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Analysis of the Influence of Monetary Instrument on the Real Sector: Using Industrial Production Index (IPI) Approach

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Abstract

The role of the monetary sector in Indonesia's economic growth is very important by minimizing transaction costs or information in financial markets, to ensure the smooth flow of economic activities and enhance the productivity of individuals in the production of goods and services in the real sector. The purpose of this study is to determine the influence of monetary instruments on the real sector using Industrial Production Index (IPI) approach. This research uses quantitative methods with an Autoregressive Distributed Lag (ARDL) estimation model, with Bank Indonesia Certificates (SBI), Interbank Money Market (PUAB) and credit as independent variables of monetary instruments, while Industrial Production Index (IPI) as the dependent variable. The results of this research show that the variable SBI in this research had in-significant results on IPI. Therefore, SBI in this research has no influence on IPI. Variable interbank money market the result of this research is that the interbank variable has an influence on IPI. The variable credit for the results of this study is in-significant. Thus, credit variables have no effect on IPI. Based on the results of the f-test on monetary instruments, it can be described that instruments from monetary have a probability value of 0.0013 < 0.05. The coefficient of determination test on the monetary instruments, it can be described that monetary instruments have an influence of 45.53%, where the influence comes from SBI, interbank money market and credit variables as monetary instrument variables.

Keywords: *Monetary Instrument, Real Sector, Industrial Production Index*

Introduction

The increase in the amount of production of goods and services in a certain period is evidence of the growth of the country's economy. The results of the production of these goods and services are illustrated through the value of a country's national income. Economic growth is characterized by increased production of goods and services, increased per capita output, and changes in economic structure. This is a challenge for a country (Nanda, 2022). The increase in the amount of production of goods and services in a certain period is evidence of the growth of the country's economy. The value of a country's national income serves as an illustration of the result of producing these goods and services. Economic growth is characterized by increased production of goods and services, increased per capita output, and changes in economic structure. This is a challenge for a country (Prihatin et al., 2019).

As the monetary authority, Bank Indonesia has the duty to maintain the value of the rupiah currency, for that the government makes monetary policy. The monetary policy of a central bank or monetary authority is intended to influence real economic activity and prices through the transmission mechanism that occurs (Octaviani 2017). Monetary policy is an important instrument for influencing changes in output. In accordance with Act No. 23 of 1999 concerning Bank Indonesia, the objectives of Indonesia's monetary policy can be broken down into two, namely maintaining rupiah stability and maintaining economic liquidity (Undang-

undang RI, 1999). Meanwhile, Islamic monetary policy is primarily directed towards achieving the two objectives above in terms of Islamic finance. In the long run, the objective of Islamic monetary policy is to support the main objectives and objectives of public welfare in general (Sejati, 2018).

Islamic banking and conventional banking have the main task as intermediary institutions, namely channeling funds from surplus parties to those who need funds optimally. One of the channels of bank intermediation is through the distribution of funds to the real sector, namely the distribution of funds allocated for investment or business development of macro, small or medium scale communities (Sugianto, Hendra Harmain, 2015). Lending to the real sector needs to be increased in an effort to increase the role of national banks as intermediary institutions. To bridge the financial and real sectors, banks must be capable of managing credit and financing channels properly as collectors and distributors of public funds. In addition, banks as the dominant financial institutions in Indonesia should fully support the existence and development of the real sector considering the huge role of the real sector for the economy (Luh Gede Meydianawathi, 2007).

The distribution of funds to the real sector through banking is certainly influenced by many factors, both internal and external factors. From various previous studies, internal factors that affect credit distribution from banks include profitability and rehabilitation factors. Meanwhile, from external factors, credit disbursement from banks is influenced by monetary instruments. The real sector is a representation of the level of productivity of the people of a country in creating goods and services. When the level of productivity of a country's people increases, in aggregate it will affect the increase in national income and economic growth of a country. The real sector is also a representation of the level of welfare of the people of a country because it is directly related to the business world (Safuridar, 2018). One of the indicators that can observe the growth of the real sector is the industrial production index (IPI). IPI is one of the macroeconomic parameters that assesses the amount of real production from the manufacturing, mining and other industrial sectors, namely electricity and oil and gas.

The Industrial Production Index (IPI) tend to increase in the same period, attracting researchers to analyze whether there is a positive relationship between monetary instruments and the industrial production index (IPI). On the other hand, monetary instruments such as SBI and PUAB also tend to increase, this attracts researchers to analyze how the influence of monetary policy through credit channels on the real sector presented by the industrial production index (IPI). From the description above, researchers are interested in conducting research and raising the theme "Analysis of the Influence of Monetary Instrument on the Real Sector: Using Industrial Production Index (IPI) Approach".

Literature Review

Monetary Policy

Monetary policy refers to the activities of a central bank or financial authority to stabilize the economy. Monetary policy is the management of money and interest rates to influence economic variables that are important to our economic well-being and an instrument for achieving policy targets. The process itself is based on financial responses to changes in monetary policy, which begin with a full economic adjustment to monetary policy (Wardhana et al., 2020). Monetary policy is also a government action taken to achieve macroeconomic

management objectives by influencing micro situations and conditions through the money market or in other languages is the process of creating money or the amount of money in circulation (Daniar, 2016).

Bank Indonesia aims to achieve and maintain rupiah stability. This objective is as stated in Act No. 3 of 2004 article 7 concerning Bank Indonesia. What is meant by the stability of the rupiah value is, among others, stability in the prices of goods and services (Keuangan, 2013). To achieve this objective, since 2005 Bank Indonesia has implemented a monetary policy framework with funds disbursed to the real sector as the main target of monetary policy. The role of stable disbursement of funds to the real sector is very important in achieving price and financial system stability. Open market operations, discount policy, minimum reserve ratio, maximum lending limit, and moral suasion are monetary policy instruments used by Bank Indonesia to achieve this objective. Through these instruments, there will be changes in the money supply (Purwanto, 2017).

This change in the amount of money will ultimately affect monetary stability with the aim of more conducive economic growth of the community. The success of monetary policy is usually measured by increased employment, improved balance of payments, and price level stability. Monetary policy is divided into 2 types are:

1) Expansionary Monetary Policy

   Expansionary monetary policy is a policy in order to increase the money supply or increase the money supply aimed at increasing output (*income*) (Case & Fair, 2016). This policy is carried out to overcome unemployment and increase people's purchasing power (public demand) when the economy experiences a recession or depression. Expansionary monetary policy is also called easy money policy.

2) Contractionary Monetary Policy

   Contractionary monetary policy is a policy in order to reduce the money supply or decrease the money supply aimed at lowering output (*income*) (Case & Fair, 2016). This policy is carried out at a time when the economy is experiencing inflation. Contractionary monetary policy is also called tight money policy (Devia & Fadli, 2022).

Monetary Policy Instruments

a. Reserve Requirement

   It is a central bank provision that requires banks to maintain a certain amount of liquid instruments (reserves) equal to a certain percentage of their current liabilities. The smaller the percentage, the greater the bank's ability to utilize its reserves to provide larger amounts of loans to the public. Vice versa, the greater the percentage, the less the bank's ability to make loans. Therefore, bank loans are one of the factors that affect the money supply.

b. Open Market Operation

   Open market operations are the activities of central banks buying and selling short-term securities in order to regulate the money supply or short-term interest rates. If the central bank intends to reduce the money supply, it will sell securities to banks so that the reserve banks are reduced so that the ability of banks to lend decreases, and vice versa (Yusri et al., 2023).

c. Discount Facility

The discount facility is the monetary policy of a central bank to influence the money supply through setting interest rates on central bank lending to banks. If the central bank sets a higher discount rate, the banks will reduce the demand for credit from the central bank which in turn will reduce the ability of banks to lend so that the money supply decreases (Ansori & Aprianti, 2023).

d. Foreign Exchange Intervention

Foreign exchange intervention is a central bank's policy to influence the money supply by buying and selling foreign exchange using its own currency. In a floating exchange rate system, the intervention of selling foreign exchange is to reduce the tendency of the strengthening of one's own currency.

e. Moral Suasion

This appeal is non-binding, but as a credible institution the central bank's appeal has a fairly effective impact on monetary policy. The central bank or monetary authority advises banks to take certain steps needed (Pohan, 2008).

Monetary Instruments

Monetary policy is an attempt to control or direct the macro-economy to desired (better) conditions by regulating the money supply. What is meant by better conditions is an increase in equilibrium output or the maintenance of price stability. Through monetary policy, the government can maintain the ability of the economy to grow. Some monetary instruments owned by Indonesia:

1) Bank Indonesia Certificate (SBI)

Bank Indonesia Certificate (SBI) is a securities issued by Bank Indonesia as a short-term debt acquisition (1-3 months) with a discount/interest system. SBI is one of the mechanisms used by Bank Indonesia to control rupiah stability. By selling SBI, Bank Indonesia can absorb excess primary money in circulation. The interest rate applicable to each SBI sale is determined by a market mechanism based on an auction system.

Bank Indonesia Certificate (SBI) has key characteristics in its role as an instrument of Open Market Operations (OPT). Based on Bank Indonesia's circular letter in 2016, namely:

a. SBI has a unit of Rp 1.000.000 (*one million rupiah*)
b. The amount of SBI time is at least 1 (one) month and a maximum of 12 months stated in days and calculated from the transaction settlement date until maturity
c. SBI is issued and traded on a discounted system
d. SBI is issued scripless
e. SBI can be traded on the secondary market
f. The cash value of the transaction is calculated on a purely discounted basis
g. The discount value is calculated as follows: *Discounted Value = Notional Value - Cash Value* (Ayuniyyah et al., 2018).

2) Interbank Money Market (PUAB)

Interbank Money Market (PUAB) or often referred to as *Interbank Call Money* is one of the important means to encourage money market development. The interbank money market itself is an interest rate determined and charged by banks to banks that make loans in the interbank money market for the issuance of interbank money exchanges. The interest

rate is measured in percent. In this case, the bank that is overfunded *(surplus units)* will lend funds to the underfunded bank by compensating for a certain interest rate.

Interbank transaction actors are commercial banks that are members of JIBOR (*Jakarta Interbank Offered rate),* the determination of interbank interest rates is adjusted to market interest rates. Based on BI Regulation No. 6/11/PBI/2004 concerning interbank loans, namely in the framework of the guarantee program by Bank Indonesia, for banks that provide interbank interest rates higher than the maximum limit of interest rates, the government only guarantees interbank funds in the amount of principal plus interest in accordance with the maximum interest rate set. The transaction process of borrowing interbank funds only takes place in the short term between one to seven days, because these interbank funds function as a fulfillment of daily needs.

Interbank money market is one of the operational targets of monetary policy because of its increasingly important role in influencing price stability. Through periodic money market interventions, the central bank influences banks reserve levels while controlling interest rate volatility in order to achieve the desired target. As for banks, interbank money is one of the alternatives to meet daily liquidity needs (D. Utami, 2012).

3) Banking Credit

Credit is a financial facility that allows a person or business entity to borrow money to buy products and pay it back within a specified period of time with interest charged. Based on the Banking Law, credit is the provision of money or similar bills, based on an agreement or loan agreement between the bank and another party, which requires the borrower to pay off the debt after a certain period of time with interest (OJK, 2021). In the banking law, namely Law No. 7 of 1998, the definition of credit is the provision of money or bills that can be equated based on an agreement based on an agreement or loan agreement between the bank and other parties and requires the borrower to pay off the debt with the amount of interest, compensation or other profit sharing within the agreed period. Meanwhile, from the explanation of economists, it is concluded that basically credit is *"a condition of delivery in the form of money, goods and services from one party (creditor) to another party (credit recipient) with mutual agreement to be settled within a certain period of time accompanied by compensation for additional principal"* (Andrianto, 2020).

Real Sector and Industrial Production Index (IPI)

The real sector or also called *the real sector, is the real* sector, which is a sector that is in direct contact with economic activities in society that greatly affect or whose existence can be used as a benchmark to determine economic growth. Economic growth relies heavily on the real sector, because the real sector is likened to an engine that can move the wheels of the economy (Beik & Laily Dwi Arsyianti, 2017).

The real sector is the sector that uses raw materials and production factors to produce goods and services. Therefore, the real sector is also often called the market for goods and services. The market for goods and services is where demand and supply for goods and services meet. Developments in the real sector can be represented by the level of Gross Domestic Product (GDP) or by the level of the Industrial Production Index (IPI).

The Industrial Production Index is one of the macroeconomic indicators that calculates the real production output of the mining, manufacturing and other industrial sectors such as oil and gas and electricity. Output refers to the quantity of physical goods produced, as a

differentiator from the value of sales, combining quantity and price. This index covers the production of goods and the strength of domestic sales and export activities. However, this index does not include production in agriculture, construction, transportation, communications, trade, financing, and industrial services, government expenditure, and import activities. Although import industries and activities are not directly included in the IPI, indirectly and broadly factory, mining, and industrial activities use these two activities as intermediary items, where both activities are components in products or production forces. The Industrial Production Index is available in two perspectives, namely:

1) The onset of output in industrial production (supply), and
2) Selected consumers and markets of the business or manufactured products (demand).

The component groups in the supply perspective are industrial production, manufacturing production, mining, and electricity and oil and gas needs. For market or demand perspective, the components are categorized as products based on the type of use, namely consumer goods, business equipment, defense equipment, intermediate products (Lincolin, 1999).

Another definition also states that the industrial production index is a number that shows the percentage increase or decrease in the value of the manufacturing industry in the current period against the production value of the manufacturing industry in the previous period. The index figures that follow show the progression of production in the manufacturing industry sector over time and are complete data series due to their monthly nature. Industrial production index figures are presented in monthly, quarterly and yearly. The industrial production index (IPI) is calculated and published by the Central Bureau of Statistics (Sudirman et al., 2023).

Hypothesis

According to Darwin, a hypothesis is defined as a logically estimated relationship between two or more variables expressed in the form of testable statements. Such relationships are estimated on the basis of a network of associations established in the theoretical framework formulated for research studies. By testing hypotheses and affirming approximate relationships, it is hoped that solutions can be found to address the problems encountered (Muhammad Darwin & et al., 2021). A hypothesis is a temporary answer to the formulation of a problem in a study. It is said to be provisional because the answers given are new based on relevant theories, not yet based on empirical facts obtained through data collection. Based on the formulation of the problem that has been described, the hypotheses that can be formulated are as follows:

1) *H01: There is no influence between the Interbank Money Market (PUAB) on Real Sector (Industrial Production Index (IPI))*
   Ha1: There is an influence between the Interbank Money Market (PUAB) on Real Sector (Industrial Production Index (IPI))
2) *H02: There is no influence between Bank Indonesia Certificate (SBI) on Real Sector (Industrial Production Index (IPI))*
   Ha2: There is an influence between Bank Indonesia Certificates (SBI) on Real Sector (Industrial Production Index (IPI))
3) *H03: There is no influence between credit on Real Sector (Industrial Production Index (IPI))*
   Ha3: There is an influence between credit on Real Sector (Industrial Production Index (IPI))

Research Method

Research Type

This type of research uses quantitative research methods, with an Autoregressive Distributed Lags (ARDL) approach on monthly data from 2019 to 2022. Quantitative method research is a method with a series of systematic investigations of phenomena by collecting data to be measured by mathematical or computational statistical techniques (Sugiyono, 2019). ARDL approach is a dynamic linear model in econometrics. Most economic analysis is concerned with time series analysis, which is realized by the relationship between changes in one economic magnitude to symptoms and economic behavior at other times. The economic relationship is formulated with a dynamic linear model with it, we can see the influence of variables Y and X over time including the influence of variable Y from the past to the present Y (Zahara, 2017). The ARDL model is a combination of *Autoregressive* (AR) and *Distributed Lag* (DL) models (Hazam et al., 2022).

Type and Source of Data

The data used quantitative secondary data in the form of monthly *time series* for the period January 2019 to December 2022. Then the data taken for monetary instruments are statistical reports of Bank Indonesia Certificates (SBI), Interbank Money Market (PUAB) and Credit, with the real sector presented with the Industrial Production Index (IPI).

The data was obtained from several sources, namely Indonesian Banking Statistics (SPI), Indonesian Economic and Financial Statistics Bank Indonesia (SEKI BI), Monthly Financial Statements of Commercial Banks and Sharia Commercial Banks, Central Statistics Agency (BPS), Financial Services Authority (OJK) and IDX.co.id. The data used is secondary data, because this research is quantitative research whose data is taken from the official website.

Data Analysis Technique

Data analysis is a systematic process of searching and organizing data transactions, records, and other materials that the author has collected to present what has been found to others. Analysis involves working with data, organizing, and breaking it down into manageable units, summarizing them, finding patterns, and discovering what is important and what needs to be learned, and making decisions about what has been said to others.

Broadly speaking, the steps to be carried out for econometric analysis using the ARDL method are as follows:

1) Collecting research data.
2) Perform descriptive analysis to describe each variable used.
3) Testing the stationarity of variable data in the research model (Wing, 2017).
4) Testing the co-integration of the Model.
5) Estimating the ARDL model, including model selection and conducting diagnostic tests to test for violations of basic econometric assumptions, before proceeding to the next procedure.
6) The optimal lag test.
7) Classical assumption tests. If all assumptions are met, then a discussion is carried out on each result obtained.
8) Estimating the coefficients of long and short term relationships from the ARDL Model and conclusion (Ningrum & Surono, 2018).

Result and Discussion

Development of Bank Indonesia Certificate (SBI)

Bank Indonesia Certificate (SBI) is a securities with a rupiah value issued by the central bank as recognition of short-term debt and traded with a discount system. Bank Indonesia certificates were first issued in 1970 with the main objective of creating a money market that was only traded between banks. Bank Indonesia issues SBI as an open market operations policy instrument, primarily for monetary contraction. Through the use of SBI, BI can indirectly influence interest rates in the money market by announcing *Stop Out Rate* (SOR)) (Devi & Cahyono, 2020).

SBI is the instrument used to control rupiah stability. When there is excess money in the community and banks, BI absorbs the excess money by selling SBI at high interest. This will affect bank liquidity and reduce lending to the public. The double effect of SBI policy is to reduce bank liquidity and thereby absorb public funds. Therefore, Bank Indonesia's target to reduce the money supply can be achieved at the same time by using one instrument of SBI sales to banks (Kemu & Ika, 2016). The following is data from SBI's development during the period January 2019 to December 2022.

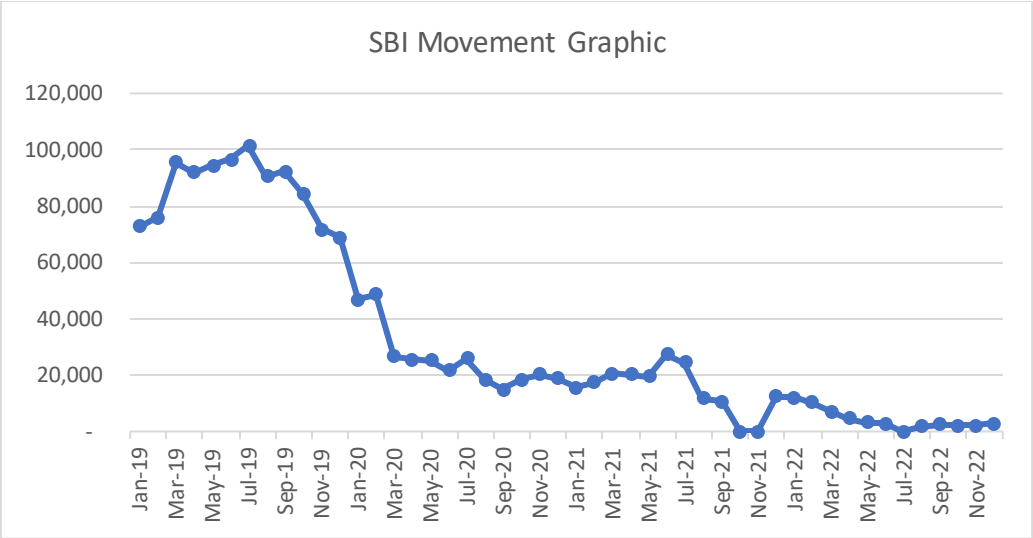

Figure 1. SBI Movement Graphic
Source: SEKI-BI (Data processed)

Based on the graph above, it can be seen that SBI development data from January 2019 to December 2022 has fluctuated. Experienced an increase in July 2019 of IDR 101,481.00 and a significant decrease in December 2021 with a total of IDR 12,420.00. Globally, SBI has decreased, but there was an increase in 2019 and decreased again until the end of 2022. The increase in SBI affected the level of bank liquidity and bank lending to the public. When SBI increases, money circulation in the community can decrease, and when SBI decreases, money is in circulation with control from BI.

Interbank Money Market Development (PUAB)

The interbank money market is the first medium for transmitting monetary policy. The interbank money market is the activity of lending and borrowing interbank funds in Rupiah or foreign currency. Within the framework *of Inflation targeting*, interbank money market interest rates are one of the operational targets of monetary policy because of their important role in the influence of price stability (Patrick Lie & Rivai, 2022).

Interbank money is a lending and borrowing activity in rupiah and foreign currencies carried out between a conventional bank and another conventional bank. The activity is carried out for a certain period of time and a maximum of one year. The type of interbank money market itself consists of foreign exchange interbank money, morning rupiah interbank and afternoon rupiah interbank (Ega Rusanti et al., 2020). The following is a graph of interbank market developments during the period January 2019 to December 2022.

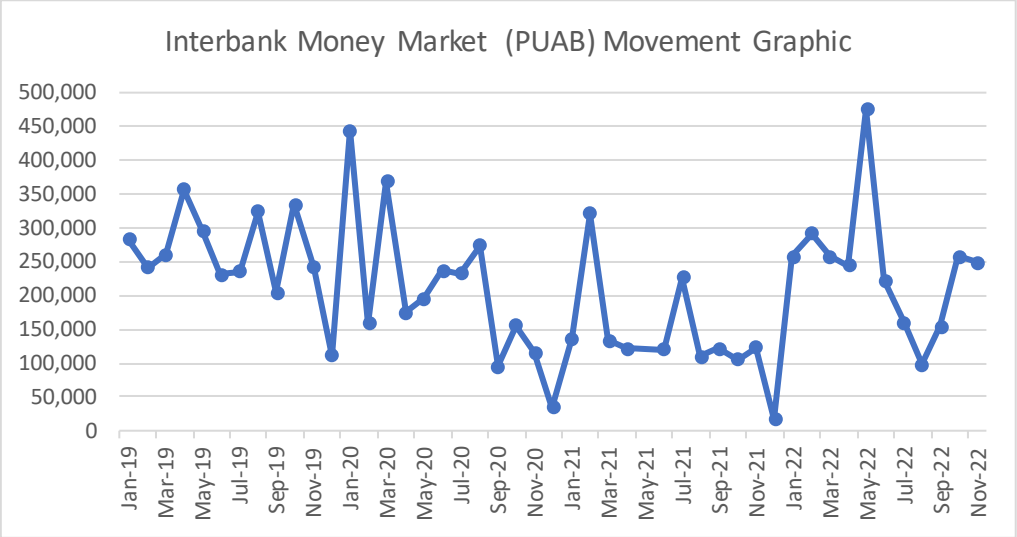

Figure 2. Interbank Movement Graphic

Source: SEKI-BI (Data processed)

Based on the graph above, it can be seen that interbank market development data from January 2019 to December 2022 experienced significant fluctuations every month. The highest level was in May 2022, reaching IDR 500 billion, while the lowest level in December 2021 was only IDR 10 billion. Globally, interbank funds do not experience a steady increase and decrease, every month interbank funds experience unstable fluctuations. For banks, the interbank money market is one of the instruments in meeting daily liquidity needs.

Credit Development

Credit in Greek is credere. It means belief in the truth. This means that it is in accordance with the principle of credit given based on the principle of trust. In law number 10 of 1998 concerning banking, credit is the provision of money or that can be equated based on an agreement between creditors (lenders) and debtors (borrowers). Loans between banks and other parties require the debtor to repay the loan after an agreed period of time accompanied by interest (Y. A. Utami & Andrian, 2022).

Credit is a gift in the use of money or goods to another person at a certain time either with collateral or not and by providing services or interest. Supervision and regulation of banking in credit must pay attention to four elements in credit itself, namely trust, time, level of risk and achievement. The third element, namely the level of risk, becomes a picture of the risk that will be faced as a result of a period of time that distinguishes between providing achievements and not in the future. The longer the credit given, the higher the level of risk (Kosasih, 2021). The following is a graph of the development of credit during the period January 2019-December 2022.

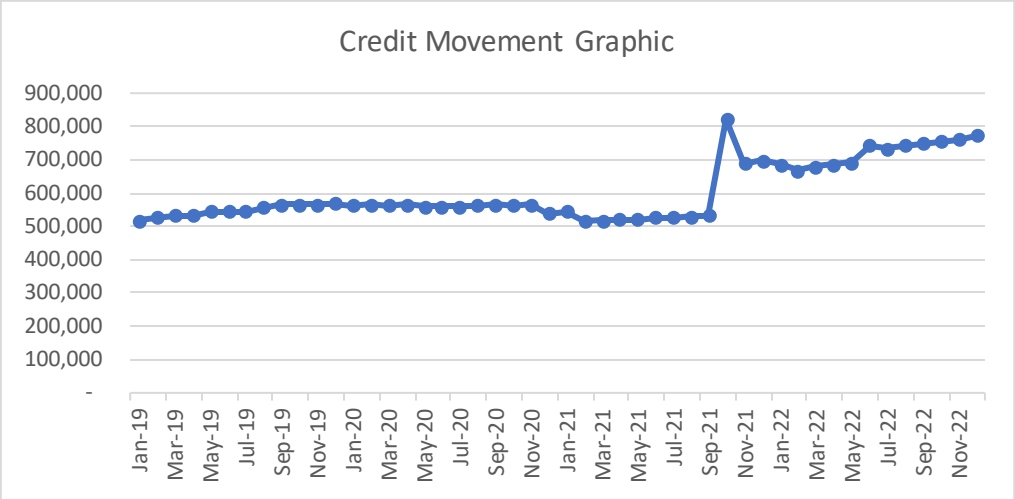

Figure 3. Credit Movement Graphic
Source: Indonesian Banking Statistics, OJK

Based on figure 8, it can be seen that credit movements during the period January 2019-December 2022 increased. Credit movements increased every month and there was a significant increase in November 2021. Overall, credit movements increased by 9.06% on an annual basis. One reason credit growth is picking up is because inflation is starting to decline to less than 2%.

Development of Industrial Production Index (IPI))

The ultimate goal of monetary policy is to influence the growth of the real sector inflation rate. One indicator that can see the growth of the real sector is the Industrial Production Index (IPI). IPI is a macroeconomic indicator that calculates the real output of the mining, manufacturing and other large industrial sectors in monthly and quarterly form (Islamiyati & Hany, 2021). IPI is also a productivity measurement tool consisting of studies of production activities in real industrial sectors. IPI stands as an analysis and measurement mechanism that is often used in the field of economic analysis. And such observations are useful for understanding economic growth from period to period.

The following is presented data on the development of IPI during the period January 2019 untill December 2022.

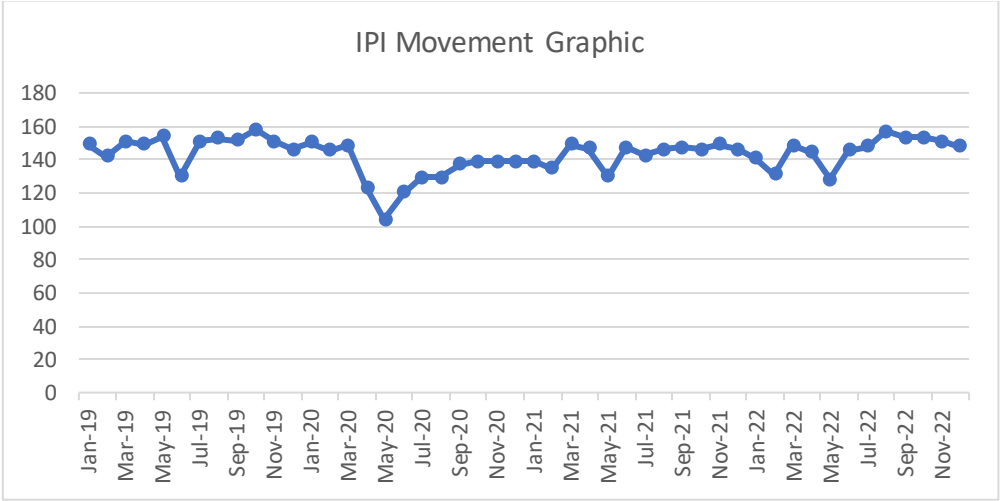

Figure 4. IPI Movement Graphic
Source: Central Statistical Body (BPS)

Based on the chart above, it can be seen that the development of IPI in the period January 2019 to December 2022 fluctuated. The movement of IPI decreased in 2020 due to the Covid-19 virus that occurred in Indonesia and had an impact on economic performance. And overall, the movement of IPI was stable at a nominal value of IDR 160 billion with the increasing economy after the Covid-19 outbreak was over.

Stationarity Test

The explanation of the results of the stationary test on monetary instruments consisting of SBI, PUAB and credit is as follows:

Table 1. Root test results at level level (IMK)

ADF			
Variable	P-Value	Critical Value	Results
SBI (X1)	0.7652	0.05	Non-stationary
PUAB (X2)	0.0000	0.05	Stasioner
Credits (X3)	0.8364	0.05	Non-stationary
IPI (Y)	0.0000	0.05	Stasioner

Source: processed data

From table 1 above, it can be seen that the ADF value in the level of each variable of Monetary Instruments with a significance level of 0.05% indicates a stationary variable, namely the Industrial Production Index (IPI) and Interbank Money Market (PUAB) variables, because the p value < 0.05. While the SBI variable has a p value of 0.7652 > 0.05 and credit has a p value of 0.8364 > 0.05, then both variables are not stationary because the p-value exceeds the critical value. So that the stationary test is carried out at the *level of differencing* 1 so that it can be continued in the ARDL method. The following are the results of the stationary test against the variables of monetary instruments at the first level of differential:

Table 2. Unit root test result at difference level 1 (IMK)

ADF			
Variable	P-Value	Critical Value	Results
SBI (X1)	0.0000	0.05	Stasioner
PUAB (X2)	0.0000	0.05	Stasioner
Credits (X3)	0.0000	0.05	Stasioner
IPI (Y)	0.0002	0.05	Stasioner

Source: processed data

Based on table 2 above, the results of the *root test* at the first difference level can be described that the p-value in the variables SBI, PUAB, credit and IPI is 0.000 < 0.05. Then the variable is completely stationary at difference level 1, and the data from the variable can be used in the ARDL method as a whole. Furthermore, cointegration tests were carried out on all research variables after meeting the requirements on stationarity. The following is a discussion of the results of the cointegration test on the variables monetary instruments that are already stationary.

Cointegration Test

Explanation of the results of the cointegration test on monetary instruments consisting of SBI, interbank money and credit with IPI independent variables:

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.396003	39.08567	47.85613	0.2569
At most 1	0.297567	17.90985	29.79707	0.5728
At most 2	0.041675	3.075239	15.49471	0.9634
At most 3	0.030186	1.287356	3.841465	0.2565

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Figure 5. The result of cointegration test in Monetary Instruments

Source: processed data

Based on figure 5, the data above shows that none, at most 1, 2 and 3 as variables of monetary instruments, namely SBI as X1, interbank money (PUAB) as X2 and credit as X3 have a probability value of > 0.05. That is, the variables of monetary instruments are concluded with the result of cointegration. Then a bound cointegration test was carried out on monetary instrument variables. The following is a discussion of the results of the bound test on monetary instruments:

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	9.947926	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Figure 1. The result of cointegration test from bound test on Monetary Instrument

Source: processed data

Based on figure 6, the data above shows that the statistical F value obtained at 9.947926 is greater than the critical value at the level of 1% or 5% and also the levels of I (0) and I (1). So the result is cointegration in long-term relationships. So in this study there is a long-term relationship between monetary instruments and IPI.

Stationary tests and cointegration tests have been carried out, the results show that in this study it is known that the root test unit test is stationary at level, differensing 1 and there are no variables that are stationary at differensing 2. The result of cointegration with SBI, interbank (PUAB) and credit variables, it is obtained that these variables occur cointegration. The results of bound tests on monetary instruments have cointegrated results in the long run. Furthermore, optimum lag tests were carried out on all research variables after meeting the requirements on stationarity. The following is a discussion of the results of the optimum lag test on variables of monetary instruments that are already stationary.

Optimal Lag Test

The optimum lag test is performed to determine the optimum lag length to be used for further analysis. The lag in the ARDL model serves to show the effect of time lapse on observation and is useful for eliminating autocorrelation problems in research. In this study, the determination of lag length was used with the *Akaike Information Criteria* (AIC) approach. The explanation of the results of the optimum lag test on monetary instruments consisting of SBI, interbank and credit variables with IPI independent variables is as follows:

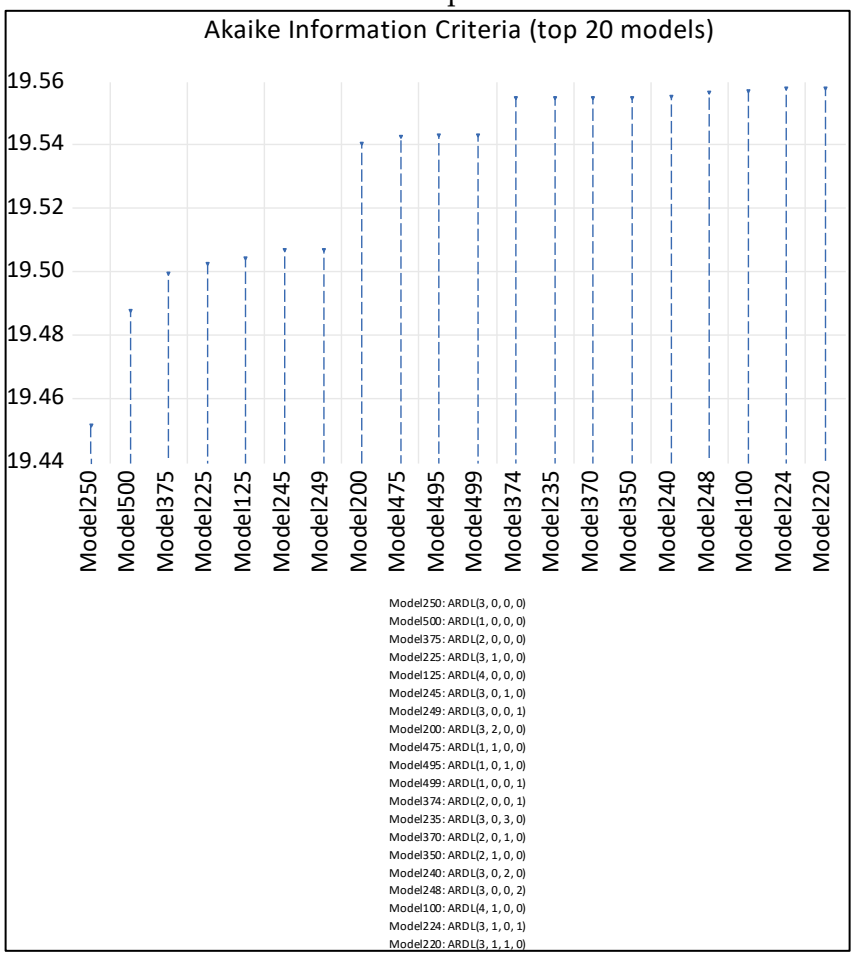

Figure 7. Optimal Lag Graphic

Based on figure 7 there are 20 top models. However, a suitable model for ARDL in monetary instrument variables is ARDL (3,0,0,0) based on the minimum AIC value or has the least error compared to other ARDL models. Furthermore, an assumption test was carried out with several steps in it, namely, normality test, autocorrelation test, heteroscedasticity test and multi-collinearity test on each monetary instrument. The following is a discussion and results of the assumption test with steps on research variables.

Stability Test

A stability test is performed to see if the ARDL model estimation is stable. The ARDL model is said to be in a stable state when the CUSUM line is between the 5% significant lines. The explanation of the results of the stability test on monetary instruments consisting of SBI, interbank and credit variables with IPI independent variables is as follows:

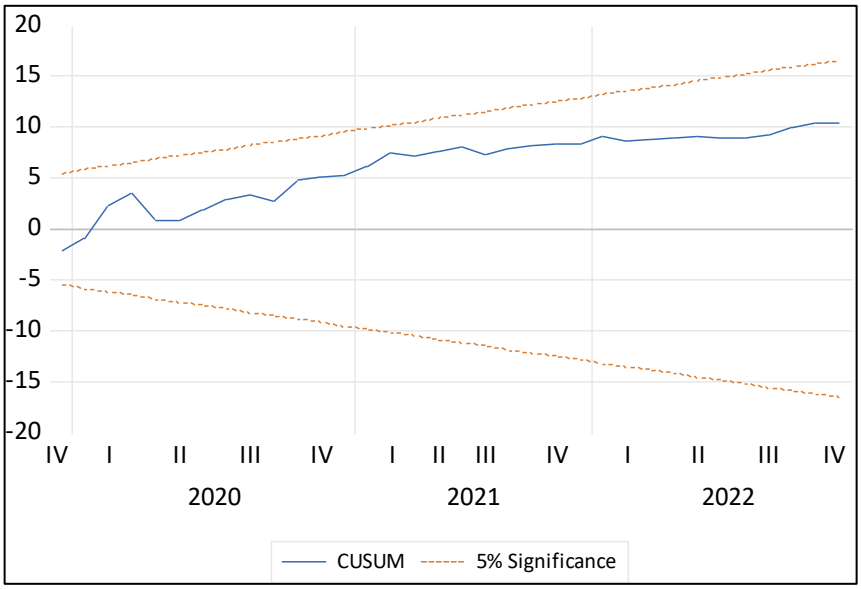

Figure 8. Stability test chart of Monetary Instruments

Based on figure 8 above, the CUSUM line is between the 5% significant lines. Thus, the stability test results show that the estimation of the ARDL model in Monetary Instruments, is in a stable state because the CUSUM line is between the significant lines of 5%. After the stability test is carried out, then a partial (t-test) is carried out. The following is the discussion and results of the partial (t-test) on research variables.

a. Partial (T-Test)

The t-test is widely known as a partial test, that the t-test is used to test the effect of each variable individually on the dependent variable. The t-test can be done by comparing t-count and t-table manually or by looking at the magnitude of the t-count and the probability value of each variable. The following are partial test results from the ARDL model estimation of research variables. The explanation of the results of the partial (t-test) on monetary instruments, namely SBI, interbank and credit is as follows:

Table 3. Results of ARDL estimates on Monetary Instruments

Fixed regressors: C
Number of models evaluated: 500
Selected Model: ARDL(3, 0, 0, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(YIPI(-1))	-0.697051	0.153775	-4.532938	0.0001
D(YIPI(-2))	-0.453955	0.175972	-2.579707	0.0144
D(YIPI(-3))	-0.444157	0.166131	-2.673537	0.0114
D(X4)	-0.038480	0.071122	-0.541039	0.5920
D(X5)	-0.007777	0.003728	-2.086187	0.0445
D(X6)	-0.002558	0.008125	-0.314885	0.7548
C	-60.41307	432.2315	-0.139770	0.8897

Source: processed data

Based on table 8 above, it is concluded that the variables of monetary instruments have no effect on the industrial production index. Because the probability value on X1 as SBI is 0.5920 > 0.05, on X3 as a credit is 0.7548 > 0.05. So, SBI and credit variables have no

effect on IPI. While the probability value of X2 as an interbank is 0.0445 < 0.05, the interbank variable has an influence on IPI. After a partial (t-test), then a simultaneous (f-test) was carried out to determine the influence of the variable as a whole. The following is the discussion and results of simultaneous (f-test) on research variables.

b. Simultaneously (F-Test)

The f-test is used to see the influence of independent variables as a whole or simultaneously. The f-test also tests whether the regression model is significant or insignificant to the model. The f-test is performed by comparing the f-count with the f-table or the probability value with the significance value. The following is an explanation of the results of the f-test on the variables monetary instruments against the Industrial Production Index. The explanation of the results of the simultaneously on monetary instruments, namely SBI, interbank and credit is as follows:

Table 4. Simultaneous test results on Monetary Instruments

P-Value	Critical Score α=5%	Results
0.0013	0.05	Significant

Based on table 4 above, the probability value of 0.0013 < 0.05, the variables of Monetary Instruments, namely SBI, interbank money and credit as a whole are significant and affect the Industrial Production Index (IPI) as variable Y of this study. After a simultaneous (f-test), followed by a coefficient of determination (R^2) test to determine the amount of influence exerted on each monetary instrument. The following is the discussion and results of the coefficient of determination test on research variables.

c. Coefficient of Determination Test (R^2)

The coefficient of determination (R^2) is carried out to see how much influence the independent variable has on the dependent variable. The value of R^2 ranges from 0-1 where R^2 approaches 0, the influence of the independent variable on the dependent is smaller and vice versa when the value of R^2 is close to 1, the influence of the independent variable on the dependent variable is greater. The following are the results of the test of the coefficient of determination of monetary instruments:

R-squared	0.455333	Mean dependent var	3.097561
Adjusted R-squared	0.359216	S.D. dependent var	3187.516
S.E. of regression	2551.575	Akaike info criterion	18.68106
Sum squared resid	2.21E+08	Schwarz criterion	18.97362
Log likelihood	-375.9618	Hannan-Quinn criter.	18.78760
F-statistic	4.737250	Durbin-Watson stat	1.997405
Prob(F-statistic)	0.001322		

*Note: p-values and any subsequent tests do not account for model selection.

Figure 92. Test Results of Coefficient of Determination of Monetary Instruments

Then from the test results the coefficient of determination R^2 in monetary instruments is 0.4553 which means that the variables SBI, interbank money, credit affect the Industrial Production Index (IPI) by 45.53% while the remaining 54.47% is influenced by variables from other monetary instruments that are not included in the model.

Conclusion

Based on the results of research and discussion has the following conclusions:

1) The variable X1 as SBI in this research had in-significant results on IPI. Therefore, SBI in this research has no influence on IPI. Variable X2 as interbank money (PUAB) the result of this research is that the interbank variable has an influence on IPI. The variable X3 as credit for the results of this study is in-significant. Thus, credit variables have no effect on IPI.
2) Based on the results of the f-test on monetary instruments, it can be described that instruments from monetary have a probability value of 0.0013 < 0.05. Therefore, the variables of monetary instruments, namely SBI, interbank money and credit, affect the real sector with the variable industrial production index.
3) Based on the results of the coefficient of determination test on the monetary instruments, it can be described that monetary instruments have an influence of 45.53%, where the influence comes from SBI, interbank and credit variables as monetary instrument variables.

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