1	0.597703	50.53974	10.64772	0.160879	8.327125	0.169832	30.15471
2	1.074184	72.05138	5.709412	1.610866	4.859451	0.931893	14.83700
3	1.485170	74.99002	3.924605	2.005969	6.121603	2.350386	10.60742
4	1.820142	74.89864	8.127868	1.743558	5.255144	2.239965	7.734825
5	2.099186	71.71477	12.99865	1.526085	4.886572	2.219502	6.654426
6	2.333295	68.64831	17.41731	1.363957	4.480814	2.021068	6.068541
7	2.537671	65.69922	20.97417	1.292054	4.613559	1.876656	5.544343
8	2.717355	63.07684	23.07189	1.198994	5.477884	1.740625	5.097798
9	2.886635	63.07684	23.26071	1.147124	6.131011	1.632311	4.752002
10	3.052903	64.05126	22.52863	1.087693	6.374884	1.528381	4.429162
20	4.524886	71.08908	20.43757	0.618134	4.243049	1.102044	2.510127
30	5.617035	73.38329	19.98346	0.445983	3.486882	0.933223	1.767162
40	6.527787	74.48657	19.84897	0.355337	3.096667	0.842548	1.369906
41	6.611828	74.56069	19.84544	0.348651	3.069442	0.835643	1.340134
42	6.694843	74.63587	19.83819	0.342229	3.042935	0.829059	1.311719
43	6.776897	74.71121	19.82865	0.336042	3.016753	0.822805	1.284538
44	6.858028	74.78508	19.81861	0.330081	2.990870	0.816869	1.258488
45	6.938254	74.85582	19.80961	0.324348	2.965508	0.811222	1.233486
46	7.017580	74.92233	19.80255	0.318846	2.940980	0.805828	1.209471
47	7.096014	74.98429	19.79754	0.313575	2.917553	0.800650	1.186398
48	7.173568	75.04212	19.79410	0.308529	2.895363	0.795660	1.164224
49	7.250264	75.09668	19.79148	0.303694	2.874396	0.790839	1.142912
50	7.326135	75.14893	19.78890	0.299055	2.854515	0.876180	1.122420
60	8.045696	75.59708	19.75215	0.260653	2.688850	0.747775	0.953491

Source: Primary Data, processed

Credit Line Decomposition Results

Inflation of Variance Decomposition

Periode	S.E.	RSBI	RDEPO	LNCB	LNKRDT	LNOG	INF
1	0.586285	49.25585	0.038862	0.149019	2.691101	0.002869	47.86230
2	0.987142	66.48904	2.078014	3.077164	1.959125	0.606805	25.78986
3	1.389020	70.60020	4.604199	2.934522	1.987685	0.741316	19.13208
4	1.762322	62.53979	14.74687	3.574699	1.799261	1.233007	16.10637
5	2.147491	51.47817	29.23994	2.681421	2.073866	1.188069	13.33853
6	2.527388	43.08028	40.27658	2.118676	2.633955	1.032797	10.85771
7	2.903300	38.46710	47.08773	1.775341	2.725804	0.897254	9.046767
8	3.248457	36.50857	50.26517	1.603320	2.754323	0.873695	7.994930
9	3.567689	36.23075	51.24301	1.529903	2.721116	0.908967	7.366250
10	3.862531	36.70539	51.25723	1.450936	2,677496	0.967058	6.941889
20	6.201622	40.21939	49.11962	1.005164	2.944309	1.831808	4.879704
30	7.872874	42.43911	47.45850	0.780316	3.135165	2.344269	3.842634
31	8.020699	42.60896	47.33814	0.763108	3.146261	2.378517	3.765009
32	8.165884	4276574	47.22727	0.746846	3.156930	2.412465	3.690750
33	8.308511	42.90957	47.12101	0.731588	3.169687	2.448646	3.619505
34	8.448486	43.04886	47.01835	0.717067	3.183275	2.480991	3.551461
35	8.586356	43.19001	46.91788	0.702789	3.192860	2.509938	3.486519
36	8.722094	43.32274	46.82369	0.689167	3.201735	2.538340	3.424330
37	8.855754	43.44517	46.73365	0.676290	3.212055	2.568282	3.364555
38	8.987260	43.56264	46.64708	0.664004	3.223270	2.595790	3.307214
39	9.116981	43.86060	46.56271	0.651951	3.231869	2.620637	3.252232
40	9.244928	43.79290	46.48297	0.640380	3.239637	2.644740	3.199377
50	10.43813	44.70064	45.82481	0.546165	3.312994	2.850859	2.764528
60	11.50828	45.35835	45.34934	0.478110	3.364995	2.998115	2.451098

Source: Primary Data, processed

Inflation Expectation Decomposition Variance Decomposition Results

Inslation of Variance Decomposition

Periode	S.E.	RSBI	RDEPO	SKDU	LNER	LNOG	INF
1	0.563402	41.13472	0.056616	0.605554	3.997351	0.031406	54.17435
2	0.914182	59.38576	1.216781	1.096889	3.449934	0.768381	34.08225
3	1.262517	61.74861	3.025677	2.601426	3.592937	2.043343	26.98800
4	1.603777	54.22630	6.070401	7.894631	4.87000	6.222463	20.71620
5	1.884712	48.5045	8.894128	9.525724	7.170270	7.657044	18.24835
6	2.08881	46.12306	9.60006	9.811666	8.439816	8.908316	17.11708
7	2.243437	45.60767	9.779209	9.42046	8.731873	9.92431	16.51848
8	2.369302	45.97687	9.549655	9.39960	8.45044	10.60301	16.02042
9	2.49060	47.16500	9.250587	9.69485	8.093275	10.46944	15.32685
10	2.612623	49.32926	8.99055	9.689537	7.603075	9.98922	14.39835
20	3.760971	59.34752	9.895526	6.117012	6.219523	9.44451	8.975916

30	4.625954	63.58101	10.25461	4.474244	5.581120	9.354971	6.754043
31	4.703340	63.8961	10.27427	4.36061	5.530768	9.341985	6.596300
32	4.779791	64.18646	10.29706	4.250402	5.48650	9.332587	6.446997
33	4.855215	64.4508	10.32182	4.144719	5.447574	9.328407	6.306661
34	4.92950	64.6930	10.34653	4.04439	5.412263	9.32890	6.174952
35	5.002567	64.91919	10.56947	3.949754	5.378751	9.331992	6.050849
36	5.074426	65.13549	10.38972	3.86065	5.345745	9.335304	5.933096
37	5.145145	65.34571	10.40732	3.776536	5.312761	9.337118	5.820558
38	5.214831	65.55117	10.42289	3.69667	5.279992	9.336807	5.712471
39	5.283596	65.75123	10.43732	3.620293	5.248007	9.334681	5.608461
40	5.351529	65.94431	10.45140	3.546838	5.217399	9.331606	5.508451
50	5.989558	67.4640	10.57689	2.949632	4.982149	9.320955	4.706388
60	6.565816	68.52568	10.66428	2.532365	4.817513	9.314267	4.145888

Source: Primary Data, processed