The Analysis of Factors Affecting Inflation in Indonesia

Al Bina[1], Muhammad Fitri Rahmadana[2], and Muhammad Yusuf[2]

{albinakisaran@gmail.com[1], mufitra@unimed.ac.id[2],
muhammadyusuf_62@yahoo.com[2]}

[1]Departement Of Economic Post Graduate, Universitas Negeri Medan
[2]Universitas Negeri Medan, Nort Sumatra – Indonesia

Abstract. Inflation is the monetary policy targer for economic stability. Inflation will directly effect economic dynamics in the short term and the long term. Purpose of research to analyze the factors influencing inflation in Indonesia. Research is using the Vector Error Correction model applied to the time series data and from this model provides forecasting and structural analysis in the long term. The results showed that the money supply, BI rate, gross domestic product, imports and exports did not have much significant impact on Indonesia inflation in the short term, but the exchange rate that had a significant impact on Indonesia was inflation. In the long run, the money supply, BI rate, exchange rate, and exports have a significant effect on Indonesia inflation, while gross domestic product and imports have no impact on Indonesia inflation.

Keywords: Inflation, Money Supply, Rupiah exchange rate, BI rate, Gross Domestic Product, Exports and Imports.

1   Introduction

Economic stability will always be the top priority that every country wants to achieve, achieving economic stability will create conducive economic activities as seen in the stability of existing macroeconomic variables. In reality, macroeconomic stability is very sensitive to changes. If there is a shock in one economic variable, it will result in other variables and this situation creates macroeconomic instability.

There are several targets as indicators of macroeconomic stability, including price stability, economic growth, and the availability of jobs. Based on some existing empirical studies, to achieve all three goals has turned out to be very difficult, and almost impossible, so there are several countries that have adopted a policy of price stability. Some countries have begun to change their monetary policy strategy with a focus on one goal, namely price stability. Price stability can be observed from the rate of inflation experienced domestically.

The inflation rate in Indonesia is higher than inflation in other developing countries, while other developing countries experienced an inflation rate of 3-5% per year in the period 2005-2014, in the same period Indonesia even had an average annual inflation rate of 8.5%. Since 2015 inflation in Indonesia has been under control, even until 2020 inflation was recorded low. The government has set a fairly low inflation target, which is in the range of 4% to 1% for 2016 and 2017 and by 3.5% to 1% in 2018[1].

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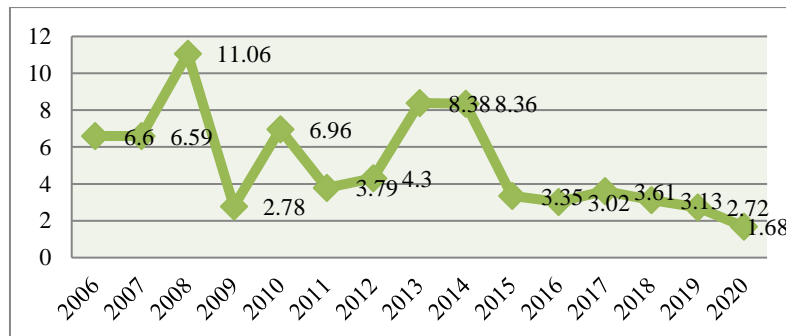
Source: Central Statistics Agency, 2021
Fig 1. Indonesia Inflation Development in 2006-2020

Based on Figure 1.1 it shows the fluctuating inflation developments from 2006 to 2020. In 2006 and 2007 inflation was held back to 6.6% and 6.59%, and in 2008 it rose to 11.06%. Inflation in 2009 is still far from the government's target of 4.5%, while previously Indonesia's inflation was close to 5%. From 2010 to 2014, it recorded an increase of more than 5% again at 8.36%. Inflation has fallen in recent years due to the last five years of recession until 2020 [1].

Tabel 1. Data on the Development of Money Supply, Exchange Rate, GDP, Interest Rate, Imports and Exports in 2006-2020

Years	Money Supply	Exchage Rate	BI Rate	GDP	Import	Export
2006	1.382.493	8.975	9,75	5.479.367,80	61065,5	100798,6
2007	1.649.662	9.372	8	5.827.034,90	74473,4	114101
2008	1.895.839	10.895	9,25	6.177.455,45	129197,3	137020,4
2009	2.141.384	9.353	6,5	6.463.402,17	96829,2	116510
2010	2.471.206	8.946	6,5	6.864.133,10	135663,3	157779,1
2011	2.877.220	9.023	6	7.287.635,30	177435,7	203496,6
2012	3.304.645	9.622	5,75	7.727.083,40	191691	190020,3
2013	3.730.197	12.128	7,5	8.156.497,80	186628,7	182551,8
2014	4.173.327	12.378	7,5	8.564.866,60	178178,8	175980
2015	4.548.800	13.726	7,5	8.982.517,10	142694,5	150366,3
2016	5.004.977	13.369	4,75	9.434.613,40	135652,8	145134
2017	5.419.165	13.48	4,25	9.912.928,10	156985,5	168828,2
2018	5.760.046	14.409	6	10.425.851,90	188711,2	180012,7
2019	6.136.777	13.901	5	10.949.037,80	170727,4	167683
2020	6.905.939	14.105	4,25	10.723.055,00	141568,8	163191,8

Source: Bank Indonesia, 2020

Inflation reflects rhe decline in the purchasing power of collectors for goods and services in the economy[2]. This is due to the expansionary monetary policy in the form of increasing

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community money supply. However, an increase in the money supply does not necessarily lead to inflation[10]. In 2009 and 2010, the money supply he increased significantly from 2,141.384 trillion to 2,471.206 trillion, and inflation rate he rose from 2.78% to 6.9%. This indicates that an increase in the money supply has led to inflation in Indonesia. However, from 2015 to 2020, money supply growth increased, but did not match inflation, which fell from 3.35% to 1.68%.

In some studies, views remain divided on the factors that influence inflation. However, economists agree that prolonged inflation is due to the money supply increasing faster than the economy grows[3]. People's expectations of future inflation can be gleaned from movements in interest rates. Since, nominal interest rates reflect, among other things, real interest rates and inflation expectations, interest rate movements can be used as indicator of inflation expectations[4].

Indonesia's inflation has also been affected by rising commodity prices, both imports and exports, and an increase in external debt as a result of the devaluation of the rupiah against the US dollar and other foreign currencies. Therefore, the rupiah's exchange rate is stable against foreign currencies, especially the US dollar, in order to control inflation pressures[5]. Exchange rate volatility affects capital flows and international trade.

Found that when implementing fiscal and monetary policies to stimulate the economy and keep inflation in check, government should exercise caution in implementing measures related to money supply, budget deficits, government spending and interest rates. From the results of the analysis[6], the variables affect inflation in Asian countries, are positively correlated, and contributr to high inflation in the economy.

Many factors influence inflation in Indonesia, including internal and external factors[7]. The impact of these external factors is inherently linked to Indonesia's character as a small open economy, affecting domestic economic stability and making it vulnerable to global economic shock. On the other hand, internal calculations that arise from within are the effects of monetary policy, fiscal policy and stability, and price manipulation. Under such circumstances, there will bw turmoil in the domestic economy. To improve its economy, Indonesia needs to maintain a stable inflation rate to achieve economic growth.

The ultimate goal of monetary policy is to achieve and maintain a low and stable price level. Bank Indonesia's inflation control policy aims to target a specific inflation. The deviation is ± 1ch based on thr Minister of Finance Regulation No. 124/PMK.010/2017 of 18 September 2017 on inflation targets for 2019, 2020, and 2021. This monetary policy strategy aims at long-term price stability, but there is still room for inflation in setting short-term instruments. In this study,

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there are several affecting the barbarity of Indonesia' inflation, including the money supply, rupiah exchange rate, BI rate, gross domestic product, exports and imports.

2   Research Methods

The analysis in this study is a quantitative study using secondary data in time-series format obtained from the central statistik agency website and various relevant institutions such as Bank Indonesia. The analytical model uses the vector error correction model. vector error correction model was popularized by Engle and Granger to correct short-term imbalances in the long-term. This allows you to use vector error correction model to see the short-term and long-term relationship in your data over time. Vector error correction model is a vector autoregression (VAR) analysis designed for use with nonstastionary data that are known to have a cointegration relationships. vector error correction model can thus be described as a form of ground-restricted vector autoregression[7]. Unlike vector autoregression, vector error correction model must be stationary in the first derivative, and all variables must have the same stationary, variable differentiated in the first derivative[8]

The first step in our investigation is to see if the data used by the root element of the unit is stationary. To test for the presence of stationary or nonstationary data, use the Augmented Dickey-Fuller test and the ADF results to the Mc Kinnon Critical Value. After steady-state testing, the next step is to determine the optimal lag length to eliminate autocorrelation in the lag length vector autoregression systems. Determination of long lag using akaike information criterion, schwartz information criterion or hannan-quinone.

The next step is to test cointegration to find relationships between variables in the long term. If the variables used in the model have cointegration, there is a long-term relationship between the variables. A Johansen test is performed to see if there is a cointegration between the variables. Granger's causality method is used to test the existence of a causal relationship between two variables, both one-way and two-way.

In the analysis of the vector error correction model, impulse response function test were performed to account for the dynamic structure, i.e. the description of impact of the shock among other endogenous-intrinsic variables. On the shock of the error term using the standard deviation values in the VAR/VECM system[9].

Analysis variance decomposition is performed to find out which variables play a relatively important role in changing themselves and other variables. States that thus variance decomposition analysis describes the relative importance of each variable in the percentage contribution of each variable's due to the changes in that particular variable within the VAR/VECM system [8]

The VECM equation with lag length p– 1 can be formulated as follows[7].

$$\Delta y_t = \alpha \varepsilon_{t\text{-}1} + \beta_1 \Delta y_{t\text{-}1} + \beta_2 \Delta y_{t\text{-}2} + \ldots + \beta_p \Delta y_{t\text{-}p+1} + \varepsilon_t \qquad (1)$$

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[8] op.cit.

[7] op.cit.

Where :

Δy_t = the first derivative vector of the dependent variable

Δy_{t-1} = the first child vector of the dependent variable with a lag to -1

ε_{t-1} = error obtained from the regression equation between Y and X at the 1st lag and also called ECT (*Error Correction Term*)

ε_t = *Residual vector*

α = coefficient of cointegration matrix

β_t = *matrix of the coefficient of the i-th dependent variable, where i = 1.2,...,p*

3   Results And Discussion

Stasionary Test

Stationary tests can be performed using the unit root test developed by Dickey Fuller. Augmented Dickey-Fuller (ADF) test. It aims to determine the stationarity of the data at levels and the first difference for all variables under investigation. The ADF test is a test that attempts to minimize autocorrelation.

Tabel 2. Root Test Unit Test Results with 1st difference

Variable	ADF Statistic	Value critis Mackinon			Prob
		1%	5%	10%	
Inflation	-6.414687	-3.555023	-2.915522	-2.595565	0.0000
Jub	-12.60931	-3.548208	-2.912631	-2.594027	0.0000
Kurs	-9.274602	-3.548208	-2.912631	-2.594027	0.0000
BI rate	-4.634983	-3.548208	-2.912631	-2.594027	0.0004
GDP	-15.10347	-3.555023	-2.915522	-2.595565	0.0000
Exsport	-9.229059	-3.548208	-2.912631	-2.594027	0.0000
Import	-7.406326	-3.550396	-2.913549	-2.594521	0.0000

Source : Data Processed

Based on Table 2. 1st difference unit root test results in a 1% 5% 10% confidence level, yhat is, all variables are at rest. Since all analyzed variables are stationary, the next step is to determine the optimum lag. The optimum lag length was determined by the Akaike Information Criterion, the Schwarz Information Criterion, and the Hannan-Quinn Information Criterion and was sufficient to validate the cointegration test and the vector error correction model. Optimal delayed display was obtained whit one omission.

Cointegration test

Tests for cointegration of variables. Uses vector autoregression models to determine whether there are equilibrium or long-term relationships, that is, wheter there are similarities in movement and stability of relationships between the variables within a study. The results of the trace statistic cointegration tests show the cointegration of the five equations for which the trace statistic 5% significant or less than 5% probability and greater than the critical value. These results indicate a long-term relationship early, so the variables form a linear relationship. If the data exhibit cointegration according to vector autoregression modeling, the model used in the next stage is the vector error correction model.

Causality Test

The results of the causality test indicated that causal vaiabels were those with probability values less than 5% of the value α. Based on the results of the Granger causality test, it means that there is a one-way causal relationship betwen the floating rupiah exchange rate (kurs) and inflation, which means that in the rupiah exchange rate will have a strong response to inflation in Indonesia increase.

Vektor Erroe Correction Model

Based on the results of the error correction model vector analysis, it is known that the previous variable also contributed to the current variable. Using the basis of lag 1, it can be seen that there is a positive and negative influence of each variable on the variable itself and other variables. Here are the results of the vector erroe correction model in table 3.

Table 3. Result Vektor Error Correction Model

Variabel	coefisien	T-statistic
Long Run		
Inf(-1)	1.000000	
Log(Jub(-1))	64.01742	[2.50692]
Log(Kurs(-1))	-154.1257	[-4.55525]
Birate(-1)	4.229050	[2.72075]
Log(Gdp(-1))	36.59651	[1.19133]
Log(Eks(-1))	-77.98016	[-2.63585]
Log(Imp(-1))	-31.57544	[-1.53773]
Short Term		
Cointeq1	-0.047509	[-2.07234]
D(Inf(-1))	-0.047173	[-0.28890]
D(Log(Jub(-1)))	7.495690	[1.28866]
D(Log(Kurs(-1)))	-11.57812	[-2.29958]
D(Birate(-1))	0.614523	[1.12292]
D(Log(Gdp(-1)))	2.841032	[0.39143]
D(Log(Eks(-1)))	-2.391412	[-0.75349]
D(Log(Imp(-1)))	2.095981	[0.85332]
C	-0.354081	[-1.10142]

Source : Data Processed

The results of table 3 the error correction model vector estimation is lag-1 the observation period Q1-2006 to Q4-2020, and the error correction model vector model for the variables using the short-term equations is:

D(Inf) = - 0.354081 - 0.047173 d(inf(-1)) + 7.495690 d(log(jub(-1))) - 11.57812 d(log(kurs(-1))) + 0.614523 d(birate(-1)) + 2.841032 d(log(gdp(-1))) - 2.391412 d(log(eks(-1))) + 2.095981 d(log(imp(-1))) - 0.047509 (ect)

Furthermore, the vecm equation in the long run is as follows:
Inf = 951.0783+ 64.01742 (log(jub(-1)) - 154.1257 log(kurs(-1)) + 4.229050 birate(-1) + 36.59651 log(gdp(-1)) - 77.98016 log(eks(-1)) - 31.57544 log(imp(-1))

Impulse Response Function

The impulse response function describes how an estimate of effect of a shock on one variable on another is proposed, so how long a shock on one affects another find out which variable provide the greatest response to shock. According to figure 2, the initial inflatioan response to export, import, money supply and BI rate shock were positif and tended to remain constant after the fifth period. It is clear that the increase exports and imports responds to movements in inflation, but not in the long run. The money supply itself, gross domestic product, inflation, exports, exchange rates, and the money supply's reaction to imports fluctuates and move constantly from the fourth period onwards. Moreover, inflation negatively impact exchange rates and gross domestic product in both the short and long term. Exchange rate response to inflation, money supply, BI rate, gross domestic product, imports and exports were positive and moved constantly throughout the period.
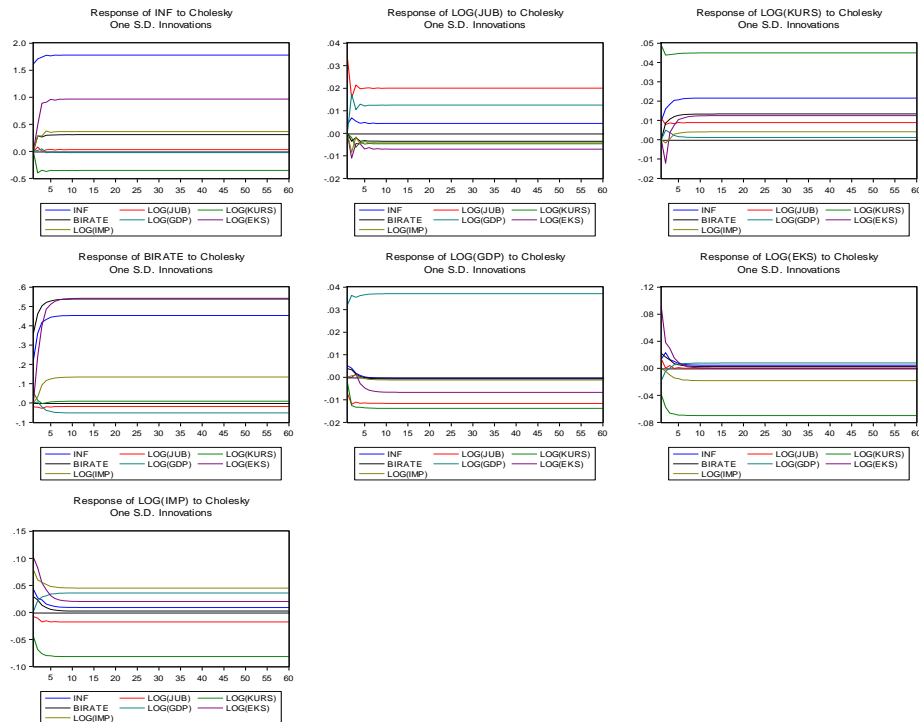

Fig. 2. Impulse Response Function Test Result

Variance Decomposition

The results of the analysis of variance decomposition in the short and medium and long term are explained by the variables themselves (inflation, money supply, exchange rate, BI rate, gross domestic product, exports and imports). Variance decomposition of inflation has contributed to the decline in inflation itself from the beginning of the period to the long-term period, export variables contribute positively and increase both in the short, medium and long term. The

variance decomposition of the money supply is influenced by the money supply itself in period 1 but in the short, medium and long term the contribution continues to decline, then the gross domestic product variable contributes 22.15% and continues to increase during the observation period. Variance decomposition of the rupiah exchange rate is influenced by the shock of the exchange rate itself, inflation and the BI rate where the contribution is 70%, 15% and 5.8%, respectively. Then on the variance decomposition of the BI rate against the consteribution of the BI rate shock itself, exports and inflation as well as the lowest contribution given by the rupiah exchange rate. Variance Decomposition of gross domestic product to gross domestic product itself and rupiah exchange rate with a contribution of 79.22% and 10.7%, respectively. Furthermore, the variance decomposition of the largest exports is explained by the rupiah exchange rate, while the variance decomposition of imports can be explained the contribution is given from exports and the rupiah exchange rate, the lowest contribution is given by the money supply.

Table 4. Variance DecompositionsTest

Variable	Inflation	Jub	Kurs	BI Rate	PDB	Eksports	Imports
Inflation	100	0.00	0.00	0.00	0.00	0.00	0.00
	72.74	0.02	2.82	2.03	0.01	19.53	2.82
	71.60	0.02	2.81	2.81	0.01	20.51	2.93
Jub	3.39	98.6	0.00	0.00	0.00	0.00	0.00
	2.97	2.79	2.87	1.6	21.73	6.70	2.70
	2.85	2.72	3.08	1.76	22.58	7.09	2.69
Kurs	3.62	4.71	91.66	0.00	0.00	0.00	0.00
	14.97	2.79	71.51	5.54	5.54	4.57	4.57
	15.64	2.72	70.01	5.91	0.06	5.08	5.08
BI Rate	26.76	0.10	1.65	71.35	0.00	0.00	0.00
	25.84	0.04	0.03	37.16	0.29	34.52	2.08
	25.51	0.04	0.01	36.18	0.31	35.73	2.18
PDB	2.38	4.43	0.39	1.29	91.48	0.00	0.00
	0.14	7.66	10.5	0.10	79.50	2.00	0.06
	0.05	7.67	10.77	0.05	78.98	2.37	0.07
Ekspor	1.71	1.69	13.98	4.40	3.14	75.06	0.00
	1.21	0.18	81.94	0.97	1.14	9.61	1.19
	0.67	0.06	88.55	0.41	1.12	3.32	5.85
Impor	8.57	0.21	9.15	3.96	0.01	48.64	29.37
	1.21	0.18	81.94	0.97	1.14	9.61	4.92
	0.67	0.06	88.55	0.41	1.12	3.32	5.85

Source : Data Processed

4 Discussion

The Effect of Money Supply on Inflation in Indonesia

Based on the short-term money supply estimate, the negative effect is negligible on Indonesia's inflation, while in the long-term it has a significant positive effect on inflation in Indonesia. This means that any increase in the money supply in the short run does not directly lead to an increase in inflation, but in the long run, an increase in the money supply will directly increase inflation. There is a positive relationship between money supply and inflation, which is consistent with Keynesian theory (agregat-demand and cosh-inflation approach) as well as money theory that the addition of the money supply in society will have the likely to push inflation higher.

Effect of Rupiah Exchange Rate (kurs) on Inflation in Indonesia

The short-term and long-run estimates of the rupiah exchange rate variable have a significant negative effect on inflation Indonesia. The negative relationship suggests that when there is an increase in the rupiah exchange rate, inflation will decrease. The results of this study are not consistent with the theory that if the exchange rate increases, foreigners will buy more domestic goods, if domestic demand is high, there will be cosh-push inflation, so thare will be an increase in domestic demand.

According to the research data, the rupiah exchange rate (kurs) tends to increas when inflation dereases. Low inflation is influenced unilaterally by global and domestic cyclical factor. On the other hand, the determining for inflation in Indonesia is either caused by the price of basic necessities or determinaed bay the price of basic demand, where basic demand is not releted to foreign trade linkages, exchange rate of rupiah (kurs) as basic need can always be met at the national level. This is supported by the government when the prices of essentialccommodities are maintained or monitored by the government for the purpose of maintaining price stability since primary commodities are often used for trading. Meanwhile, if you look at the development of the rupiah exchange rate (exchange rate) continues to depreciate against the US dollar. Thus the exchange rate increases while inflation decreases. The results of this study are in line with research conducted [11] the results of research that states that the rupiah exchange rate has a negative and significant effect on inflation in Indonesia during the Covid-19 pandemic.

Effect of BI Rate on Inflation in Indonesia Effect of BI Rate on Inflation in Indonesia

The results of the estimated bi rate variable interest rate in the short term have a positive effect on inflation in Indonesia. When the inflation rate is high, the monetary authority raises its short-term nominal interest rate with the aim of reducing the amount of money circulating in the economy so as to reduce inflation. If the disinflationary policy implemented by the monetary authority can run consistently, the impact of interest rate increases on the decline in liquidity of the real sector will be reduced by decreasing prices of consumer goods.

The amount of money circulating in the economy so that it can reduce inflation. If the disinflationary policy implemented by the monetary authority can run consistently, the impact of the interest rate hike on the decline in liquidity of the real sector will be reduced by the decline in prices of consumer goods. In the long run, the BI rate has a significant positive effect on inflation in Indonesia. Rising inflation The monetary authority will raise the interest rate and

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[11] Rumondor, N., Kumaat, R. J., & Tumangkeng, S. Y. L. Pengaruh Nilai Tukar dan jumlah uang beredar terhadap inflasi di Indonesia Pada Masa Pandemic COVID-19. Jurnal Berkala Ilmiah Efisiensi. 2021; 21(03): 57–6

eventually people will divert their money to save or invest, so an increase in the BI rate can trigger pressure on inflation in the long term but through indirect influence. The relationship between interest rates and inflation is in line with the factual condition that interest rate movements are the same as indonesia's inflation movements during the 2006-2020 period. This research is in line with the research conducted with long-term results, the BI rate has a significant effect on Indonesia's inflation rate.[7]

The Effect of Gross Domestic Product on Inflation in Indonesia
The results of short-term and long-term etimations of gross domestic product variables show a positive and insignificant relationship to inflation in Indonesia. This means that the increase in gross domestic product does not have a certain influence on changes in inflation. Friedmen stated that inflation that occurs due to the money supply has a greater effect than due to economic growth or in other words, inflation that occurs in the long term is caused by the amount of money growth and is not influenced by economic growth. If the growth of the money supply is higher than the growth rate of the economy, inflation will occur. This research is supported by research conducted which states that gross domestic product in the short and long term has a positive and insignificant effect[12].

The Effect of Exports on Inflation in Indonesia
The results of the short-term estimation of the export variable show an insignificant negative influence on inflation in Indonesia. In the long run, exports have a significant negative effect on inflation in Indonesia. This means that if exports increase, inflation will fall. In this case, there is an increase in exports if domestic inflation decreases, because the prices of goods and services decrease or remain as high as exports will increase.

The Effect of Imports on Inflation in di Indonesia
The results of the short-term estimation of import variables have a significant positive effect on inflation in Indonesia. Meanwhile, in the long run, import variables have an insignificant negative effect on inflation in Indonesia. The results of the research are inconsistent with the theory that imports can affect domestic inflation directly through import prices, and indirectly through competition with domestic goods and services. Imports are carried out to overcome domestic demand by utilizing import policies, but when demand has been below the level of domestic output, inflation will begin to fall. In general, an increase in imports will cause exchange rate depreciation, this will increase inflationary pressures so that imports will become expensive. This research is in line with the research conducted (Nasrun, 2018) and (Dexter et al., 2002) which states that imports have a significant effect on inflation meaning that when imports increase, inflation will decrease [13].

[7] op.cit.
[12] Janah, Ilma Ulfatul, Amin Pujiati. Analisis mekanisme transmisi kebijakan moneter saluran ekspektasi dalam mempengaruhi inflasi di Indonesia. Economics Development Analys. 2018; 7(4).
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5 Conclusion

The results showed that in the short term there is one variable rupiah exchange rate that has a significant negative effect on inflation in Indonesia,. Meanwhile, the other variables did not have a significant effect, namely the positive money supply was insignificant, the BI rate, gross domestic product and imports had a positive effect on insignificant, exports had an insignificant negative effect on inflation in Indonesia with a significant level of 5%. In the long term, it also shows that the variable Money Supply, BI rate has a significant positive effect on inflation in Indonesia, gross domestic product has a positive effect on inflation in Indonesia. Meanwhile, the variables of the rupiah exchange rate and exports have a significant negative effect and imports have a negative insignificant effect on inflation in Indonesia, it can be concluded that in the short term only the variables of the rupiah exchange rate have a significant effect and in the long term the variables money supply, Exchange Rate, BI rate, and exports have a significant effect on inflation in Indonesia.

This research proves that the money supply has a positive effect on inflation in Indonesia, meaning that if there is an increase in the money supply it will result in an increase in inflation. Therefore, for policy makers, especially expansive monetary policy, it is necessary to be careful in increasing the money supply because it will have a direct impact on inflation in the country both in the short and long term.

The government is advised of its prudence in raising the BI rate because the bi rate increase will have a positive effect on rising inflation in Indonesia. Then pay attention to policies aimed at strengthening the position of the rupiah against foreign currencies so that it does not become an obstacle to exports and imports. For the development of knowledge related to the final target of monetary policy, namely price stability or inflation, the findings of this study can be continued by using other variables or other methods to enrich understanding and become an appropriate policy reference.

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