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Andrian Dolfriandra Huruta (Indonesia)

The Causality of BI Rate and Federal Fund Rate

Abstract

The Central Bank held power to carry out a monetary policy through the setting of monetary targets such as the money supply or interest rates with the main objective of maintaining inflation at the level determined by the government. At the operational level, this monetary objective depends on the use of instruments, including open market operations in the foreign exchange market, the setting of the discount rate, the setting of minimum reserve requirements and regulating credit or financing. We analyzed the causality of Bank Indonesia (BI Rate) and US interest rates (Federal Fund Rate). This study used secondary data, especially data from Bank Indonesia and The Federal Reserve. This data was the ones from the monthly time series from January 2006 to May 2016. This study used Granger causality test to determine the causality of BI Rate and Federal Fund Rate. Granger Causality test results indicated that there was no causality between the BI Rate and the Federal Fund Rate. We found that the movement of interest rates was not only caused by the external side, but also by the internal side. The case in Indonesia showed that the movement of interest rates was mainly due to an increase in gross domestic product, low participation in the Global Value Chain and the adoption of the expansionary monetary policy.

Keywords: Bank Indonesia Interest Rates; Granger Causality; Monetary Policy; United States Interest Rates

JEL Classification: E43, E52, E58

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Abstrak

Bank Sentral memegang kekuasaan untuk melakukan kebijakan moneter melalui penetapan target moneter seperti jumlah uang beredar atau suku bunga dengan tujuan utama menjaga inflasi pada tingkat yang ditentukan pemerintah. Pada tingkat operasional, tujuan moneter ini bergantung pada penggunaan instrumen, termasuk operasi pasar terbuka di pasar valuta asing, pengaturan tingkat diskonto, menetapkan persyaratan cadangan minimum dan mengatur kredit atau pembiayaan. Kami menganalisis kausalitas Suku Bunga Bank Indonesia (BI Rate) dan Suku Bunga Amerika Serikat (Federal Fund Rate). Studi ini menggunakan data sekunder terutama data Bank Indonesia dan The Federal Reserve. Data ini adalah data runtun waktu (bulanan) dari Januari 2006 sampai Mei 2016. Studi ini menggunakan uji kausalitas Granger untuk menentukan kausalitas BI Rate dan Federal Fund Rate. Hasil uji Kausalitas Granger membuktikan bahwa tidak ada kausalitas antara BI Rate dan Federal Fund Rate. Kami menemukan bahwa pergerakan suku bunga tidak hanya disebabkan oleh sisi eksternal, tetapi juga oleh sisi internal. Kasus di Indonesia menunjukkan pergerakan suku bunga lebih disebabkan oleh peningkatan dalam produk domestik bruto, rendahnya partisipasi dalam Global Value Chain, dan penerapan kebijakan moneter yang ekspansif.

Kata Kunci: Suku Bunga Bank Indonesia; Kausalitas Granger; Kebijakan Moneter; Suku Bunga Amerika Serikat

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Theoretically and empirically, there are two main lines of the transmission mechanism for monetary policy, namely the money supply and interest rates. Interest rates are one of the important factors in a country's economy. Interest rates play an important role in realizing the ultimate goal of monetary policy (Fan, Yu, & Zhang, 2011; Caldara & Herbst, 2016; Cesa-Bianchi, Thwaites & Vicendoa, 2016; Chen, Chow, & Tillmann, 2017; Kamber & Mohanty, 2018). Interest rates are not only related to the monetary sector but also with the real sector, the employment and foreign sectors (Clarida, Gali & Gertler, 1998; Adam, Cobham, & Girardin, 2005; Barassi, Caporale, & Hall, 2005; Touny, 2013). Since July 2005, the monetary policy set by Bank Indonesia (BI) has been carried out through controlling interest rates (Bank Indonesia, 2017c; Sasongko & Huruta, 2018). In the same year, in June 2005, Egypt also implemented monetary policy (Touny, 2013) as what had been done by Indonesia.

The movement of interest rates in a country can be caused by internal or external factors (Caporale & Pittis, 1997; Yahya, 2007; Prastowo, 2008; Duburcq & Girardin, 2010; Setiawan, 2010; Andrian & Lestari, 2013; Siahaan & Hidayat, 2015; Siburian, 2015; Bank Indonesia, 2017; and Setiawan, 2017). Both from the internal and external factors, Duburcq & Girardin (2010) found that the interest rates of the United States central bank had a positive effect on interest rates in Latin America countries such as Panama, Ecuador, Argentina, Brazil, Mexico, Colombia, Peru, and Venezuela. The movement of interest rates in Latin America countries was not only caused by external factors but also caused by internal factors. Increased public income results in increased demand for money and ultimately increases domestic interest rates. Furthermore, the contractionary monetary policy results in increasing domestic interest rates. Caporale & Pittis (1997) also found that there was a relationship between the behavior of interest rates in the United States, Germany, Japan, France, and Switzerland.

Interest rate behavior in these countries was caused by external and internal factors. Internally, interest rate movements were caused by expansionary and contractionary monetary policies, inflation, controls on capital movements, increased gross domestic product, the balance of payments deficits, open economic system and rigidly-fixed exchange rates. Externally, specifically the US and Japanese interest rates are more sensitive to German interest rates (The Bundes Bank). Furthermore, Germany is the country that is the center of the European Central Bank (ECB), which is the central bank of every country that is a member of the European Monetary Union (EMU). With almost the same system, it is suspected that the European Central Bank (ECB) will be stronger than the Federal Reserve.

In the context of developing countries such as Indonesia, interest rate movements are also caused by internal and external factors. In the external factors, Setiawan (2010) said that in determining the direction of monetary policy such as determining the BI Rate, Bank Indonesia would consider various factors (including external factors). This happens because of the characteristics of the Indonesian economic system that adheres to a small open economic system and a free-floating exchange rate system (Yahya, 2007; Setiawan, 2010; Andrian & Lestari, 2013; Melani, 2015).

In other words, the greater the international trade and financial transactions, the greater the effect they will have on the number of foreign capital inflows and capital outflows. Furthermore, when the United States central bank (The Fed) raised the Federal Fund Rate from 0.25 percent - 0.50 percent, it had impacted the economy of Indonesia. There are three impacts: (1) the flow of foreign investor funds out of developing countries including Indonesia; (2) there is a pressure on the currencies of developing countries in Asia including Rupiah; and (3) the United States currency will strengthen significantly (Melani, 2015). When the Fed raises its interest rate benchmark, the central bank in devel-

oping countries will respond by raising theirs. This makes an investment in US dollars profitable so that investments that are initially invested in developing countries will return to the United States.

For developing countries like Indonesia, when the Fed raises its interest rate benchmark, Bank Indonesia will respond by also raising its interest rate benchmark. This will certainly have an impact on the banking sector, especially on credit growth. This means that if the cost of funds increases, it will make debtor's interest to borrow reduced and the quality of the loan will decrease (Siahaan & Hidayat, 2015; Siburian, 2015; Setiawan, 2017).

The Fed's contractionary monetary policy, which began with the Subprime Mortgage crisis in July 2005 to June 2006, was carried out by raising the Federal Fund Rate target to 5.25 percent. Then in July 2006 to August 2007, the Fed set a constant target of the Federal Fund Rate at 5.25 percent. However, in September 2007, the Fed changed the direction of monetary policy to be loose which was indicated by a decrease in the Federal Fund Rate target to 4.75 percent (Prastowo, 2008; Bank Indonesia, 2017). This then led to a liquidity crisis in the US money market which ultimately resulted in the global financial crisis in 2008. The Subprime Mortgage Crisis and the global financial crisis began to enter Indonesia were facilitated through domestic financial markets (Haryati, 2009; Yударuddin, 2017). The domestic financial market is quite integrated with the global market so that the domestic financial market generally shows a movement in the direction of the global financial market. Then, the global financial crisis in 2008 caused instability in the domestic financial market because of the withdrawal of funds (diverging) out of Indonesia, resulting to a peak in September 2009 where foreign capital inflows into Indonesia dropped dramatically (\$ 1,446,380 million to \$ 540,380 million). This condition illustrates that the decrease in capital inflow during the global financial crisis in 2008 is far more severe than during the Subprime Mortgage crisis in

2005-2006 (precisely in July 2006) which showed that Indonesia's capital inflow decreased by \$ 1,089,300 million. A decrease in capital inflow or an increase in capital outflow results in a pressure on the exchange rate of the Rupiah against the United States Dollar. This was seen during the peak of the global financial crisis in November 2008 when the IDR / USD exchange rate depreciated to IDR 12,151 / USD (Andrian & Lestari, 2013; Bank Indonesia, 2017).

The Federal Fund Rate and BI Rate have similarities in reflecting the attitude of monetary policy such as interest rate control policies. Therefore, a monetary policy carried out by the Federal Reserve and Bank Indonesia through interest rates is known as conventional monetary policy.

This study aims to analyze the causality of Bank Indonesia interest rate (BI Rate) with the interest rate of the United States Bank (Federal Fund Rate) from January 2006 to May 2016. The selection of this period was based on the consideration that: (1) since July 2005, Bank Indonesia implemented controlling interest rates (Interest Rate Policy); (2) the Fed's contractive monetary policy which began with the Subprime Mortgage crisis in July 2005 to June 2006; and (3) in August 2016, Bank Indonesia implemented the Bank Indonesia Reverse Repo Rate reference rate. In other words, the selection of this period was based on Indonesia's experience in facing the transition period since the adoption of interest rate control policies, the Subprime Mortgage Crisis, and the implementation of the Bank Indonesia Reverse Repo Rate.

METHODS

The types of data used in this study were secondary data obtained from Bank Indonesia and the Central Bank of the United States. The data used in this study were monthly time series data from the period from January 2006 to May 2016.

Furthermore, this study used analysis of Granger causality time series. The main reason for

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using Granger causality test was the inability of regression analysis to reveal whether or not there was a causality relationship even though regression was believed to be able to measure the degree of statistical relationship between variables (Huruta, 2017). In cases of certain regression models, it is difficult to see which variables are the cause of other variables. If time series data are used, then the concept of causality can be explained differently because time cannot walk backward. If event A occurs before event B, then (maybe) A causes B, so this type of behavior can be explained by Granger Causality (Rosadi, 2012).

$$X_t = \sum_{i=1}^m a_i X_{t-1} + \sum_{j=1}^n b_j Y_{t-1} + \mu_t \quad (1)$$

$$Y_t = \sum_{i=1}^r c_i X_{t-1} + \sum_{j=1}^s d_j Y_{t-1} + V_t \quad (2)$$

X_t is the BI Rate at t-period, and Y_t is the Federal Fund Rate at t-period, while μ_t and V_t are the error terms at t-period which is assumed to contain no serial correlation and $m = n = r = s$. Furthermore, in the Granger causality test, there are four possibilities that might occur, namely: (1) if $\sum a_j \neq 0$ and $\sum b_j = 0$, then there is a one-way causality from the BI Rate to the Federal Fund Rate; (2) if $\sum a_j = 0$ and $\sum b_j \neq 0$, then there is a one-way causality from the Federal Fund Rate to the BI Rate; (3) if $\sum a_j = 0$ and $\sum b_j = 0$, there is no causality between the BI Rate and the Federal Fund Rate; and (4) if $\sum a_j \neq 0$ and $\sum b_j \neq 0$, then there is a two-way causality between the BI Rate and the Federal Fund Rate.

Before conducting the Granger Causality test, it was necessary to pass several tests such as stationary test and lag length test. The following is the model used for stationary testing.

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + u_t \quad (3)$$

Where Y is the observed variable, Δ is the first difference, δ is the trend component, β is the intercept, t_{-1} is the first lag, t is the observation period, and u is the error. The optimal lag selection can be done by selecting the smallest Akaike Information Criterion (AIC) value. The smaller the AIC value, the better the quality of a model (Winarno, 2015).

RESULTS

The Stationary Test Results

Stationary test results or unit root tests using the Augmented Dickey-Fuller (ADF) method can be seen in Table 1.

Table 1 shows that the Augmented Dickey-Fuller test statistic of the BI Rate variable (-2.372420) is smaller than the critical value at the 5 percent error tolerance level (-2.887665). This means that the data is not stationary or still contains unit roots at the level of integration level. After data differentiation is carried out, the Augmented Dickey-Fuller test statistic (-4.671146) is greater than the critical value at the 5 percent error tolerance level (-2.887665). Therefore, it can be concluded that the data is in a stationary condition or does not contain a unit root at the first order differentiation level (DBI Rate).

Table 1. Stationary Test

Variable	α	ADF-test statistic*	Critical Values*	Conclusion
BI Rate	5 %	-2,372420	-2,887665	Series has unit root
DBI Rate**		-4,671146	-2,887665	I(1)
Fed Fund Rate	5 %	-1,901182	-2,887665	Series has unit root
DFed Fund Rate***		-8,284994	-2,887665	I(1)

*Indicates the Absolute Value

** DBI Rate implies that BI Rate at the first difference [I(1)]

*** DFed Fund Rate implies that Federal Fund Rate at the first difference [I(1)]

Meanwhile, the interest rate variable of the United States Bank (Federal Fund Rate) shows that the Augmented Dickey-Fuller test statistic (-1.901182) is smaller than the critical value at the 5 percent error tolerance level (-2.887665). This means that the data still contains the root of the unit or is not in a stationary state at the level. After first order differentiation was done, it appears that the Augmented Dickey-Fuller test statistic value (-8.284994) is greater than the critical value at the 5 percent error tolerance level (-2.887665). This indicates that the data does not contain the unit root or is already in a stationary state at the first order differentiation level (DFed Fund Rate).

The Lag Length Test Results

After the data was stationary, then determining the optimal lag length was done by using Lag Length Test. The test results are summarized in Table 2.

Based on Table 2, it is indicated that the most optimal lag to describe the influence of a variable on its past variables and other endogenous variables is lag 2.

The Granger Causality Test Result

After determining the optimal lag length, the test results by using Granger Causality method can be seen in Table 3.

Table 3 shows that there is no Granger Causality between DFed Fund Rate and DBI Rate. This means that the null hypothesis which states DFed Fund Rate, not Granger Cause DBI Rate and BI Rate does not Granger Cause DFed Fund Rate is accepted. Acceptance of the null hypothesis is based on the probability values of 0.1048 and 0.3272 which are greater than the value of α (5 percent).

DISCUSSION

The absence of a causality relationship between the BI rate and the Federal Fund Rate shows an evidence that the movement of domestic interest rates was basically not solely caused by external factors, but also by internal factors (Caporale & Pittis, 1997; Yahya, 2007; Prastowo, 2008; Duburcq & Girardin, 2010; Setiawan, 2010; Andrian & Lestari, 2013; Siahaan & Hidayat, 2015; Siburian, 2015; Bank Indonesia, 2017; and Setiawan, 2017).

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Table 2. Lag Length Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-259.4659	NA	0.434399	4.841961	4.891630	4.862100
1	60.10215	621.3823	0.001259	-1.001892	-0.852884	-0.941475
2	101.0901	78.18078*	0.000635*	-1.686854*	-1.438509*	-1.586159*
3	103.6685	4.822568	0.000652	-1.660528	-1.312845	-1.519555
4	105.0209	2.479391	0.000685	-1.611499	-1.164477	-1.430247
5	106.4827	2.625845	0.000718	-1.564495	-1.018135	-1.342966

*Indicates the optimal lag

Table 3. Granger Causality Test

Null Hypothesis	Obs	F-Statistic	Prob.
DFed Fund Rate does not Granger Cause DBI Rate	111	2.30451	0.1048*
DBI Rate does not Granger Cause DFed Fund Rate		1.12914	0.3272*

*Accepted Null Hypothesis

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(Federal Fund Rate) caused excessive speculation, resulting to shake the world economy (Haryati, 2009; Yударuddin, 2017). However, it turned out that Indonesia's Gross Domestic Product (GDP) had not decreased. This was shown by Indonesia's GDP which continued to increase from 1996 to 2014. This condition can be seen in Figure 1.

This condition was reinforced by the findings of researches by Duburcq & Girardin (2010), and Caporale & Pittis (1997) showing that the movement of domestic interest rates was caused by internal factors such as gross domestic product. Increases in gross domestic product and or community income could lead to increased demand for money and ul-

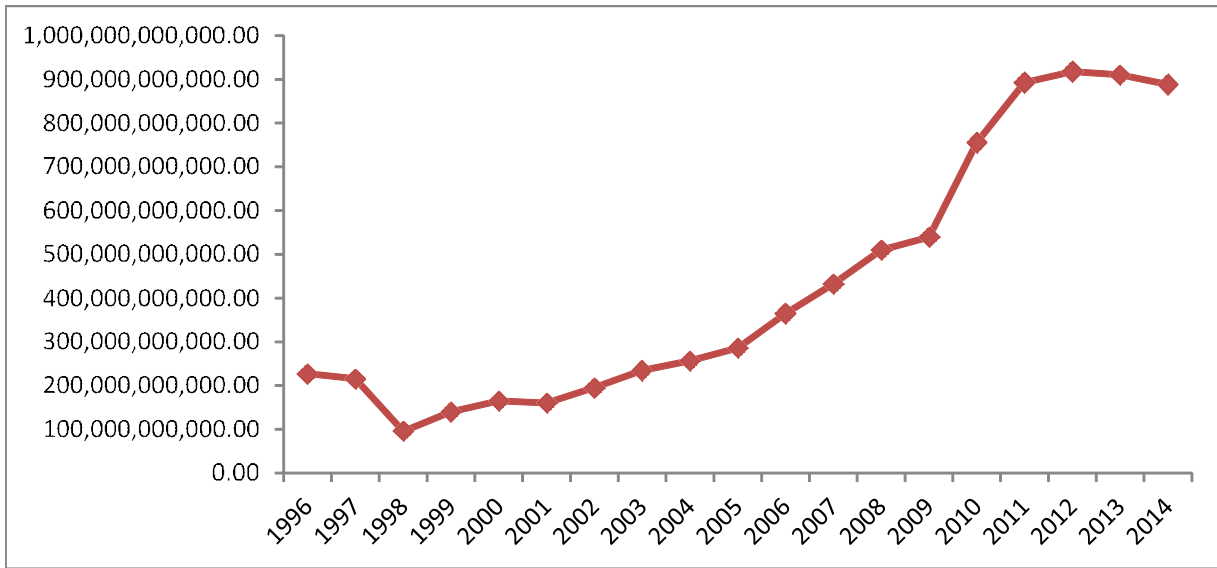


Figure 1. Trends in Indonesia's Gross Domestic Product for the period of 1996-2014

Source: Bank Indonesia (2017)

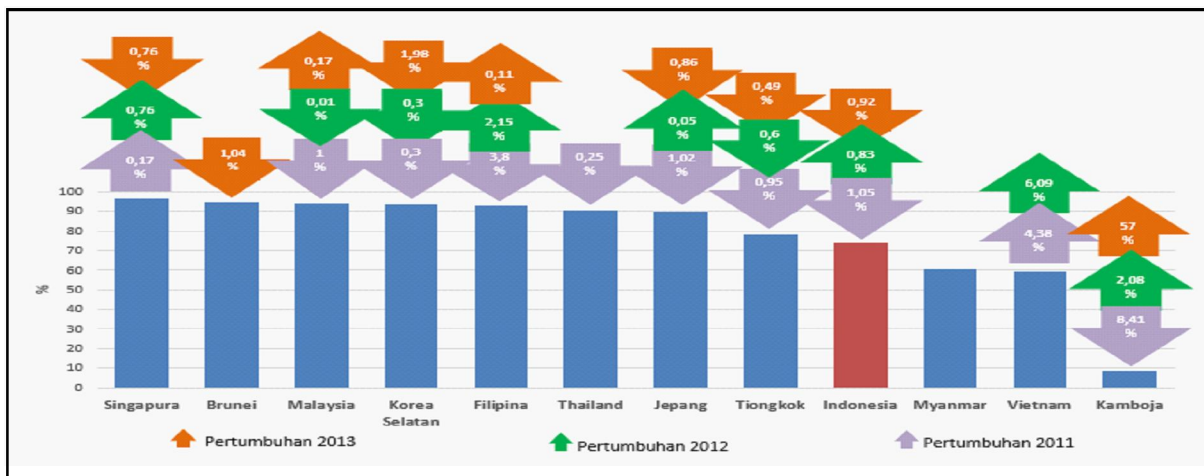


Figure 2. Trades in Machine Goods toward Total Manufacturing

Source: EU-Indonesia Trade Cooperation Facility (2015)

timately increased domestic interest rates. Theoretically and empirically, interest rates played an important role in realizing the ultimate goal of monetary policy (Fan, Yu, & Zhang, 2011; Caldara & Herbst, 2016; Cesa-Bianchi, Thwaites, & Vicendoa, 2016; Chen, Chow, & Tillmann, 2017; Kamber & Mohanty, 2018).

Furthermore, Indonesia adheres to a small open economic system and a free-floating exchange rate system. Therefore, Indonesia will not be separated from the principles of the global economy and the principle of trade liberalization. This means that the greater the international trade and financial transactions, the greater effect they will have on the amount of capital inflow and capital outflow (Caporale & Pittis, 1997; Yahya, 2007; Prastowo, 2008; Duburcq & Girardin, 2010; Setiawan, 2010; Andrian & Lestari, 2013; Bank Indonesia, 2017; and Setiawan, 2017).

However, Indonesia’s low participation in the Global Value Chain (GVC) strengthened the evidence that there was no causality between the Federal Fund Rate and the BI Rate. GVC is a production system revolution in the 21st century where production and distribution of goods are held jointly

by several countries. In GVC, a production stage of a single production process is held in one country while the next stage is carried out in another country. This can be seen in Figure 2.

Figure 2 shows the level of Indonesia’s participation based on the GVC Participation Index which is relatively low compared to Singapore, Thailand, and Malaysia, although it is not much different from China. The fact shows that the United States Dollar was used as a reference currency in the trading process at GVC. Therefore, if the interest rate of the United States changed, it would affect the trade process in GVC and would have an impact on the world economy (Caporale & Pittis, 1997; Clarida, Gali, & Gertler, 1998; Adam, Cobham, & Girardin, 2005; Barassi, Caporale, & Hall, 2005; Duburcq & Girardin, 2010; Andrian & Lestari, 2013). However, Indonesia’s lack of participation in the GVC turned out to make Indonesia experienced no impact. In other words, the absence of causality between the BI Rate and the Federal Fund Rate might occur because the Indonesian currency (Rupiah) was very rarely used as a reference by other countries, so that all forms of economic policy in Indonesia (specifically interest rates) could only affect economic con-

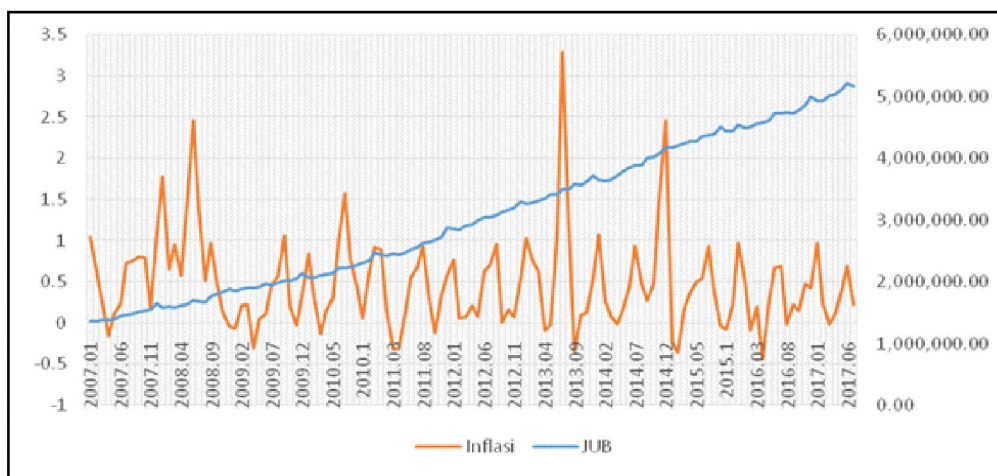


Figure 3. Inflation and the Amount of Circulating Money in Indonesia in the Period of January 2007 to June 2017

Source: Bank Indonesia (2017a; 2017b)

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ditions in country and would not affect international economic conditions, especially the Federal Fund Rate.

In addition to gross domestic product and lack of Indonesian participation in GVC, money supply, and inflation were also able to cause movement in domestic interest rates (Caporale & Pittis, 1997; Duburcq & Girardin, 2010; Sasongko & Huruta, 2018). This can be seen in Figure 3.

Figure 3 shows that after the global financial crisis, inflation continued to fluctuate. However, after July 2013 inflation tends to decline. This condition was allegedly caused by the Inflation Targeting Framework especially the interest rate policy implemented by Bank Indonesia since 2005 and the strengthening of the Inflation Monitoring Team and Regional Inflation Monitoring Team in provinces and districts or cities in supporting inflation control.

Meanwhile, the existence of expansionary monetary policy through the addition of foreign exchange into the money market accelerated bank lending and an increase in net foreign assets increased the money supply (Sasongko & Huruta, 2018). Theoretically, an increase in the money supply causes a decrease in interest rates, then make the LM (Liquidity and Money) curve shift to the right. Shifting the LM curve caused an increase in aggregate demand and output (Gross Domestic Product). However, at the same time, it caused an increase in price (inflation).

CONCLUSION AND SUGGESTIONS

Conclusion

Based on the results of the Granger causality test between the BI Rate and the Federal Fund Rate from January 2006 to May 2016, it could be concluded that there was no causality between the BI Rate and the Federal Fund Rate. Movement in interest rates could be caused by external or internal factors. The findings in this study show that interest rate movements tend to be caused by an increase in GDP, low Indonesian participation in GVC and expansionary monetary policy. There are several policies that can be considered by the government such as pushing macroeconomic policies (especially monetary) in maintaining the position of the domestic currency exchange rate so that the domestic currency continues to appreciate and can compete with other currencies and encourage Indonesia to participate in the Global Value Chain.

Suggestions

The analysis in this study is limited to the observation period of January 2006 to May 2016, so it has not been able to reflect the behavior of the BI Rate causality with the Federal Fund Rate as a whole. Therefore, future studies need to consider the use of a longer observation period using the Vector Autoregression (VAR) model, Vector Error Correction Model (VECM), and using panel data especially the Panel Granger Causality model.

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