

## **Analysis of the Effect of Multiple Monetary Policy Instrument on Industrial Production Index (IPI) in Indonesia, 2011:1-2017:12**

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**Abstract:** *This study aims to find out how the impact of interest rate of Bank Indonesia Certificates, interest rate of Interbank Money Market, yield of Bank Indonesia Sharia Certificates, yield of Sharia Interbank Money Market on Indonesia's Industrial Production Index (IPI). The research method used in this study was regression technique with Error Correction Model by Domowitz El-Badawi data analysis. The data was secondary data using time series in 2011:1-2017:12. The data was processed by using E-views 7.0 program. In the stationarity, it was found that all observed variables were stationary. In the determination of optimal lag length it showed Akaike Information Criterion (AIC) criteria, Schwarz Criterion (SC) and Human Quinn Criterion (HQ) and the smallest value was chosen between the optimal lags from Schwarz Criterion (SC) on lag 1. The result of co-integration indicated that the variables were in long term balance, therefore the result of regression was co-integrated regression. After conducting classical assumption test, it was found that the data was normally distributed, free from autocorrelation, multicollinearity and heteroscedasticity. In the short term and long term period, the interest rate of Bank Indonesia Certificates negatively and significantly affected the Indonesia's Industrial Production Index. The variable of the yield of Sharia Bank Indonesia Certificate In the short term and long term positively and significantly affected the Indonesia's Industrial Production Index. The variable of interest rate of Interbank Money Market in short term on conventional monetary policy negatively and significantly affected the Indonesia's Industrial Production Index while in long term it negatively and insignificantly the Indonesia's Industrial Production Index. The variable of the yield of Sharia Interbank Money Market in short term negatively and significantly affected the Indonesia's Industrial Production Index. While the yield of Sharia Interbank Money Market in long-term.*

**Keywords:** *Conventional Monetary Policy Instrument, Islamic Monetary Policy Instrument, Industrial Production Index (IPI), Error Correction Model by Domowitz El-Badawi*

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### **I. Introduction**

One indicator that can see the growth of the real sector is the framework of the Industrial Production Index (IPI). Industrial Production Index or IPI is a numeral index measuring earlier development of the production sector of industrial manufacturing and longer and more complete data series because it is designed monthly. This index is usually used as a proxy for economic activity or especially national income due to the unavailability of real GDP or GNI measured on a monthly basis.

Monetary Policy plays a very crucial role in achieving the goals of economic macro. The proper monetary policy making will be able to influence price stability, economic growth rates, creation and expansion of employment opportunities through the monetary mechanism. Mechanism of monetary policy transmission is a process in which a regulated policy can influence economic growth and inflation of a state, the channel of monetary policy transmission is carried out through six channels, consisted of interest rate, credit, asset price, company balance sheet, exchange rate and expansion, all the policies are carried out by a central bank which is the main partner of government in moving and implementing various economic policies through the policies.

This research specializes in monetary policy of interest rate channel. This is because the channel emphasizes the importance of price in financial markets to various economic activities in real sector. The most important feature in the monetary policy of interest rate is the emphasis on the real interest rate that affects the economic expenditure decisions (investment and consumption), so that even though the nominal of interest rate is zero, even the monetary policy of the parties is effective through changes in price levels. In this connection, the monetary policy pursued by the central bank will have an influence on the development of various interest rates in the financial sector and subsequently will affect the level of real output.

Based on the background above, the research problems of the interest rates of Bank Indonesia Certificate (SBI), Bank Indonesia Sharia Certificates (SBIS), Interbank Money Market (PUAB) and Inter Sharia Bank Money Market (PUAS) towards Industrial Production Index (IPI) in Indonesia in the short and long term. The aim of this study is to analyze the effect of the interest rates of Bank Indonesia Certificate (SBI), Bank Indonesia Sharia Certificates (SBIS), Interbank Money Market (PUAB) and Inter Sharia Bank Money Market (PUAS) towards Industrial Production Index (IPI) in Indonesia in the short and long term.

In this study, the final goal of dual monetary policy in which there is an influence of conventional interest rate and Sharia on the Industrial Production Index. By looking at the theory, data, and previous studies. Therefore, based on the basic explanation of the study, this study took the title "Analysis of the Effect of Dual Monetary Policy Instrument on Industrial Production Index (IPI) in Indonesia in 2011:1-2017:12." In this study, the final goal of dual monetary policy is the influence of conventional and Sharia relations on the Industrial Production Index.

## **II. Theoretical Framework and Hypothesis Development**

The Industrial Production Index (IPI) is an economic and statistical indicator that measures changes in the total value of inflation adjusted to the production output from producers, mining companies, electricity, water supply and the gas industry. These indications usually exclude construction industry. IPI is usually structured to measure the increase and decrease in production results.

The data on the monthly and quarterly IBS production index time series presented in this publication are the results of the Monthly IBS Survey conducted by the Central Bureau of Statistics. This index uses the 2010 baseline = 100. The sampling technique used the Cut Off Point method and Proportional to Size (PPS) method. The Cut Off Point method is a method of sampling based on a certain output value that is certainty determined and chosen. The remainder was chosen using the PPS sampling method with the output value as a result.

In order to achieve the final target of monetary policy, Bank Indonesia applies a monetary policy framework through controlling interest rates (interest rate targets). Since June 2008, Bank Indonesia has used overnight Interbank Money Market (PUAB) interest rates as operational targets for monetary policy. PUAB itself is a lending of funds activity between one bank and other banks. The PUAB interest rate is the price formed by the agreement of the parties that demand and lend funds. Activities in the PUAB are carried out through an over-the-counter (OTC) mechanism, which is the making of an agreement between the borrower and the owner of the funds which is not carried out through the trading floor. Bank Indonesia itself has always tried to maintain and meet the needs of banking liquidity in a balanced manner to create a reasonable and stable interest rate through the implementation of monetary operations. (Ginting, et al., 2013).

Interest rate is basically a Keynesian view in which the long-term real interest rate is the most influencing in the economy and it can be explained clearly by IS-LM schema. The traditional IS-LM Keynesian view of the mechanism of monetary transmission can be marked with the following scheme (Mishkin, 2004: 604):

$$M \uparrow \Rightarrow P e \uparrow \Rightarrow \pi e \uparrow \Rightarrow i r \downarrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$$

The interest rate of Bank Indonesia Certificate (SBI) is set at a fixed price method (fixed rate) and various prices (variable rate). The interest rate of Bank Indonesia Certificate (SBI) at a fixed price (fixed rate) is determined by BI and it refers to BI Rate (starting from May 2006 to January 2008). The interest rate of Bank Indonesia Certificate (SBI) with a variety of prices (variable rate) is calculated by using the weighted average (used from January 1998 to April 2006 and has been reapplied since February 2008 to present).

Post-Keynesian Theory, the first person to emphasize that an interest rate can be said to be the Equilibrium Interest Rate for an economy if the interest rate meets the balance in the investment fund market and at also the balance in the money market (as a liquid asset) is a famous English economist Sir John Hicks (1937) with the famous IS-LM curve analysis tool. The IS-LM model explains how the interest rate and income level in the economy (Mishkin, 2004:536). The IS-LM model is one of the models that emphasizes the interaction between the goods market and money market. Spending, interest rates and income are determined jointly by the equilibrium on the money market and capital market.

The theory of Liquidity Preferences is a basic model of determining interest rates. Theory of Keynes emphasizes the direct relationship between people's willingness to pay interest and the element of demand for money for speculative purposes where demand is large if interest rates are low and demand is small if interest rates are high (Boediono, 1994:83).

The interest rate states that in an interest-free foreign exchange system in one country will tend to be the same as the interest rate in another country. After calculating the estimates of one state's depreciation currency rate to another country (Boediono, 1994:101). From this we can see that the relation with foreign countries has an effect on the development of domestic interest rate.

The classical theory of saving is a function of the interest rate. Therefore, the higher the interest rate the higher the community's desire to save.

The Interbank Money Market (PUAB) is the first medium for monetary policy transmission. Through interbank loan transactions that are mostly short-term (daily/overnight) monetary policy signals are transmitted (channeled) to interest rates of other instruments in the financial markets. The Interbank Money Market (PUAB) has become one of the operational targets of monetary policy because of its increasingly important role in influencing price stability. Through periodic financial market interventions, the central bank influences the reserve levels of banks as well as controlling interest rate volatility in order to achieve the desired target. As for banks, the Interbank Money Market (PUAB) is an alternative way to meet daily liquidity needs.

Bank Indonesia Sharia Certificate (SBIS) is issued by Bank Indonesia as one of the instruments of open market operations in the context of monetary control conducted based on sharia principles. Bank Indonesia Syariah Certificate (SBIS) is useful especially when the central bank does not have enough government securities to implement the OPT. This instrument also provides equal opportunities for sharia banks to participate in the money market with a sharia system.

Basically, the Inter Sharia Bank Money Market (PUAS) and the Interbank Money Market (PUAB) have similarity that is the two financial markets have the same function. Inter Sharia Bank Money Market (PUAS) and Interbank Money Market (PUAB) function as a regulator of liquidity. If the banks have excess liquidity, they will use money market instruments for investment, and if they have less liquidity, they will issue instruments to get cash. The basic differences between the two banks are the publishing mechanism and the character of the instrument itself. In conventional money market, the issued instruments are debt instruments that are sold at a discount and are based on interest calculations, while issued sharia money market is an instrument that uses contracts based on sharia principles as needed and it requires an underlying asset in the issuance of this instrument in the form of investments. (Soemitra, 2014).

Similar to the Interbank Money Market (PUAB), the Inter Sharia Bank Money Market (PUAS) has a function of providing facilities for banks that experience liquidity problems, both in the form of shortages and excess liquidity. Investment facility used by banks in PUAS transactions is Interbank Mudharabah Investment Certificate with mudharabah way.

A previous study is conducted by Dede Ruslan in 2017 entitled "The Monetary Policy Transmission Mechanism based Macroeconomic Model of North Sumatera: A Projection using Stochastic Simulation by using Three Stage Least Square (3SLS). The study aimed to find out the transmission mechanism effect through North Sumatera macroeconomy based interest rate and identify the effects of interest rate changes on the North Sumatera economy by using Three Stage Least Square (3SLS). The results showed that interest rate changes significantly affected the aggregate economic activity in North Sumatera through the mechanism of the elasticity.

In accordance with literature studies, the studies have been carried out in previous studies, as well as based on the theoretical framework, then the hypotheses proposed in this study are:

H<sub>1</sub>. Bank Indonesia Certificate (SBI) and Bank Indonesia Sharia Certificate (SBIS) have a significant effect on the Industrial Production Index (IPI) in Indonesia in the short and long term.

H<sub>2</sub>. The interest rate of the Interbank Money Market (PUAB) and the Inter Sharia Bank Money Market (PUAS) yield have a significant effect on the Industrial Production Index (IPI) in Indonesia in the short and long term.

### **III. Research Methodologies**

This research is a research based on the summary data in certain time. The Calculation and Analysis of data used E-views software. Wahyu (2007) explains that E-views is Econometric Views. The uses of E-views is for data analysis and evaluation, financial analysis, macroeconomic forecasting, simulation, sales forecasting and cost analysis. The research object used in the research consisted of statistical data of Bank Indonesia Certificates (SBI), the interest rate of Interbank Money Market (PUAB), the yield of Inter Sharia Bank Money Market (PUAS) and Industrial Production Index (IPI) from 2011:1 to 2017:12.

The type of data used in this research was secondary data in the form of time series in 2011:1 - 2017:12. The data collection was carried out with the documentation technique, which was conducted by collecting secondary data collected from the Central Bureau of Statistics (BPS) and Bank Indonesia (BI) and the Financial Services Authority. In addition, the researcher conducted a literature studies to obtain the

used in data by studying and analyzing literature books and processed data to get relevant and accurate materials.

In collecting the data used in this study used literature studies and collected secondary data from various sources issued by the Central Bureau of Statistics, and Bank Indonesia in 2011:1-2017:12. The data used in this study consisted of Indonesia's Industrial Production Index (IPI) data from BPS, interest rate of Bank Indonesia Certificate (SBI), interest rate of Interbank Money Market (PUAB) (Bank Indonesia), the yield of

Bank Indonesia Sharia Certificate (SBIS) (OJK) and the yield of Inter Sharia Bank Money Market (PUAS) (OJK). The collecting data method in this study was conducted by collecting the data from authorized government website that issued the publications from the determined variables in this study the data was collected from [www.bi.go.id](http://www.bi.go.id) and [www.bps.go.id](http://www.bps.go.id).

The data analysis method used in this study was the annual time series data model. The coherent data was obtained data from the various data used in 2011:1–2017:12.

The following is the model the study:

$$IPI_t = f(rSBI_t, rPUAB_t, SBIS_t, PUAS_t) \quad (3.1)$$

Next, by following the approach developed by Domowitz-El Badawi, we can formulate a single period quadratic cost function as follows:

$$C_t = e_0 [IPI_t - IPI_t^*]^2 + e_1 \{(1-B) IPI_t - f_t (1-B) Z_t\}^2 \quad (3.2)$$

Where the first component of the equation reflects the imbalance cost and the second component is the cost of adjustment.  $IPI_t$  is an industrial production index in the period  $t$ ,  $Z_t$  is a variable that affects  $IPI_t$  and  $f_t$  is a weighting factor (Insukindro, 1999).

$$IPI_t = \beta_0 + \beta_1 rSBI_t + \beta_2 rPUAB_t + \beta_3 SBIS_t + \beta_4 PUAS_t \quad (3.3)$$

Where:

$IPI$  = Industrial Production Index (%)

$rSBI$  = Bank Indonesia Certificate Interest Rate (%)

$rPUAB$  = Interbank Money Market Interest Rate (%)

$SBIS$  = Bank Indonesia Sharia Certificate Return Rate (%)

$PUAS$  = Inter Sharia Bank Money Market Return Rate (%)

$\beta_0$  = Constanta

$\beta_1 : \beta_2 : \beta_3 : \beta_4$  = Coefficient of Regression

Then the minimization of cost function on  $IPI$  is calculated as below:

$$\frac{dC_t}{dIPI_t} = 2 e_0 [IPI_t - IPI_t^*] + 2 e_1 \{(1-B)IPI_t - f_t (1-B)Z_t\}$$

$$\frac{dC_t}{dIPI_t} = e_0 [IPI_t - IPI_t^*] + e_1 \{(1-B)IPI_t - f_t (1-B)Z_t\}$$

$$\frac{dC_t}{dIPI_t} = e_0 IPI_t - e_0 IPI_t^* + e_1 IPI_t - e_1 B IPI_t - e_1 f_t (1-B)Z_t$$

$$0 = e_0 IPI_t - e_0 IPI_t^* + e_1 IPI_t - e_1 B IPI_t - e_1 f_t (1-B)Z_t$$

$$e_0 IPI_t + e_1 IPI_t = e_0 IPI_t^* + e_1 B IPI_t - e_1 f_t (1-B)Z_t$$

$$(e_0 + e_1) IPI_t = e_0 IPI_t^* + e_1 B IPI_t - e_1 f_t (1-B)Z_t \quad (3.4)$$

$$IPI_t = \frac{e_1}{(e_0 + e_1)} IPI_t^* + \frac{e_1}{(e_0 + e_1)} B IPI_t - \frac{e_1}{(e_0 + e_1)} f_t (1-B)Z_t \quad (3.5)$$

The equation 3.4 and 3.5 above is equivalent to:

$$IPI_t = e IPI_t^* + (1-e) B IPI_t - (1-e) f_t (1-B)Z_t$$

Where  $Z$  is the variable influencing  $IPI_t$ , the equation 3.2 is substituted to the basic model 3.3 and it becomes:

$$IPI_t = e (\beta_0 + \beta_1 rSBI_t + \beta_2 rPUAB_t + \beta_3 SBIS_t + \beta_4 PUAS_t) + (1-e) B IPI_t + (1-e) f_t (1-B)Z_t$$

$$IPI_t = \beta_0 e + \beta_1 e rSBI_t + \beta_2 e rPUAB_t + \beta_3 e SBIS_t + \beta_4 e PUAS_t + (1-e) B IPI_t + (1-e) f_t (1-B)Z_t \quad (3.6)$$

$$IPI_t = \beta_0 e + [(\beta_1 e + (1-e) f_1) rSBI_t - (1-e) f_1 B rSBI_t] + [(\beta_2 e + (1-e) f_2) rPUAB_t - (1-e) f_2 B rPUAB_t] + [(\beta_3 e + (1-e) f_3) SBIS_t - (1-e) f_3 B SBIS_t] + [(\beta_4 e + (1-e) f_4) PUAS_t - (1-e) f_4 B PUAS_t] + \beta_5 (1-e) B IPI_t \quad (3.7)$$

where:

$$\beta_0 = \beta_0 e$$

$$\beta_1 = (\beta_1 e + (1-e) f_1)$$

$$\beta_2 = (\beta_2 e + (1-e) f_2)$$

$$\beta_3 = (\beta_3 e + (1-e) f_3)$$

$$\beta_4 = (\beta_4 e + (1-e) f_4)$$

$$\beta_5 = (1-e) B IPI_t$$

Thus, the dynamic model is:

$$IPI_t = \beta_0 + \beta_1 rSBI_t + \beta_2 rPUAB_t + \beta_3 SBIS_t + \beta_4 PUAS_t + \beta_5 B rSBI_t + \beta_6 B rPUAB_t + \beta_7 B SBIS_t + \beta_8 B PUAS_t + \beta_9 (1-e) B IPI_t \quad (3.8)$$

Based on the basic equation model in this study, it is transferred into ECM (Error Correlation Model) which has parameterized.

$$IPI_t - IPI_{t-1} = \beta_0 + \beta_1 D rSBI_t + \beta_2 D rPUAB_t + \beta_3 D SBIS_t + \beta_4 D PUAS_t + \beta_5 B rSBI_t + \beta_6 B rPUAB_t + \beta_7 B SBIS_t + \beta_8 B PUAS_t + \beta_9 (1-e) B IPI_t$$

Where :

$$B = \text{backwardlag operator}$$

$$D IPI_t = IPI_t - IPI_{t-1}$$

$$\beta_9 (1-e) B IPI_t = (B rSBI_t + B rPUAB_t + B SBIS_t + B PUAS_t - B IPI_t)$$

Equation 3.9 can be written as

$$D IPI_t = \beta_0 + \beta_1 D rSBI_t + \beta_2 D rPUAB_t + \beta_3 D SBIS_t + \beta_4 D PUAS_t + \beta_5 B rSBI_t + \beta_6 B rPUAB_t + \beta_7 B SBIS_t + \beta_8 B PUAS_t + \beta_9 (B rSBI_t + B rPUAB_t + B SBIS_t + B PUAS_t - B IPI_t) + \epsilon_i \quad (3.9)$$

where :

$$ECT = B rSBI_t + B rPUAB_t + B SBIS_t + B PUAS_t - B IPI_t$$

Then the Error Correction Model (ECM) from the above equation is:

$$D IPI_t = \beta_0 + \beta_1 D rSBI_t + \beta_2 D rPUAB_t + \beta_3 D SBIS_t + \beta_4 D PUAS_t + \beta_5 B rSBI_t + \beta_6 B rPUAB_t + \beta_7 B SBIS_t + \beta_8 B PUAS_t + \beta_9 ECT + \epsilon_i \quad (3.10)$$

Ket:

DIPI<sub>t</sub> = Changes in Industrial Production Index year t

DrSBI<sub>t</sub> = Changes in interest rates on Bank Indonesia Certificate year t

DrPUAB<sub>t</sub> = Changes in Interbank Money Market interest rates year t

DSBIS<sub>t</sub> = Changes in yields on Bank Indonesia Sharia Certificate year t

DPUAS<sub>t</sub> = Changes in yields on the Islamic Interbank Money Market year t

ECT = Error Correction Term

μ<sub>t</sub> = Interference Variable

Koefisien β<sub>0</sub> = Intercept

Koefisien β<sub>1,2,3,4</sub> = Short term Regression Coefficient

Koefisien β<sub>5,6,7,8</sub> = Long term Regression Coefficient

Koefisien β<sub>9</sub> = Coefficient of ECT Regression

The error correction model can analyze the short term balance of each independent variable to the dependent variable. The error correction model can identify how long the adjustment factor needed to achieve the reversal of the trapping balance after the shock occurs. The error correction model can stay away from the problem of spurious regression so that the resulting analysis and conclusions are not biased (Thomas, 1997).

The data analysis technique used in this study referred to the Error Correction Model (ECM) equation model by estimating the short-term and long-term relationships between Bank Indonesia Certificate (rSBI) interest rate, Bank Indonesia Sharia Certificate (SBIS) return rate, Interbank Money Market (rPUAB) interest rate, Inter Sharia Bank Money Market (PUAS) return rate and Industrial Production Index (IPI) period 2011:1-2017:12. The ECM model had passed the stationarity test, integration degree test and Domowitz-El Badawi cointegration test and was free from all problems from the test, so that the ECM model was feasible to be used and analyzed.

One of the identifying method of the relationship between variables that are non-stationary is to do error correction modeling. Provided that in a group of non-stationary variables there is a cointegration, the error correction modelling is valid. This requirement is stated in the representative theory of Domowitz -El Badawi (Ariefianto, 2012: 142).

To analyze the effect of interest rate of Bank Indonesia Certificate (SBI), Bank Indonesia Sharia Certificate (SBIS), Interbank Money Market (PUAB), Inter Sharia Bank Money Market (PUAS) and Index Industrial Production (IPI) by using Error Correction Model (ECM) model proposed by Sargan and popularized by Domowitz-El Badawi, because the model is able to see variables in analysing short- and long-term economic phenomena and solve time series variables that are vulnerable to non-stationery which is tested by ADF stationer and cointegration test.

The test in analysis technique in this study consisted of stationer test (unit root test), integration degree test, optimal lag-length test, cointegration test, classical assumption test (normality test, autocorrelation test, heteroscedasticity test, and multicollinearity test), hypothesis test (t test, F test, and coefficient determination test (R<sup>2</sup>)) and error correction model.

The dependent variable in this study was the Industrial Production Index which was a proxy for economic growth or output (GDP). This study used monthly data on the Monthly Large and Medium Industrial Production Index in the period 2011:1-2017:12 published by the BPS.

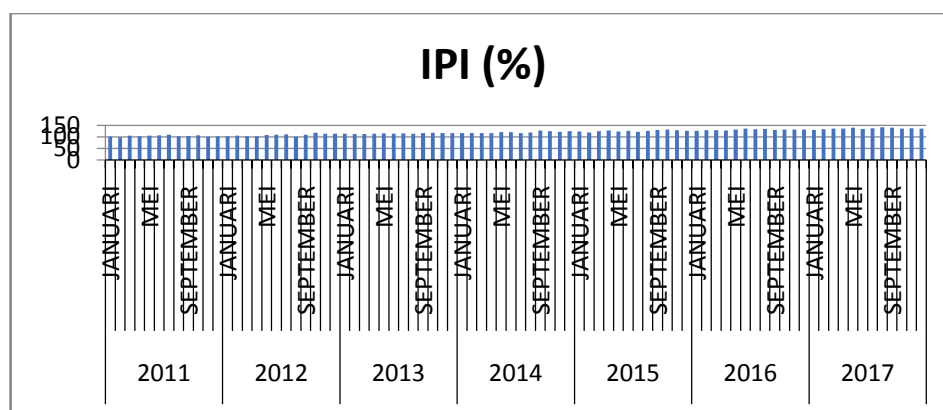
The independent variables in this study were the variables that had a relationship with the transmission of monetary policy, consisted of:

1. Bank Indonesia Certificate (SBI) is securities issued by Bank Indonesia in recognition of short-term debt (1-3 months) with an interest system. This study used monthly data for 2011:1-2017:12 obtained from the Indonesian Economic and Financial Statistics (SEKI) published by Bank Indonesia in percentage.
2. Interbank Money Market (PUAB) is the activity of lending and borrowing funds between one bank and another. Banks with excess funds (surplus units) will lend funds to banks that are underfunded (deficit units). As compensation, the lending bank will charge a certain interest rate. Interest rates are called interbank money market rates. This study used monthly data on PUAB interest rates for the period 2011:1-2017:12 obtained from the Indonesian Economic and Financial Statistics (SEKI) published by Bank Indonesia in percentage.

3. Bank Indonesia Sharia Certificate (SBIS) is securities denominated in rupiah issued by short-term Bank Indonesia based on sharia principles. This study used monthly data on the position of SBIS for the period 2011:1-2017:12 obtained from the Indonesian Economic and Financial Statistics (SEKI) published by the Financial Services Authority in percentage.
4. The Inter Sharia Bank Money Market (PUAS) is a short-term interbank financial transaction activity based on sharia principles both in rupiah and foreign currencies . This study used monthly data on the return rate of the Interbank Mudharabah Investment Certificate (SIMA) in the period 2011:1-2017:12 obtained from the Indonesian Economic and Financial Statistics (SEKI) published by the Financial Services Authority in percentage.

#### IV. Results and Discussion

##### The Development of Industrial Production Index in Indonesia



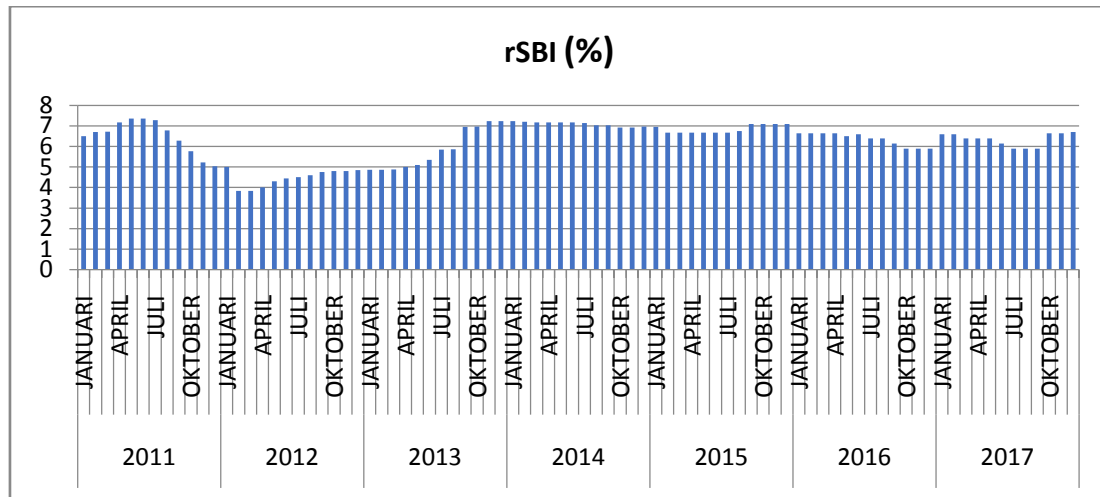
Source: Central Bureau of Statistics (BPS)

Figure 1. The Development of Industrial Production index (IPI) 2011:1-2017:12

From Figure 1 above, it can be seen that the development of the Industrial Production Index (IPI) in January 2011 to December 2017 experienced a fluctuation but tended to increase. The development of the Industrial Production Index (IPI) is seen from the real output of manufacturing, mining and other industrial industries such as the oil and gas industry.

Manufacturing industry experienced a decline in the first quarter of 2016 by 1.29 percent compared to the previous quarter. Whereas in the second quarter of 2016 it increased 3.02 percent compared to the first quarter of 2016 or increased from the production index 127.89 to 131.76. Likewise, in the third quarter of 2016 it increased 0.89 percent compared to the previous quarter. In the third quarter of 2016, compared to the second quarter of 2016 there were many industrial classifications that experienced an increase in production such as the Food Industry (Manufacture of food products) (KBLI 10) by 3.21 percent, the Tobacco Processing Industry (Manufacture of tobacco products) (KBLI 12) by 0.85 percent, Chemical Industry and Chemical Products (Manufacture of chemicals and chemical products) (KBLI 20) by 3.05 percent, Pharmaceutical Industry, Chemical and Traditional Medicines Products (Manufacture of pharmaceuticals, medicinal chemical and botanical products) (KBLI 21) by 2.51 percent, Non-Pharmaceutical Industry Metals (Manufacture of non-metallic mineral products) (KBLI 23) by 3.89 percent, Manufacture of Metal Products, Non-Machinery and Equipment (Manufacture of metal products, except manufacturing and equipment) by 2.89 percent (KBLI 25), Computer Industry, Electronic Goods and Optics (Manufacture of computers, electronic and optical products) (KBLI 26) by 6.77 percent, In the Electrical Equipment Industry (Manufacture of electric equipment) (KBLI 27) by 0.53 percent, the Other Transport Equipment Industry (Manufacture of other transport equipment)(KBLI 30) by 1.86 percent. Although there are several types of industries that are still experiencing a decline in production, on average, it can be said that the production of the Large Manufacturing Industry Medium-Q3 / 2016 has increased (Economic Report, 2016).

**The Development of Interest Rate of Bank Indonesia Certificate (SBI) and Return Rate of Bank Indonesia Sharia Certificate (SBIS) in Indonesia**

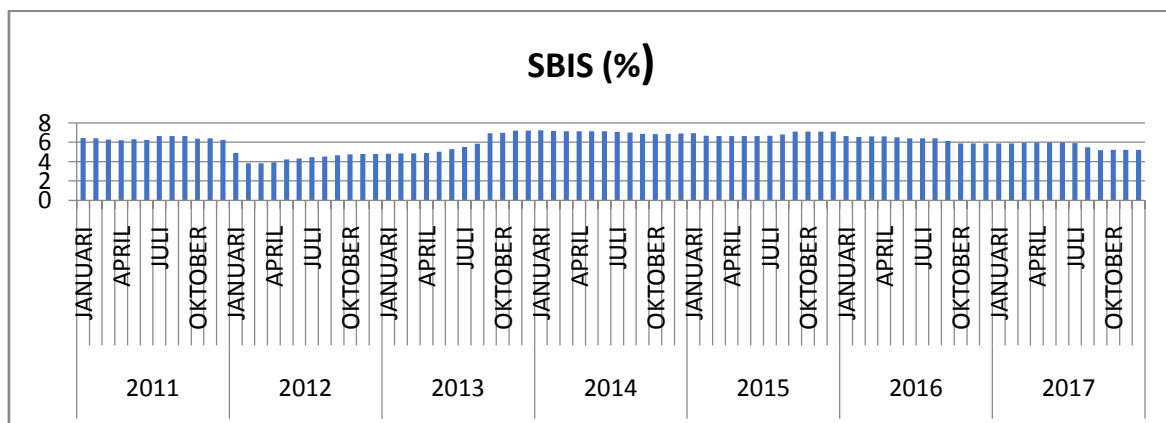


Source: Bank Indonesia, Processed Data

Figure 2. The Development of Interest rate of Bank Indonesia Certificate on 2011:1-2017:12

From Figure 2 above, it can be seen that the SBI positions from 2011 to 2017 tend to be fluctuating. In December 2015 it is decided to maintain the BI Rate at 7.50%, with interest rates Deposit Facility of 5.50% and Lending Facility at the level of 8.00%. Bank Indonesia viewed that the space for monetary policy was increasingly open with the maintenance of macroeconomic stability, especially inflation at the end of 2015 which was below 3% and the current account deficit which will be in the range of 2% of Gross Domestic Product (GDP). Bank Indonesia will keep an eye on developments in global financial markets after the increase in the US Federal Reserve (Fed Fund Rate) interest rate and domestic economic conditions in the short term going forward. Bank Indonesia will continue to strengthen coordination with the government in controlling inflation, strengthening growth stimulus, and structural reforms, so as to sustain higher economic growth with macroeconomic stability and a financial system that is maintained.

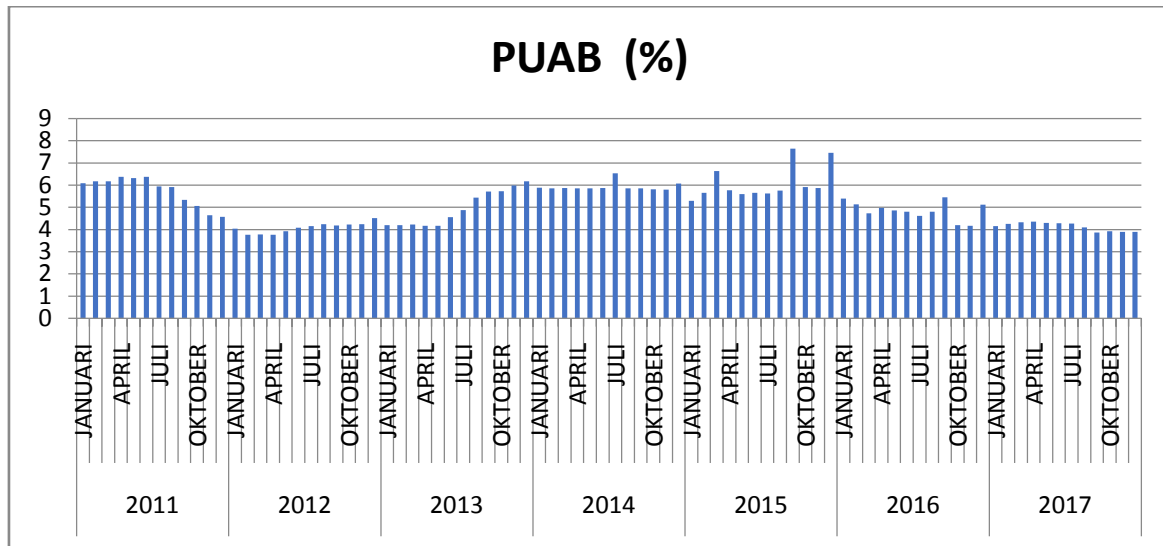
The SBIS fee level experienced a significant decline in the period of January 2012 at the level of 4.88% until August 2013 and experienced a significant increase in November 2013 at the level of 7.22%. The increase in the SBIS fee level was due to the slowing economic growth in 2013 of Indonesia's economic condition. The increase in the SBIS fee rate was also due to the still large transaction deficit amid the high risk of global uncertainty. To avoid bad loans the central bank increased the SBIS fee level so that Sharia banking encouraged to invest their funds in SBIS instruments.



Source: Bank Indonesia, Processed Data

Figure 3. The Development of Return rate of Bank Indonesia Sharia Certificate in 2011:11-2017:12

**The Development of Interest Rate of Interbank Money Market (PUAB) and Return rate of Inter Sharia Bank Money Market (PUAS) in Indonesia**

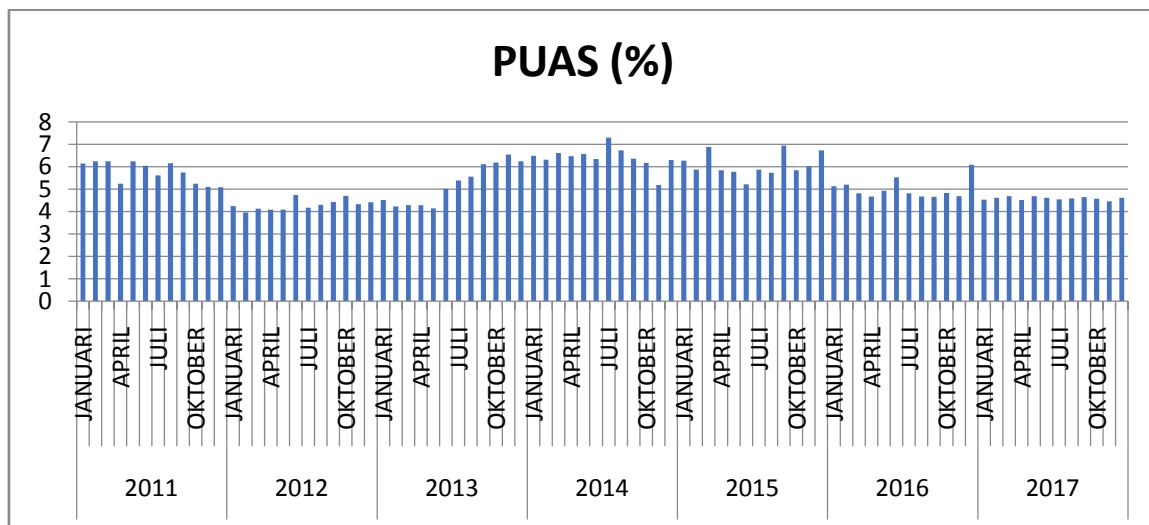


Source: Bank Indonesia, Processed Data

**Figure 4.** The Development of Interest Rate of Interbank Money Market (PUAB) in Indonesia 2011:1-2017:11

The interest rate of the interbank money market O/N in 2013 to 2016 was fluctuating, where at the beginning of the 2013 it tended to increase but in the 2016 tended to decrease. Similar to the PUAB, PUAS or equivalent rate or return rate of the Inter Sharia Bank Money Market from 2013 to 2016 was also fluctuating, which at the beginning of the 2013 it tended to increase. The overnight interbank rate (O/N) was recorded at the level of 8.12 percent in September 2015, rising by 245 bps compared to June 2015 with the spread on JIBOR reaching to 236 bps. The increase in the interbank rate was driven by the need for rupiah liquidity for the purpose of foreign currency hedging on the forward market. So that banking liquidity experienced tightening (BI Report, 2015)

In December 2016 interbank rates decreased, the interest rate of PUAB declined to 4.24 percent. In the last two years, interbank rates continued to decline. It was caused by increasing liquidity in line with the policy of Minimum Statutory Reserves (GWM) and decline of interest by Bank Indonesia.



Source: Bank Indonesia, Processed Data

**Figure 5.** The Development of Return Rate of Inter Sharia Bank Money Market (PUAS) in Indonesia Period 2011:1-2017:12

From figure 5 the PUAS return rate position tends to be stable and has increased where the highest PUAS point was in July 2014 by 7.3 percent until December 2016 in which the PUAS position was 6.08



percent. The greater the yield given, the greater the placement of funds in the PUAS instrument and it will reduce the portion of the financing that will be distributed to the public, so that there will be a tug of interest in bank decisions in the distribution of funding carried out and placement of funds in PUAS.

**The Final Result of Unit Root Test Augmented Dickey Fuller (ADF)**

**Table 1.** The Final Result of Unit Root Test with ADF Method in Level

No.	Variable	ADF Value	McKinnon Critical Value		Probability	Conclusion (Stationary / No)
			Value			
1.	Industrial Production Index (IPI)	-1.376690	1%	-3.512290	0.5898	Not Stationary
			5%	-2.897223		
			10%	-2.585861		
2.	Bank Indonesia Certificate (rSBI)	-1.928746	1%	-3.512290	0.3178	Not Stationary
			5%	-2.897223		
			10%	-2.585861		
3.	Interbank Money Market (rPUAB)	-1.888959	1%	-3.512290	0.3359	Not Stationary
			5%	-2.897223		
			10%	-2.585861		
4.	Bank Indonesia Syariah Certificate (SBIS)	-1.289575	1%	-3.512290	0.6311	Not Stationary
			5%	-2.897223		
			10%	-2.585861		
5.	Islamic Interbank Money Market (PUAS)	-6.860719	1%	-3.512290	0.0000	Stationary
			5%	-2.897223		
			10%	-2.585861		

Source: Processed Data by Using Eviews 9

Table 1 shows that there are five not stationary variables at the basic level, they were Bank Indonesia Certificate (rSBI) interest rate, the interbank money market (rPUAB) interest rate and the Bank Indonesia Sharia Certificate (SBIS) return rate. At the ADF statistical value <its critical value (MackinonCriticalValues) at  $\alpha = 5\%$ , the data was not stationary. While stationary of Inter Sharia Bank Money Market (PUAS) were stationary at the base level, because the statistical ADF value > the critical value (MackinonCriticalValues) at  $\alpha = 5\%$ , the data was not stationary. Therefore, not all variables were stationary at the base level or still had unit root problems. Because the average variable was not significant at the level, it needs to be tested with integration degrees.

**Integration Test**

**Table 2.** The Result of Unit Root test with ADF Method in the First Different

No.	Variable	ADF Value	McKinnon Critical Value		Probability	Conclusion (Stationary / No)
			Value			
1.	Industrial Production Index (IPI)	-10.65097	1%	-3.513344	0.0001	Stationary
			5%	-2.897678		
			10%	-2.586103		
2.	Bank Indonesia Certificate (rSBI)	-6.183966	1%	-3.512290	0.0000	Stationary
			5%	-2.897223		
			10%	-2.585861		
3.	Interbank Money Market (rPUAB)	-10.26488	1%	-3.513344	0.0000	Stationary
			5%	-2.897678		
			10%	-2.586103		
4.	Bank Indonesia Syariah Certificate (SBIS)	-6.860719	1%	-3.512290	0.0000	Stationary
			5%	-2.897223		
			10%	-2.585861		
5.	Islamic Interbank Money Market (PUAS)	-14.03559	1%	-3.512290	0.0001	Stationary
			5%	-2.897223		
			10%	-2.585861		

Source: Processed Data by Using Eviews 9

Based on the table of Industrial Production Index (IPI) variables, the t-statistic ADF value was  $-10.65097 >$  critical value of 5%, that is  $-2.897678$ , so it can be concluded that the Industrial Production Index (IPI) variable data had been stationary at the first difference. Bank Indonesia Certificate (SBI) interest rate variable had a t-statistic ADF value of  $-6.183966 >$  a critical value of 5%, it was  $-2.897223$ , thus, it can be concluded that the variable interest rate of Bank Indonesia Certificate (SBI) had been stationary at the first differentiation. Variable interbank money market interest rate (PUAB) had an ADF value of t- statistics of  $-10.26488 >$  critical value of 5%, it was  $-2.897678$ , it can be concluded that the interbank money market variable (PUAB) data had been stationary at the first differentiation.

Variable of Bank Indonesia Sharia Certificate (SBIS) return rate had a t-statistic ADF value of  $-6.860719 >$  a critical value of 5%, it was  $-2.897223$  it can be interpreted that Bank Indonesia Sharia Certificate (SBIS) return rate variable had been stationary at the first differentiation. Furthermore, the Inter Sharia Bank Money Market (PUAS) return rate variable has a t-statistic ADF value of  $-14.03559 >$  5% value, it was  $-2.897223$ , so we can conclude that the Inter Sharia Bank Money Market (PUAS) return rate variable had been stationary at the first differentiation.

**The Result of Optimal Lag-Length Test**

**Table 3.** The Determination of Optimal Lag-Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-538.5938	NA	0.335970	13.09865	13.24436	13.15719
1	-242.3638	549.6316*	0.000488*	6.562983*	7.437263*	6.914220*

Source: Processed Data by Using Eviews 9

Based on Table 3 above, it shows the Akaike Information Criterion (AIC) of the smallest value was in lag 1, and for the Schwarz Criterion (SC), the smallest value was in lag 1.

**The Result of Cointegration Test**

**Table 4.** The Result of Cointegration Test

Variabel	Nilai Kritis McKinnon			ADF	Probabilitas
	1%	5%	10%		
ECT	-3.511262	-2.896779	-2.585626	-5.556527	0.0000

Source: Processed Data by Using Eviews 9

From the table above, it shows that the value of the ADF test  $>$  Critical Value that was  $-5.556527$  it means that the residual of the equation had been stationary at the zero or I (0) degree of integration. This means that there was a significant relationship (cointegration) in the long run between the Industrial Production Index (IPI) and the variables that influenced it, it was Bank Indonesia Certificate (SBI) interest rate, Bank Indonesia Sharia Certificate (SBIS) return rate, Interbank Money Market (PUAB) interest rate, and Inter Sharia Bank Money Market (PUAS) return rate.

**Classical Assumption Test**

The JB statistical probability value was  $0.380923 >$   $\alpha = 5\%$  (0.05). Then, it can be concluded that the data used in the ECM model was normally distributed. The value of  $\text{obs} \cdot R\text{-squared}$  or  $X^2$  count = 9.924798 more than the standard table ( $df = 10, \alpha = 10\%$ ) was 1.996588 and Prob. F (2.76) was  $0.4084 >$   $\alpha = 5\%$  (0.05), so it can be concluded that the ECM model was free from autocorrelation problems. Value Prob. F (4.78) was  $0.8938 >$   $\alpha = 5\%$ , so that it can be concluded that the ECM model was free from the problem of heteroscedasticity. All independent variables had a correlation coefficient  $>$  0.90 so that it can be concluded that the ECM model was free from multicollinearity problems.

**t-Statistics Test**

**Table 5.** The Result of t-Statistics Test

Variable	Coefficient	t-Statistic	Prob.	Keterangan	Estimasi
D(SBI)	-0.113856	-3.349102	0.0013	Significant at $\alpha = 5\%$	Short Term
D(PUAB)	-0.561230	-34.77507	0.0000	Significant at $\alpha = 5\%$	
D(SBIS)	0.682072	16.70661	0.0000	Significant at $\alpha = 5\%$	
D(PUAS)	-0.173496	-11.03304	0.0000	Significant at $\alpha = 5\%$	
ECT	0.007701	61.03669	0.0000	-	Long Term
C	4.505272	177.8679	0.0000	-	
SBI(-1)	-0.011717	-1.740527	0.0486	Significant at $\alpha = 5\%$	
PUAB(-1)	-0.000171	-0.067204	0.9466	Not significant at $\alpha = 5\%$	
SBIS(-1)	0.011534	1.850025	0.0564	Significant at $\alpha = 5\%$	
PUAS(-1)	0.002171	0.877288	0.3832	Not significant at $\alpha = 5\%$	

Source: Processed Data by Using Eviews 9

**The Results of Short-Term ECM**

1. Bank Indonesia Certificate (SBI) interest rate variable with a t-statistic value of  $-3.349102$  and a probability value of 0.0013 shows that in the short term the Bank Indonesia Certificate had a negative and significant effect on the Industrial Production Index (IPI) in Indonesia with a coefficient of  $-0.113856$  which means that if there is an increase on the Bank Indonesia Certificate (SBI) interest rate variable it will reduce the Industrial Production Index (IPI) in Indonesia.

2. Interbank Money Market (PUAB) interest rate variable with a t-statistic value of -34.77507 and a probability value of 0.0000 concluded that the Interbank Money Market (PUAB) interest rate variable in the short term had a negative and significant effect on the Industrial Production Index (IPI) in Indonesia. Where Interbank Money Market (PUAB) interest rate had a coefficient value of -0.561230 which means that if there is an increase in the Interbank Money Market (PUAB) interest rate then it will reduce the Industrial Production Index (IPI) in Indonesia.
3. Similarly, in the short-term estimation of the Bank Indonesia Sharia Certificate (SBIS) return rate variable where the t-statistic value was 16.70661 and the probability value of 0.0000 was stated that the return rate of Bank Indonesia Certificate in the short term had a positive and significant effect on the Industrial Production Index (IPI) in Indonesia. With the coefficient of the SBIS return rate variable was 0.011717 which means that if there is an increase in the Bank Indonesia Sharia Certificate (SBIS) return rate it will increase the Industrial Production Index (IPI) in Indonesia.
4. Inter Sharia Bank Money Market (PUAS) return rate variable with a t-statistic value of -11.03304 was negative and probability 0.0000 indicates that the Inter Sharia Bank Money Market (PUAS) return rate variable in the short term had a negative and significant effect on the Industrial Production Index (IPI) in Indonesia. With a coefficient of -0.173496 which means that if there is an increase in the Inter Sharia Bank Money Market (PUAS) return rate variable it will reduce the Industrial Production Index (IPI) in Indonesia.

### **The Results of Long-Term ECM**

1. The Bank Indonesia Certificate (SBI) interest rate variable with a t-statistic of -1.740527 was negative, and the probability of 0.0486 was concluded that the Bank Indonesia Certificate (SBI) interest rate variable in the long-term had a negative and significant effect in influencing the Industrial Production Index (IPI) in Indonesia with a coefficient value -0.011717 which means that if there is an increase in the Bank Indonesia Certificate (SBI) interest rate variable it will reduce the Industrial Production Index (IPI) in Indonesia.
2. While the Interbank Money Market (PUAB) interest rate variable with a t-statistic value of -0.067204 was negative, where the probability value of 0.9466 indicates that the Interbank Money Market (PUAB) interest rate variable had a negative and insignificant effect on the long-term Industrial Production Index (IPI) in Indonesia, with a coefficient of -0.000171 which means that if there is an increase in the Interbank Money Market (PUAB) interest rate variable, it will reduce the Industrial Production Index (IPI) in Indonesia.
3. Where other independent variables such as the Bank Indonesia Sharia Certificate (SBIS) return rate variable with a t-statistic value of 1.850025 was positive, and the probability value of 0.0564 indicates that the Bank Indonesia Sharia Certificate (SBIS) return rate variable had a positive and significant effect in the long term on the Industrial Production Index (IPI) in Indonesia. With a coefficient value of 0.011534 which means that if there is an increase in the Bank Indonesia Sharia Certificate (SBIS) return rate variable it will reduce the Industrial Production Index (IPI) in Indonesia.
4. The Inter Sharia Bank Money Market (PUAS) return rate variable in the long-term estimation with a t-statistic value of 0.877288 was positive and a probability value of 0.3832, it is concluded that the Inter Sharia Bank Money Market (PUAS) return rate variable with a coefficient value of 0.002171 had no effect in the long term with the interest rate to the Industrial Production Index (IPI) in Indonesia which means that if there is an increase in the Inter Sharia Bank Money Market (PUAS) return rate variable, it will increase the Industrial Production Index (IPI) in Indonesia.

### **F-Statistics Test**

Based on the results of the above table and data processing method by using short-term and long-term ErrorCorrection Model it was obtained that F count was 1586.092 with probability = 0.000000 < of  $\alpha = 5\%$  therefore  $H_0$  is rejected. Then the variables of Bank Indonesia Certificate (SBI) interest rate, Bank Indonesia Sharia Certificate (SBIS) return rate, Interbank Money Market (PUAB) interest rate and Inter Sharia Bank Money Market (PUAS) return rate in the short and long term significantly and simultaneously affected the Industrial Production Index (IPI) in Indonesia.

### **The Results of Determination Coefficient Test (R<sup>2</sup>)**

Based on the results of data processing with the method of short-term and long-term ErrorCorrection Model it was obtained that R Squared was 0.994912 which means that the variables of Bank Indonesia Certificate (SBI) interest rate, Bank Indonesia Sharia Certificate (SBIS) return rate, Interbank Money Market (PUAB) interest rate and Inter Sharia Bank Money Market (PUAS) return rate in the short and long term affected the Industrial Production Index (IPI) in Indonesia by 99.4%.

Thus, the monetary policy variables in Indonesia, either conventional or sharia policies, did not fully affect the Industrial Production Index (IPI) in Indonesia through the interest rate channel both in the short and long term.

**The Results of Error Correction Model Regression by Domowitz-El Badawi**

**Table 6.** The Results of Regression Estimation with Error Correction Model by Domowitz-El Badawi in Short- and Long-Term

<b>Dependent Variable: DLNIPI</b>			
<b>Variable</b>	<b>Coefficient</b>	<b>t-Statistic</b>	<b>Prob.</b>
D(SBI)	-0.113856	-3.349102	0.0013
D(PUAB)	-0.561230	-34.77507	0.0000
D(SBIS)	0.682072	16.70661	0.0000
D(PUAS)	-0.173496	-11.03304	0.0000
ECT	0.007701	61.03669	0.0000
C	4.505272	177.8679	0.0000
SBI(-1)	-0.011717	-1.740527	0.0486
PUAB(-1)	-0.000171	-0.067204	0.9466
SBIS(-1)	0.011534	1.850025	0.0564
PUAS(-1)	0.002171	0.877288	0.3832
R-squared	0.994912		
Adjusted R-squared	0.994285		
F-statistic	1586.092		
Prob(F-statistic)	0.000000		
Durbin-Watsonstat	1.329859		

Source: Processed Data by Using Eviews 9

Error correction model (Domowitz-El Badawi’s Error Correction Model ) obtained positive and significant coefficient values (probability < absolute price critical value for  $\alpha = 5\%$ ). This indicates that the ECM model used in this study was valid or appropriate. In this study the value of ECT (Error Correction Term) was 0.007701 with t-statistic value of 61.03669 and probability value of 0.0000 therefore it is significant at  $\alpha = 5\%$ ).

**V. Conclusion and Suggestions**

**5.1 Conclusion**

Based on the analysis of the results that have been carried out regarding the influence of the variables of Bank Indonesia Certificate (SBI), Bank Indonesia Sharia Certificate (SBIS), Interbank Money Markets (PUAB), Inter Sharia Bank Money Market (PUAS) in the interest rate affected the Industrial Production Index (IPI) in 2011:1-2017:12, then it can be concluded that:

- a. From several independent variables which were tested and entered into Industrial Production Index (IPI) equation by using Error Correction Model by Domowitz El Badawi which was the conventional monetary policy instrument of the variables of Bank Indonesia Certificate (SBI) interest rate, Bank Indonesia Sharia Certificate (SBIS) return rate, Interbank Money Market (PUAB) interest rate and Inter Sharia Bank Money Market (PUAS) return rate. In the short- and long-term of the Bank Indonesia Certificate (SBI) interest rate negatively and significantly affected the Industrial Production Index (IPI) in Indonesia, while the variable of Bank Indonesia Sharia Certificate (SBIS) return rate in short- and long-term positively and significantly affected the Industrial Production Index (IPI) in Indonesia.
- b. The variable of Interbank Money Market (PUAB) interest rate in the short term on conventional monetary policy negatively and significantly affected the Industrial Production Index (IPI) in Indonesia while in the long term the Interbank Money Market (PUAB) interest rate negatively and insignificantly affected the Industrial Production Index (IPI) in Indonesia.
- c. The variable of Inter Sharia Bank Money Market (PUAS) return rate in short-term negatively and significantly affected the Industrial Production Index (IPI) in Indonesia while the Inter Sharia Bank Money Market (PUAS) return rate in long-term positively and insignificantly affected the Industrial Production Index (IPI) in Indonesia.
- d. From the coefficient of determination ( $R^2$ ) on the estimation results of Error Correction Model by Domowitz El Badawi, it can be explained in the short and long term that the variables of Bank Indonesia Certificate (SBI) interest rate, Interbank Money Market (PUAB) interest rate and Sharia monetary policy instruments with Bank Indonesia Sharia Certificate (SBIS) return rate, Inter Sharia Bank Money Market (PUAS) return rate contributing to changes in the Industrial Production Index (IPI) in Indonesia . And the value of the ECT (Error Correction Term) on the ECM model used in this study was valid or appropriate.

**5.2 Suggestions**

Based on the conclusions, there are a number of suggestions that can be made as recommendations, as follows:

- a. Bank Indonesia as the monetary authority needs to reduce the level of SBIS fees so that Sharia banks are able to channel more funds into the real sectors rather than to put their funds in Bank Indonesia.
- b. Bank Indonesia, as the monetary authority, is expected to be able to determine PUAB interest rate that supports bank crediting, which is the interest rate that tends to be low and relatively stable. This will make bank crediting in Indonesia is accelerating the growth and impact on economic growth particularly an increasing on industrial sectors.
- c. Sharia banking as an intermediary institution should increase the distribution of financing to the manufacturing sectors with a higher proportion than placing funds in the Inter Sharia Bank Money Market (PUAS). The reduced proportion of fund distribution to PUAS is expected to make Sharia banking more focused on channeling funds to the real sectors, especially manufacturing industries.
- d. Further researches in the future are expected to add more independent variables such as the money supply, credit and financing for conventional lines, the results for sharia path that could deepen the study of monetary policy to be used as a better instrument in Indonesia

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