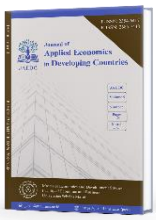

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ANALYSIS OF EXCHANGE RATE PASS-THROUGH TO PRICE STABILITY IN INDONESIA 2010-2019

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ABSTRACT

As an open country, the exchange rate affects Indonesia's macroeconomic stability, especially inflation. Extreme exchange rate depreciation can cause inflation to be high so it disrupts the ultimate goal of monetary policy, namely maintaining price stability. This study identifies the effect of the exchange rate on price stability and the transmission of the exchange rate to price stability. This study uses secondary data on the Nominal Effective Exchange Rate (NEER), Consumer Price Index (CPI), Output Gap, Import Prices, and Oil Prices. The period used is 2010-2019 as quarterly data. The method that will be used in this research is VECM which will look at impulse response and variance decomposition, looking at the long-term effect of variable shocks. The results of this study indicate that shock on the exchange rate affects price stability with direct pass-through between the exchange rate variable and the consumer price index. Recommendations for a good exchange rate policy will also result in a good price stability, this is shown by the consumer price index

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1. INTRODUCTION

Indonesia's macroeconomic stability can be affected by exchange rate volatility. As an open country, the exchange rate influences Indonesia's macroeconomic stability, especially inflation. Extreme depreciation of the exchange rate can cause the inflation rate to be high so that it hinders the ultimate goal of monetary policy, which is to strive for price stability. One of the factors that determine the success of a country's development is by setting exchange rate policies.

This agrees with research Beirne & Bijsterbosch (2011) which shows that the effect of exchange rate pass-through is in countries with flexible exchange rate regimes such as Indonesia. The results of this study state that a high exchange rate pass-through identifies that an appreciation in the nominal exchange rate tends to reduce inflationary pressures, which can help reduce inflation to below the Maastricht reference value for inflation. Other research by Xia (2017) the results show that the effective exchange rate pass-through effect carried out in China after the RMB accession to SDE exchange rate fluctuations increased. Changes in exchange rates result in changes in imported raw materials resulting in other impacts such as increasing domestic production costs and ultimately impacting index producers, consumer prices, etc.

The exchange rate is an important instrument in international trade. The exchange rate identifies the payment in international trade with the value of the payment. The exchange rate is the price of a country's currency if it is exchanged for a foreign country's currency. The dollar is an international currency because it is relatively stable in the economy. So in Indonesia the race for the exchange rate used is against the dollar. Changes in the value of the Indonesian currency relative to several other countries' currencies can be seen from the Nominal Effective Exchange Rate (NEER) proxy (Ramli, 2021).

Research by Shintani et al (2013) says that periods of low exchange rate pass-through are likely to be associated with low inflation. A study on developing countries by Nasir et al (2020) shows the Czech Republic as the first developing country to adopt inflation targeting, which shows that the influence of the exchange rate has significant implications for inflation expectations. Meanwhile, research Junttila & Korhonen (2012) states that exchange rate changes tend to have a very strong effect on inflation in a small open economy compared to a large open economy. This is because small open economies usually have more concentrated markets, and thus, consumers of imported goods can be seen as price takers.

The percentage of domestic (import or export) price transitions as a result of a one percent change in the exchange rate is called the Exchange rate pass-through (ERPT). ERPT is related to the relative stability of monetary policy (Devereux et al., 2004). In general, countries with low average inflation and exchange rate variability tend to have low pass-through and vice versa (Ghartey, 2019). High inflation causes the country's economy to deteriorate. This is because inflation can make domestic prices increase, so if inflation is too high it can result in a reduction in the purchasing power of money. And another impact is the decline in investors so that real domestic income will also decrease.

The main goal of monetary policy is to help stable inflation or price variations at a low level (Kassi et al., 2019). The rate and time of pass-through are important for estimating inflation and thus for making monetary policy decisions (Beirne & Bijsterbosch, 2011). Exchange rate fluctuations are one of the main drivers of price changes for commercial goods and cause changes in the consumer price index. Thus, ERPT is a prerequisite for inflation targeting policies. According to research Ghartey (2019) the size of a country's exchange rate pass-through is related to monetary policy discipline and a stable monetary environment

The global economic crisis that occurred in 2008 had an impact on almost all countries, including Indonesia. This is because Indonesia still relies too heavily on investment from foreign investors, so that with this global economic crisis foreign investors automatically take back funds from Indonesia. Thus, the impact that occurred in Indonesia was the fall in the value of our currency. Thus, causing a very sharp increase in inflation (Anggraeni et al., 2017; Yamauchi & Larson, 2019).

Indonesia adopted a policy that prevented a further slowdown in the real economy while still aiming at achieving the medium and long term inflation targets. One of the efforts to maintain price stability is by targeting the exchange rate. Applying exchange rate targeting can suppress the high rate of inflation.

2. RESEARCH METHODS

The type of data that will be used in this study is secondary data. Secondary data is data obtained by research from available sources. The period used by researchers is 2010-2019, with quarterly data. Data sources were obtained from Bank Indonesia, Organization for Economic Co-operation and Development (OECD), Central Bureau of Statistics (BPS), Bank for International Settlements (BIS), U.S. Energy Information Administration (EIA). While the variables that will be used in this study are as follows: Nominal Effective Exchange Rate (NEER), Consumer Price Index (CPI), Output Gap, Indonesian Oil Price, Import Price Index.

The method used in this study is the Vector Autoregression (VAR) method. If the data used is stationary at 1st difference, and is cointegrated then it will be combined with an error correction model to become a cointegrated VAR which is often referred to as the Vector Error Correction Model. And if the VAR model does not have cointegration, the method used is VAR Difference.

Because this research is cointegrated, the method used is VECM. Although several studies have been conducted using this approach, the research model used is as follows (Anggraeni et al., 2017; Caporale et al., 2018; Grabowski & Self, 2016):

$$\Delta y_t = ae_{t-1} + \beta_1 \Delta y_{t-1} + \cdots + \beta_p y_{t-p+1} + E_t$$

Where Δy_t as vector of first derivatives of the dependent variable; Δy_{t-1}as vector of first derivatives of the dependent variable with the 1st lag; e1-1 as error; E_t as residual vector; α as cointegration coefficient matrix; β as dependent variable coefficient matrix. Based on this description, the VECM model in the research is formulated as follows:

$$CPI_t = a_0 + \beta_1 CPI_{t-1} + \beta_2 NEER_{t-1} + \beta_3 OP_{t-1} + \beta_4 IP_{t-1} + \beta_5 GAP_{t-1} \quad + E_t$$

Where CPI as Indeks Harga Konsumen or CPI; NEER as Nominal Effective Exchange Rate; OP as Oil Price; IP as Import Price; GAP as Output Gap; a_0 as coefficient variable; β as variable coefficient independent variable; t as periode; e as error term.

The analysis used is Impulse Response Function (IRF) analysis to examine the shock response of the innovation variable to other variables. By assuming that the variables are not correlated with each other, tracing the influence of a shock can be direct. Through the IRF graph, it shows the balance point value for the response of a variable due to shock. Next, variance decomposition analysis is used to explain the proportion of movements in a series due to shocks from that variable compared to other variables (Gujarati et al., 2019).

3. RESULTS AND DISCUSSION

3.1. RESULTS

In 2007, a global crisis occurred which impacted the subprime motagae market in the US and developed into an international banking crisis. The crisis had an impact on the Indonesian economy in the fourth quarter of 2008 and continued to increase in 2009 reaching 13,389/USD. Another event marked by a fall in the Nominal Effective Exchange Rate (NEER) will weaken the domestic currency. This incident occurred in 2014 as a result of the decline in foreign capital entering the country as a result of global sentiment, especially the normalization of the US Central Bank's monetary policy and the devaluation of the Chinese currency. The inflation rate in 2008 in Indonesia reached 10.22 percent, this was due to the increase in oil and commodity prices. The effect was that the price of subsidized fuel rose and there was a shortage of kerosene and LPG in several areas. Testing using VECM requires stationary data testing using Augmented Dickey Fuller with stationary results at the 1st difference in table 1.

Table 1. Data Stationary

Variabel	ADF Value
LNEER	-2.01
CPI	-5.86
LGAP	-13.38
LIP	-7.04
LOP	-6.01

Source: Processed data, 2021

Determining the optimal lag is used to eliminate autocorrelation problems in a VAR model. Using the Akaike's Information Criterion (AIC) component, the lag at lag 3 was found to be 0.85. Cointegration occurred using the Johansen Cointegration Test method with statistical trace values and maximum eigen statistics > critical value with a significance level of 5%. So it can be said that there is a long-term relationship between the variables studied.

The test currently focused is the Impulse Response Function (IRF) on each variable to check the variable's surprise response to other variables, we tested 6 variables in a model. Figure 1 it can be explained that the response from the CPI and LOP as the dependent variable is due to this shock from the LNEER variable. First, the shock from LNEER was responded positively by the CPI in the third period of 3.37 standard deviations. And the response from the CPI decreased towards the balance point in period 10. So it can be concluded that a high LNEER can cause a high CPI. So that the relationship between LNEER and CPI is positive. Second, the response of the LOP variable as the dependent variable is because there is shock from the LNEER variable. LNEER responded positively to the LOP shock. The highest positive response was in the seventh period of 0.99 standard deviation. So that the relationship between LOP and LNEER is positive. Where there is an increase in LNEER can cause an increase in LOP.

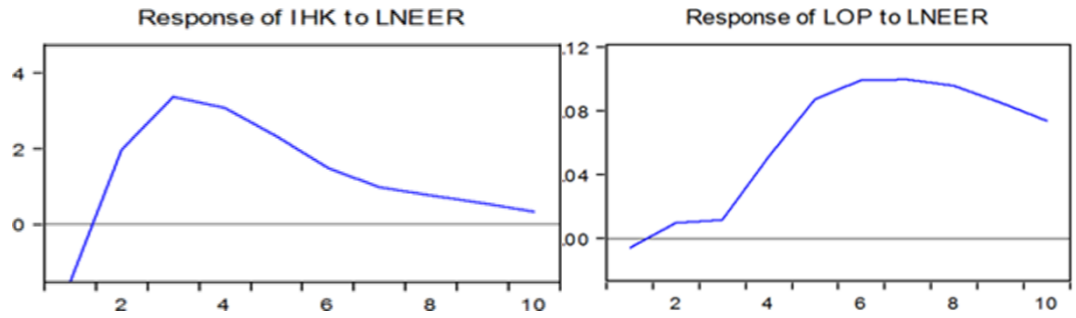

Figure 1. Estimation results impulse response CPI and LOP to LNEER shocks
Source: Processed data, 2021

In Figure 2 below, it can be explained that the response of the LIP variable as the dependent variable is because there is shock from the LGAP variable. In the graph shown above, it can be said that the LGAP response fluctuated, meaning that there were positive and negative responses (up and down) from the beginning of the period to the tenth period. However, the fluctuations that occur are getting less steep. So that it can be estimated that in the next period it is possible if the LGAP line can stabilize at the balance line.

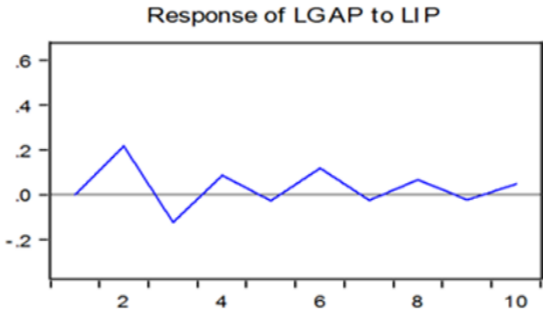

Figure 2. Estimation results impulse response LGAP to LIP shocks
Source: Processed data, 2021

In Figure 3 in the next page, it can be explained that the response of the LGAP variable as the dependent variable is because there is shock from the CPI variable. In the first period to the second period the positive LGAP response was 0.2 standard deviation. After the second period, it decreases to the balance line and increases again in the fifth period by 0.13 standard deviations. Back down steadily in period seven. So, if you look at figure 2 above, it can be said that the relationship between LGAP and CPI is positive. So that an increase in LGAP can lead to an increase in CPI.

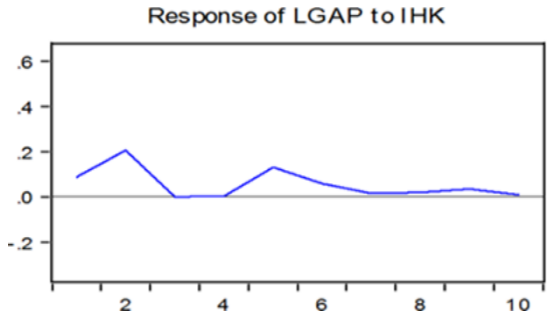

Figure 3. Estimation results impulse response LGAP to CPI shocks
Source: Processed data, 2021

In Figure 4 it can be explained that the response of the LGAP variable as the dependent variable is due to the shock of the LIP variable. In the graph shown above it can be said that the LIP response is very fluctuating, namely there are positive and negative responses (up and down) starting with shocks to the LGAP variable from the first to the fifth period. In the sixth period to the tenth period, the LIP response was still very fluctuating but the response given was a negative response.

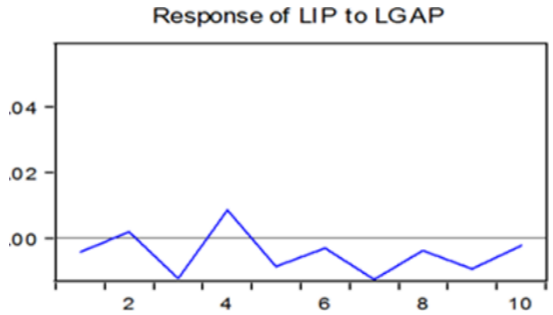

Figure 4. Estimation results impulse response LIP against LGAP shocks
Source: Processed data, 2021

In Figure 5 it can be explained that the response of the LIP variable as the dependent variable is because there is shock of the LOP variable. In the first period to the second period LIP gave a positive response of 0.3 standard deviation for the LOP shock. However, in the following period, LIP gave a negative response to LOP shocks. The fluctuating negative response continued until the tenth period. So from all the responses given by LIP to LOP shocks it can be concluded that the relationship between LIP and LOP is negative where if there is an increase in oil prices then there can be a decrease in import prices.

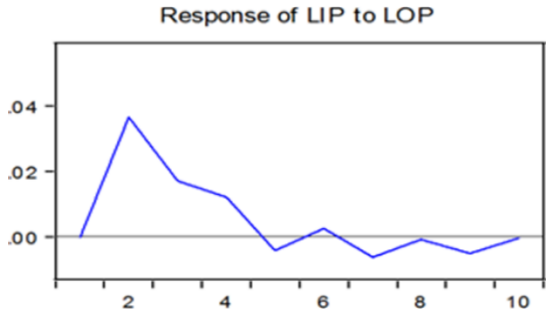

Figure 5. Estimation results impulse response LIP against LOP shock
Source: Processed data, 2021

The function of the Variance Decompositions (VD) test is to provide information regarding the influence of shocks that occur on a variable and the reciprocal relationships between variables. In table 2 it can be explained that, shock LNEER has an increasing contribution throughout the period. The increase from the first period to the tenth period reached 33.65%.

Table 2. Variance Decompositions of CPI

Period	LNEER
1	9.17
2	13.41
3	24.15
4	29.74
5	32.40
6	33.36
7	33.52
8	33.62
9	33.66
10	33.65

Source: Processed data, 2021

In table 3 can explain that shock LNEER has an increasing contribution throughout the period. The increase from the first period to the tenth period reached 53.1151.

Table 3. Variance Decompositions of LOP

Period	LNEER
1	0.19
2	0.55
3	0.97
4	8.10
5	22.33
6	33.98
7	41.89
8	47.49
9	51.21
10	53.61

Source: Processed data, 2021

In table 4 can explain that shock CPI has a contribution to the LGAP. During the first and second periods, shock from CPI increased from 1.64 to 7.1, but in the third to tenth period shock The CPI contributed to fluctuating. So that in the tenth period it reached 6.13%

Table 4. Variance Decompositions of LGAP

Period	CPI
1	1.65
2	7.10
3	5.78
4	5.25
5	6.59
6	6.43
7	6.32
8	6.18
9	6.21
10	6.14

Source: Processed data, 2021

In table 5 explaining, shock LIP has a contribution to LGAP. Shock LIP experienced an increase from the first period to the fourth period of 7.23%. In the fifth period shock LIP's contribution decreased from the previous period. However, from the sixth period to the tenth period shock LIP contributed an increase of 7.79%.

Table 5. Variance Decompositions of LGAP

Period	LIP
1	0.00
2	6.61
3	7.12
4	7.24
5	6.87
6	7.65
7	7.57
8	7.74
9	7.71
10	7.80

Source: Processed data, 2021

In table 6, it can be explained that in the first period LIP has not been affected by shock LOP. Shock LOP has a decreasing contribution throughout the period. Contributions made shock LOP to LIP is 8.78%.

Table 6. Variance Decompositions of LIP

Periode	LOP
1	0.00
2	18.57
3	18.26
4	17.50
5	14.49
6	12.20
7	10.65
8	9.69
9	9.15
10	8.78

Source: Processed data, 2021

3.2. DISCUSSION

If you look at impulse respon and variance decomposition, shock from NEER responded positively to the consumer price index. Shock NEER always contributes to increase in each period to the consumer price index. So if the exchange rate increases it can cause an increase in the consumer price index. This is in line with research López-Villavicencio & Pourroy (2019) dan Wang (2022) which found that exchange rate movements had a positive effect on price stability, in this case indicated by the consumer price index.

International trade will be disrupted if exchange rate changes are very rapid and unstable. This condition will disrupt the performance of the domestic real sector. In the end, it will disrupt the business climate so that it can kill the sustainability of economic growth in the future. Therefore, efforts to maintain exchange rate stability for both monetary authorities and financial market players are fully carried out. The exchange rate pathway holds the view that changes in the exchange rate or exchange rate are variables that influence the achievement of the final target monetary policy, especially an open economy with a freely floating exchange rate system (Mira Larasati, 2017; Setiawati et al., 2021).

To achieve goals that are in line with medium and long term inflation targets, as well as supporting competitiveness with similar countries, the monetary authority's exchange rate policy in implementing good governance must be consistent (Syarifuddin, 2015).

If we look at the impulse response and variance decomposition, there is a relationship between all the variables in this study. First, NEER affects CPI and oil prices. The NEER shock contributed to an increase throughout the period in the IJK and oil prices. This means that an increase in NEER will result in an increase in CPI and oil prices. This condition illustrates the existence of direct transmission (direct pass-through) between exchange rate variables and price stability.

The oil price variable itself influences import prices and import prices also influence the output gap. Meanwhile, CPI also influences the output gap. So it can be said that to achieve low inflation you can control changes in the exchange rate so that it does not increase. similar to Chaidir's research that the exchange rate indicator (exchange rate) is only able to explain variation in inflation of 3.15 percent. and proven from research by Bato et al (2017) and Ningsih & Kristiyanti (2016) value variables partial exchange has a positive and significant effect on inflation. so that by controlling the exchange rate you can also control the output gap.

4. CONCLUSION

Exchange rate movements have an influence on the consumer price index. If there is an increase in the exchange rate, it can also cause an increase in the consumer price index. This is because there is a positive relationship between the exchange rate and the consumer price index. This states that with a good exchange rate policy, price stability will also be good, this is indicated by the consumer price index.

There is a relationship between each variable in this study. The transmission of exchange rate variables directly to the CPI illustrates the direct exchange rate pass-through to monetary policy targets, especially price stability. To achieve price stability, the step that needs to be achieved is to improve the exchange rate. Controlling exchange rate volatility can also have an impact on other variables such as oil prices, import prices and still aim at monetary policy objectives, namely economic growth as indicated by the output gap.

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