JPEB Vol. 7, No. 1, 2022, pp: 46-54



Jurnal Penelitian Ekonomi dan Bisnis

journal homepage: http://jpeb.dinus.ac.id



The Effect of BI Rate and Exchange Rate on Inflation in Indonesia with the Money Supply as a Mediating Variable

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Article Information

Article history: Accepted: October 2021 Approved: January 2022

Published: March 2022

Keywords: Inflation BI Rate Exchange Rate Money Supply

Abstract

Inflation can be interpreted as a tendency to increase the prices of goods and services in general and continuously which can be influenced by several factors such as reference interest rates, exchange rates, the money supply and so on. This study intends to analyze about the influence of the BI rate and the exchange rate on inflation in Indonesia with the money supply as an intervening variable. The population in this study is Inflation, BI Rate, Rupiah / USD Exchange Rate, and Money Supply. The sample used is this data in the 2010-2019 period which was analyzed using WarpPLS and Sobel Test. The results show that the BI rate, exchange rate and the money supply have a significant effect on inflation and the money supply can mediate the effect of the BI rate and the exchange rate on inflation which has been proven by the sobel test.

How to Cite: Oktavia, V., & Wahyudi, S. (2022). The Effect of BI Rate and Exchange Rate on Inflation in Indonesia with the Money Supply as a Mediating Variable. *Jurnal Penelitian Ekonomi dan Bisnis*, 7(1), 46-54.

doi:https://doi.org/10.33633/jpeb.v7i1.4305

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10.33633/jpeb.v7i1.4305

INTRODUCTION

Since 2019, The World Economic Forum has introduced the Global Competitiveness Index 4.0. This index was built with a new concept that integrates pillars capable of driving long-term productivity and growth in line with the industrial revolution 4.0. This new method also includes the use of improved technology to complement other pillars of competitiveness (WEF, 2019). The Global Competitiveness Index (CGI) 4.0 consists of 12 pillars with 98 indicators ranging from 0-100.

One of the pillars used in measuring the competitiveness of the WEF version is the macroeconomic pillar with its forming variables, among others, interest rates, exchange rates and inflation. One of the macroeconomic indicators that can show the stability of a country's economy is inflation, because the impact of inflation can be serious for economic growth, inflation is an important government concern.

One of the factors influencing changes in inflation in Indonesia, namely the BI Rate or Bank Indonesia's benchmark interest rate, which is a signal for banks to set interest rates such as savings, time deposits and credit. Changes in the BI Rate will affect macroeconomic variables that will have an impact on inflation (Yodiatmaja, 2012).

Another factor that affects inflation is the exchange rate. The success of controlling inflation can encourage the strengthening and stability of the rupiah exchange rate by reducing the difference between domestic prices and foreign prices (Bank Indonesia, 2004).

As the economy develops, controlling the money supply is a very important factor in the overall economic activity of a country, as stated by Walter Bahegot that money will not manage itself. If the amount of money in circulation is excessive and not properly controlled, it will cause inflation which will hinder the increase in real people's income and overall economic growth. On the other hand, if the money supply is too small, economic activity will be hampered.

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Based on the description above, the following shows the data on the BI Rate, Rupiah Exchange Rate against USD, the Broad Money Supply (M2) and Inflation in Indonesia in 2010 – 2019

Table 1. BI Rate, Rupiah Exchange Rate, Money Supply and Inflation in Indonesia in 2010 – 2019

Tahun	BI Rate (%)	Exchange Rate (Rp/USD)	Money Supply (M2) (Milyar Rp)	Inflation (%)
2010	6.5	8.991	2.471.205,79	6.96
2011	6	9.068	2.877.219,57	3.79
2012	5.75	9.670	3.307.507,55	4.30
2013	7.5	12.189	3.730.197,02	8.38
2014	7.75	12.440	4.173.326,50	8.36
2015	7.5	13.795	4.546.743,03	3.35
2016	4.75	13.436	5.004.976,79	3.02
2017	4.25	13.548	5.419.165,05	3.61
2018	6	14.481	5.760.046,20	3.13
2019	5	13.901	6.136.551,81	2.72

Source: Bank Indonesia and the Indonesian Central Bureau of Statistics (BPS)

Table 1 above shows that the BI Rate, Rupiah Exchange Rate against USD, Money Supply and Inflation in Indonesia have experienced an up and down cycle. The BI Rate experienced a high increase in 2013, namely 30.4% and decreased by 36.7% in 2016. In 2013, the Rupiah Exchange Rate against USD was in the range of IDR 12,189 or a drop of around 26.0% from 2012. Conditions This happened because Indonesia experienced many "attacks" from the

global in the form of US economic improvements, the shutdown of the US Government, and the tapering off plan carried out by the US Central Bank (the Fed) which had signaled it would reduce monetary stimulus, so since May August 2013, the flow of foreign capital continues. The impact of the global economic "attack" also had an impact on the exchange rate of the Rupiah against the USD. In early 2013, this Rupiah currency opened at the level of Rp. 9,600 / USD and at the end of 2013 fell to the level of Rp. 12,189 / USD. With the depreciation of the Rupiah exchange rate, it can be ascertained that the inflation rate will also increase, because the Rupiah exchange rate has a function as a nominal anchor in controlling inflation, namely to prevent inflation due to increases in international prices of goods.

The data above shows that the Money Supply in a broad sense (M2) has increased from 2010 - 2019. The Money Supply has an effect on inflation as explained by Fisher's quantity theory which states that if there is an increase in the money supply, it will stimulate inflation, with the assumption that the speed of the money supply and the volume of production of the economy are constant. Without an increase in the money supply, there will be no inflation even though there is an increase in prices.

Inflation data for 2010 - 2014 shows a very fluctuating figure, and began to stabilize in 2015 - 2019. Inflation in 2013 increased to 8.38% from 4.30% in 2012 or above the inflation target set, 4.5 + 1%. The increase in inflation was mainly due to the impact of the domestic food price fluctuation as well as the impact of the increase in subsidized fuel prices at the end of June 2013. The increase in subsidized fuel prices has driven price increases, both in direct and second round effects. The Central Statistics Agency (BPS) noted that throughout 2019 Indonesia experienced inflation of 2.72% or lower than the inflation that occurred throughout 2018 of 3.13%. Inflation in 2019, which was below 3%, was the lowest since 2009, which was recorded at 2.78% (Media Indonesia, January 2, 2020).

The Central Statistics Agency (BPS) recorded an inflation rate from January to December 2019 of 2.72%, this condition is the lowest for the last 10 years and the first time below 3% even though the money supply has increased for 5 consecutive years. The graph below shows the money supply and inflation that has occurred in Indonesia in the last 10 years.



Figure 1. The Money Supply and Inflation in Indonesia 2010-2019

Amid the low inflation that occurred in 2019, there are positive and negative sides that can be analyzed. The government and Bank Indonesia can make a low inflation rate, a relatively stable exchange rate, and a downward trend in interest rates as momentum to boost slowing economic growth. Things that need to be watched out for from the low inflation rate in 2019 include indicating a weakening in the household consumption sector, weakening non-oil and gas exports, and increasing imports, and indicating a decline in purchasing power

Research on the effect of the BI Rate, the Rupiah Exchange Rate and the Money Supply on Inflation has been widely conducted and has provided different analysis results from several researchers. Research from Theodores, Vecky and Hanly (2014) shows that the BI interest rate has a positive and significant effect on the inflation rate in Indonesia, while the money supply and the IDR / USD exchange rate have a positive and insignificant effect on the inflation rate in Indonesia. Mahendra (2016) produced research on the effect of the money supply, the Rupiah exchange rate against the USD and the BI Rate which did not significantly influence inflation in Indonesia. Krisnaldy (2017) in his test results show that the variable growth in the money supply and the interest rate does not have a significant effect on changes in the inflation rate in the short term, only the growth variable of the Rupiah exchange rate against the USD has a significant effect on changes in the inflation rate in the short term. The results of research from Setiatirti and Hapsari (2019) using Model Error Correction (ECM) to obtain a balance model and find out the effect of each independent variable in the short and long term. The results show that the money supply has a positive and significant effect on inflation in the short run. When the money supply increases by one point, inflation increases by 9.68 points. However, the money supply has no significant effect in the long run on inflation. The exchange rate and

the BI exchange rate also did not have a significant effect on inflation, neither in the long term nor in the short term. Sari and Yeniwati (2019) conducted research on the effect of interest rates, money supply and exchange rates on the inflation rate in Indonesia in 2005 - 2018 showing the results of research that interest rates and money supply have a significant positive effect on inflation in Indonesia, while the exchange rate does not have a significant effect on inflation in Indonesia. Turna (2020) who conducted research on the effect of exchange rates and interest rates on inflation that occurred in Turkey provided the results of an analysis that in the short and long term, these two variables had an effect on inflation in Turkey.

From the above description, it can be seen that interest rates, currency exchange rates and the amount of money supply have an influence on inflation that occurs in Indonesia and in other countries. Based on these phenomena and background problems, this study intends to discuss "The Effect of the BI Rate and Exchange Rates on Inflation in Indonesia with the Money Supply as an Intervening Variable (2010-2019 Period)"

The Effect of the BI Rate and The Exchange Rate of IDR / USD on Inflation

One of the factors influencing changes in inflation in Indonesia is the benchmark interest rate of Indonesian banks or in other words the BI Rate, which is a signal for banks to set interest rates such as savings, deposits and credit. According to Yodiatmaja (2012: 3) changes in the BI Rate will affect several macroeconomic variables which are then passed on to inflation. Kemu and Ika (2016) in their research stated that the BI Rate has no effect on inflation in Indonesia.

Changes in the BI Rate affect deposit rates and bank lending rates. If the economy is experiencing a downturn, Bank Indonesia can use an expansionary monetary policy by lowering interest rates to stimulate economic activity. A reduction in the BI Rate will lower lending rates, so that demand for credit from companies and households will increase. A reduction in loan interest rates will also reduce the cost of capital for companies to invest. All of these will increase consumption and investment activities so that economic activity will be more vibrant. Conversely, if inflationary pressure increases, Bank Indonesia responds by raising the BI Rate to put a brake on economic activity that is too fast to reduce inflationary pressures (Bank Indonesia, 2013).

Based on previous research and the description above, the following hypothesis can be formulated H1:BI Rate (X1) has a negative and significant effect on inflation (Y2) that occurs in Indonesia H2:The exchange rate of IDR/USD(X2) has a positive and significant effect on inflation (Y2) in Indonesia

The Effect of BI Rate (BIR), Exchange Rate (KURS) on Inflation (INF) through Money Supply (JUB)

Research from Fauziyah and Cahyono (2016) that the BI Rate affects the Money Supply. The BI Rate is the benchmark interest rate used as a monetary policy instrument in regulating the money supply.

Krugman (2009) The movement of the exchange rate will change the movement of the money supply. In a condition where the exchange rate is appreciated, the money supply will decrease and in a condition of depreciation, the money supply will increase. Hendayanti and Nugrahini (2016) conducted a study on the exchange rate of IDR / USD against the Money Supply and concluded that there was a significant and positive relationship between changes in the rupiah exchange rate against the US dollar in the previous month and changes in the money supply this month. Firmansyah (2016) in his research on the Effect of Exchange Rates on the Amount of Money Circulating in Indonesia 2010-2014 that the stable exchange rate of the rupiah against the US dollar will have a large enough impact on foreign and local investors to invest in Indonesia, This investment will of course bring an influx of funds into Indonesia, which of course is closely related to the exchange rate with the amount of money circulating in society.

The relationship between money supply and inflation can be explained through the Quantity Theory of Money (Lestari, 2018; Ambarini, 2015). The theory put forward by Irving Fisher (2011) is most widely used as a reference to understand the relationship between money supply and inflation. This theory states that there is a direct relationship between money supply growth and increases in general prices or inflation.

Research by Sutawijaya and Zulfahmi (2014) states that the money supply variable in the short and long term has a positive relationship and has a significant effect on the inflation rate in Indonesia during the period 1992-2012 (annual data). The higher the money supply, both in the short term and in the long term, the higher inflation will be. The results of this study are also supported by research conducted by Prasasti (2014). The findings of this study indicate that money supply has a positive and significant effect on inflation in Indonesia in the 1973-2012 period.

Furthermore, the study by Agusmianata, Militina and Lestari (2017) concluded that money supply (M1 and M2) had a positive and significant effect on inflation in Indonesia for the 2006-2015 period (annual data).

Then Afrizal (2017) conducted a caseality test between money supply and inflation in Indonesia in the period 2000.1-2014.4 (quarterly or quarterly data). The estimation results of the Granger Causality test with a lag of 6 indicate that money supply in Indonesia has no effect on the rate of inflation. Furthermore, the estimation results of the Granger Causality test with a lag of 12 indicate that money supply in Indonesia has an effect on the inflation rate

Based on previous research and the description above, the following hypothesis can be formulated

H3: The Money Supply has positive significant impact on Inflation

H4: The Money Supply can mediate the relationship between BI Rate and Inflation

H5: The Money Supply can mediate the relationship between The Exchange Rate of IDR / USD and Inflation

METHOD

Samples and Data

The data used in this study are secondary data obtained from Bank Indonesia and the Indonesian Central Bureau of Statistics (BPS). The population in this study were Inflation, BI Rate, Exchange Rate of IDR / USD, and the Money Supply. The sample data used in this study are as follows:

- 1. Inflation data in Indonesia in 2010-2019
- 2. BI Rate data for 2010 2019
- 3. Data on Rupiah Exchange Rate against USD in 2010 2019
- 4. Data on the Amount of Money Supply (M2) in Indonesia in 2010 2019

This study uses path analysis using Warp PLS 6.0 software. Warp PLS can analyze the value of the indirect effect and the total effect along with the value of ρ , standard error, effect size. This output is very helpful for testing the mediating variable hypothesis. Path analysis has the ability to show and test the effect directly (direct), and indirectly (indirect) on one variable with other variables. Path analysis can show the presence of a mediating variable (mediating or intervening) in an indirect relationship or show the absence of the mediating variable so that the relationship is direct between variables.

Variable Definitions

Dependent Variable

The dependent variable in this study is inflation. The inflation data used is the annual general price index data published by Bank Indonesia. Inflation data can be formulated as follows:

$$Annual\ Inflation\ Rate = \frac{This\ year's\ CPI - Last\ year's\ CPI}{Last\ year's\ CPI}\ x\ 100\%$$

Inflation data uses monthly data for the years 2010 - 2019 and is expressed as a percentage (%).

Independen Variable

BI Rate

The BI Rate is a policy interest rate that reflects the monetary policy stance set by Bank Indonesia and announced to the public. The BI Rate is a financial policy set by BI every month preceded by a meeting of members of the board of governors by observing the overall economic conditions at home and abroad. Then BI's attitude towards these conditions was formulated through monetary operations as a reference for setting the BI Rate

Rupiah Exchange Rate against USD

Currency exchange rate or what is often referred to as exchange rate is the price of one unit of foreign currency in domestic currency or it can also be said that the price of domestic currency against foreign currency. For example, the exchange rate (NT) of Rupiah against US Dollars (USD) is the price of one US dollar (USD) in Rupiah (Rp), or it can also be interpreted as the price of one Rupiah for one USD. If the exchange rate is defined as the value of Rupiah in foreign currency it can be formulated as follows:

IDR / USD = Rupiah required to buy 1 US dollar (USD)

Intervening Variable

Money Supply in a Broad Meaning (M2) based on the Indonesian monetary system, M2 money supply is often referred to as economic liquidity. M2 is defined as M1 plus time deposits and public savings balances at banks, because M2 developments can also affect price developments, production and economic conditions in general.

M2 = M1 + TD + SD

M1 = The money supply in a narrow sense (consisting of currency and demand deposits)

TD = time deposits (time deposits)

SD = savings deposits

There is no general definition of M2 for all countries, because the things that are unique to each country need to be considered. In Indonesia, the amount of M2 includes all time deposits and savings balances in rupiah at banks regardless of the size of the deposits but does not include time deposits and savings balances in foreign currency (Boediono, 1994).

RESULT AND DISCUSSION

Tabel 1. Descriptive Statistic of The Research Variables

	N	Min	Max	Mean	Std	_
BIR	120	-0.430	-0.140	-0.237	0.081	
KURS	120	0.850	1.520	1.183	0.212	
JUB	120	0.999	1.024	1.014	0.007	
INF	120	0.020	0.090	0.048	0.017	
N	120					

Source: WarpPLS Processed Data, 2020

Table 2. Research Fit Model

Definition	Conclusion
Average path coefficient (APC)= 0.376, p<0.001	Fit
Average R-Square (ARS)= 0.670, p<0.001	Fit
Average adjusted R-square (AARS)= 0.662, p<0.001	Fit
Average block VIF (AVIF)= 1.831, acceptable if <=5, ideally <=3.3	Fit
Average full collinierity VIF (AFVIF) = 2.673, acceptable if <=5, ideally <=3.3	Fit
Tenenhaus GoF (GoF)= 0.818, small >= 0.1, medium >= 0.25, large >= 0.36	Fit

Source: WarpPLS Processed Data, 2020

Based on the results of the fit model as presented in table 2, it can be concluded that this research model is fit. This is supported by the AVIF value of 1.831 and the AFVIF value is 2.673, which is less than 5 so that it indicates that there is no multicolinearity problem.

Table 3. Full Collinearity VIF, R Squared and Adjusted R Squared Tests

	BIR	KURS	JUB	INF
Full collinearity	1.709	3.438	3.862	1.684
R squared			0.727	0.612

Source: WarpPLS Processed Data, 2020

According to table 3 above, it can be seen that affect money supply at R squared is 0.727, which means the effect of variation in BI rate, currency exchange rate on money supply of 72.7% and the remaining 27.3% is

explained by other variables. The adjusted R square value for variation in the effect of BI rate, currency exchange rate, money supply on inflation is 62.12%, the remaining 37.88% is explained by other variables not included in this research method.

Table 4. Path Coefficient and P-Value Results

Path	Coefficient	P-value	
BIR→INF	0.507	<0.001***	
KURS→ INF	-0.267	0.001***	
BIR→ JUB	-0.179	0.022 ***	
Path	Coefficient	P-value	
KURS → JUB	0.749	<0.001***	
JUB→INF	-0.177	0.022 ***	

Source: WarpPLS Processed Data, 2020

From the results of testing the path coefficient model equation and the P-value in table 4 above, the test results for the first hypothesis show that the BI Rate has a positive and significant effect on inflation in Indonesia. This is indicated by the BI rate coefficient value of 0.057 and p-value <0.001 so that the first hypothesis is rejected. For the second hypothesis, the rupiah exchange rate against USD has a negative and significant effect on inflation in Indonesia as indicated by the exchange rate coefficient of -0.267 and a p-value of 0.001, so the second hypothesis is rejected. To test the third hypothesis, namely the money supply has a negative and significant effect on inflation in Indonesia, which is indicated by the coefficient value of the money supply of -0.177 and a p-value of 0.022, so the fourth hypothesis is rejected. Next is the BI rate with a coefficient of -0.179 and a p-value of 0.022 where the fourth hypothesis of the money supply can mediate the effect of the BI rate on inflation is accepted. Furthermore, the exchange rate with a coefficient value of 0.749 and p-value <0.001, where the fifth hypothesis is that the money supply can mediate the effect of exchange rates on inflation is accepted. The full model test results can be seen in Figure 2 which shows the causal relationship between variables, in this case the BI rate, and the exchange rate are independent variables and inflation is the dependent variable mediated by the money supply.

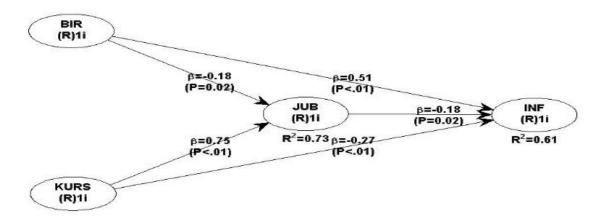


Figure 2. Full Research Model

Sobel Test

Sobel test is a test to determine whether the relationship through an intervening variable is significantly capable of acting as a mediator in the relationship. From the calculation of the sobel test for the amount of influence of the BI rate on inflation mediated by the money supply that the results of sobel test significance value is 0.00258686 < 0.05. It means that money supply can mediate significantly BI rate on inflation. From the calculation of the sobel test for the amount of influence of the BI rate on inflation mediated by the money supply that the results

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of sobel test significance value is 0.00139031 < 0.05. It means that money supply can mediate significantly exchange rate on inflation

CONCLUSSION AND RECOMMENDATION

In this study, the variables that affect Inflation in Indonesia are BI rate, Rupiah Exchange Rate and money supply. In addition, money supply can mediate the influence of BI rate and Rupiah exchange rate on inflation and has been proven using the Sobel test

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