

Exchange Rate Analysis: Short-Term and Long-Term Balance

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ABSTRACT

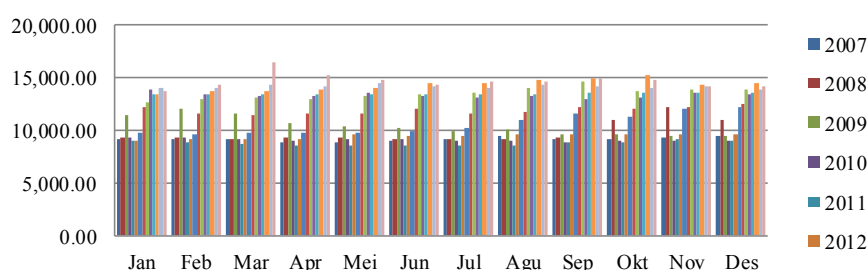
This study aims to analyse how the impact of inflation, money supply, and export to influence the movement of the IDR/USD exchange rate, so it is expected to be used as a basis for determining reduction policy to mountain the IDR/USD exchange rate. The method of analyse used this research is linier regression data time series with Error Correction Model (ECM) analysis method with the help of software E-views 9. The data used in this study are secondary data obtained from IFS and BI. The results of the study show that in the short and long term, inflation and money supply have a positive effect and exports have a negative effect on the IDR/USD exchange rate

Keywords: Exchange Rate IDR/USD, Inflation, Money Supply, Export

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INTRODUCTION

In 2008, the financial crisis hit the United States, which began with the housing credit crisis, which later expanded into a global economic crisis due to the depletion of liquidity in financial institutions (Bappenas, 2009). Not only countries in the Americas are dealing with the financial crisis, but also Europe and Asia. Especially for countries with weak domestic economic fundamentals. As one of the countries in Asia, Indonesia also felt the impact of the financial crisis that hit the United States. One of the impacts caused by the global economic crisis is from the monetary side. The picture below shows the IDR/USD exchange rate movement in 2007-2020.



Source: International Finance Statistic, 2021

Figure 1. IDR/USD Exchange Rate Trend 2007-2020 (IDR)

Before the global financial crisis, the IDR/USD exchange rate weakened, which meant that the rupiah appreciated. In December 2007, IDR 9,419 per USD was IDR 9,118 per USD in June 2008. One of

the reasons for the rupiah's appreciation was the increase in export revenues (Bappenas, 2009). However, the IDR/USD exchange rate strengthened during the global economic crisis. As the result, the rupiah depreciated to its peak, from the previous position of IDR 9.000 per USD to IDR 12.151 per USD in November 2008. Then the currency of the rupiah was appreciated again in the third week of April 2009 to IDR 10.700 per USD. The movement of the IDR/USD exchange rate after the global financial crisis in 2010-2020 can be seen that in the short term, there are fluctuations in the IDR/USD exchange rate, but in the long term, the IDR/USD exchange rate strengthens, which means the rupiah currency is increasingly depreciating. The lowest IDR/USD exchange rate of IDR 8.508 per USD in July 2011 was approved by the swift inflow of foreign capital (Bappenas, 2009). Meanwhile, the highest IDR/USD exchange rate of Rp 16.367 per USD occurred in March 2020 due to Covid-19, which began to spread in Indonesia.

Djulus and Yudi (2014) say that in the developing exchange rate system, fundamental and non-fundamental factors influence its movement. Fundamental factors are economic variables, namely inflation, money supply, exports, and other economic variables. Meanwhile, non-fundamental or non-economic factors include psychological, socio-political and state security factors.

Based on the description above, the global financial crisis in the United States impacted the IDR/USD exchange rate. The variables that can be considered in maintaining the rate of increase in the value of IDR/USD are inflation, money supply, and exports. Therefore, this study intends to determine what factors influence the movement of the IDR/USD exchange rate both in the short and long term after the global financial crisis in 2010-2020.

LITERATURE REVIEW

Exchange Rate

Exchange rates play an important role in trade between countries. Therefore, the exchange rate is an economic measure that needs to be considered. The exchange rate is the price commonly used for transactions between countries. The exchange rate is also defined as the price of a country's currency against another country's currency (Dornbusch et al, 2011). Indonesia has implemented a free-floating exchange rate system since 1997 until now (Syamsuddin, 2015). Market mechanisms affect exchange rate movements in countries with this system.

Inflation

Inflation is thought to affect the IDR/USD exchange rate movement as the quantity theory of money says that the primary determinant of the rise and fall of inflation is the money supply (Dornbusch et al., 2011). The increase in money supply will encourage price increases so that it will decrease the value as in the theory of value for money. This is in line with the purchasing power parity (PPP) theory which says that the movement in value analogizes the difference between domestic and foreign inflation (Krugman, 2018). The higher the domestic inflation rate, the more the domestic currency will depreciate. Inflation itself is interpreted as a condition that indicates a continuous increase in the price of certain goods (Mishkin, 2011).

Money Supply

The money supply is also suspected of influencing exchange rate movements. Based on Keynes' theory of money demand, there are three motives based on money demand: transaction motives, prudence, and speculation (Dornbusch et al., 2011). Changes influence the third motive in income and interest rates. An increase in income or a decrease in interest rates will increase the demand for money. The increase in money supply will decrease the value, as in the theory of value for money, and impact increasing prices. In addition, the Classical quantity theory of money shows that changes in prices determined by the money supply will subsequently affect the value of money. An increase in a country's money supply will cause its currency to depreciate, and a decrease in money supply will appreciate the domestic currency (Krugman, 2018).

Exports

Other variables besides inflation and money that are thought to influence the IDR/USD exchange rate movement are exports. Based on the theory of trade approach (trade approach) and international trade, exports have the opposite relationship with exchange rate movements. Therefore, the increase in exports will increase the country's foreign exchange earnings so that the IDR/USD exchange rate will decrease and the rupiah currency will appreciate (Salvatore, 2016).

METHOD

This study was designed using quantitative data types in the form of time series from 2010 to 2020. Data retrieval is sourced from certain agencies (secondary data), namely the publications of International Finance Statistics (IFS) and Bank Indonesia (BI). The object of this research in Indonesia. The dependent variable in this study is the IDR/USD exchange rate, while inflation, money supply, and exports are independent variables. The method used to analyse the data is an error correction model (ECM) using an analytical tool, E-views 9.

Data Stationarity Test

Determination of the econometric equation model with data in the form of time series must ensure that the data is stationary. Data that is not stationary, either from the dependent independent variable of development or development of heteroscedasticity or autocorrelation, impacts the results and estimates of the wrong model, such a model is known as spurious regression. This interpretation model will result in wrong analysis and decisions resulting in wrong policies (Gujarati, 2012). There are several data stationarity tests that must be carried out, namely the unit root test, the degree of integration test, and the cointegration test.

Classic assumption test

The estimate issued by the analytical tool will be declared good if it does not violate the basic assumption, which is better known as the BLUE (Best Linear Unbiased Estimator) (Gujarati, 2012). If there is no classic violation, then BLUE will be achieved. The classical assumption test consists of a data normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test.

Error Correction Model (ECM)

ECM is one of the econometric models used to connect the independent variable to the dependent variable in the long term, which may not occur in the short term in equilibrium. If the error correction term (ECT) with a negative coefficient value (-) the speed of adjustment (adjustment speed) in the short term towards long term equilibrium. Prob. value of ECT shows significance, meaning that the ECM model is appropriate to use or the results are valid.

Statistical Test (Goodness of Fit Test)

A statistical test is carried out to interpret the estimation results obtained from ECM modelling in both the short and long term. The statistical test consisted of a coefficient of determination test (R^2), a simultaneous test (F-statistical test), and a partial test (t-statistical test).

Framework

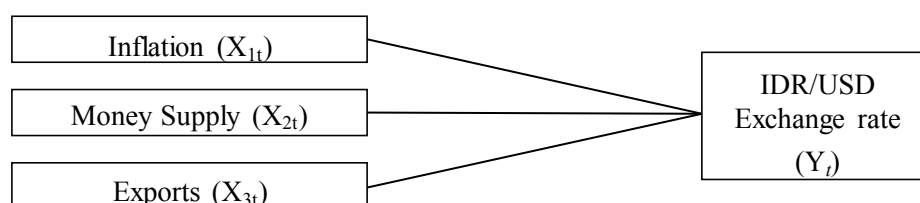


Figure 2. Framework Conceptual

Hypothesis:

H1 : Inflation has positively affects the IDR/USD exchange rate in the short and long term.

H2 : The money has supply positively affects the IDR/USD exchange rate in the short and long term.

H3 : Exports has negatively affect the IDR/USD exchange rate in the short and long term.

RESULT AND DISCUSSION

As previously explained, the data used in this study are data on the IDR/USD exchange rate, inflation, money supply, and exports from 2010-2020 taken from IFS and BI. Before doing the ECM modeling, it is necessary to test the data stationarity first.

Data Stationarity Test Results

Stationarity test results consisting of unit root test, degree of integration test, and cointegration test are summarized in Table 1, as follows:

Table 1. Data Stationarity Test

Unit Root Test				
Variable	Level of Differentiation	Prob. (5%)	Hypothesis	Conclusion
LER	Level	0.6224	Ha Rejected	Not Stationary
	1 st Difference	0.0000	Ha Accepted	Stationary
INF	Level	0.0705	Ha Rejected	Not Stationary
	1 st Difference	0.0000	Ha Accepted	Stationary
LMS	Level	0.5459	Ha Rejected	Not Stationary
	1 st Difference	0.0000	Ha Accepted	Stationary
LX	Level	0.1366	Ha Rejected	Not Stationary
	1 st Difference	0.0000	Ha Accepted	Stationary
Cointegration Test				
ECT (-1)	Level	0.0000	Ha Accepted	Stationary

Sources: IFS and BI (Processed by E-views 9)

Stationarity test results show that inflation, money supply, and export variables are not stationary at differentiation level I(0) but are stationary at differentiation level 1 difference I(1). Cointegration test results show that ECT is stationary at a level with a probability of $0.0000 < 0.05$ ($\alpha = 5\%$). This shows that it has been accepted, so that all variables are declared to be cointegrated or balanced in the long run.

After testing the stationarity of the data, it is continued with ECM modeling. Finally, the analysis is obtained from the estimation results through the ECM method using the E-views 9.

Short-term Estimation Results

In the short term, the estimated effects of inflation, money supply, and exports of movements in the IDR/USD exchange rate are shown in Table 2.

Table 2. Short-term Estimation Results

Variable	Coefficient	Prob. (5%)	Hypothesis	Conclusion	
Constanta	-0.014962	0.1241	Ha Rejected	Not Significant	
D(INF)	0.008851	0.0794	Ha Rejected	Not Significant	
D(LMS)	1.006641	0.0009	Ha Accepted	Positive Significant	
D(LX)	-0.196846	0.0314	Ha Accepted	Negative Significant	
ECT (-1)	-0.587074	0.0004	Ha Accepted	ECM Valid	
Goodness Of Fit Test					
Adj. R ²			0.493121		
Prob. F-Stat			0.000026		
Classic Assumption Test					
Normality Error	Prob. Jb-Stat	0.215062	Ha Accepted	Normal Distributed Error Data	
Heteroscedasticity	Prob. Chi-Square	0.0839	Ha Accepted	No Heteroscedasticity	
Multicollinearity	VIF	D(INF)	1.045336	Ha Accepted	No Multicollinearity
		D(LMS)	1.237474	Ha Accepted	No Multicollinearity
		D(LX)	1.364187	Ha Accepted	No Multicollinearity
		ECT (-1)	1.206125	Ha Accepted	No Multicollinearity
Autocorrelation	Prob. Chi-Square	0.1401	Ha Accepted	No Autocorrelation	

Sources: IFS and BI (Processed by E-views 9)

Based on the short-term estimates in Table 2, the short-term ECM equation in this study can be formulated as follows:

$$LER = \alpha + \beta_1 D(INF) + \beta_2 D(LMS) - \beta_3 D(LX) - ECT + e$$

Plugged into the equation:

$$LER = -0.014962 + 0.008851D(INF) + 1.006641D(LMS) - 0.196846D(LX) - 0.587074ECT + e$$

The results of the classical assumption test are summarized in Table 2, which shows that there is no interference with the classical assumption, so that the basic BLUE assumption in this equation is fulfilled. The coefficient value of ECT described by ECT(-1) is -0.587074, meaning that the speed of ECT in correcting the behavior of each variable in the short term towards long-term equilibrium is 0.58%. From the equation above, it can be seen that the magnitude of the ECT coefficient is feasible to be negative and the probability is significant at the 1% test level with Prob. of 0.0004. Therefore, this ECM test model can be said to be valid. After knowing that the short-term equation is valid,

statistical tests are carried out consisting of the coefficient of determination (R^2) test, F-statistical test, and t-statistical test.

Coefficient of Determination Estimation Results (R^2)

The coefficient of determination (R^2) is 0.493121, which indicates that variations in inflation, money supply, and exports 49.31% can explain the IDR/USD exchange rate variable, and other variables outside the model explain 50.69%.

Simultaneous Estimation Results (F-statistical Test)

The Prob. F-statistic value is $0.000026 < 0.05$, the results show that inflation, money supply, and export variables significantly affect the IDR/USD exchange rate simultaneously in the short term.

Partial Estimation Results (t-statistical test)

The inflation variable has a value of Prob. of $0.0794 > 0.05$ means H_a is rejects. So the inflation variable affects the IDR/USD exchange rate isn't significantly in the short term. The money supply variable has the value Prob. $0.0009 < 0.05$ means that the money supply variable significantly affects the IDR/USD exchange rate in the short term. The export variable has a value of Prob. $0.0314 < 0.05$ means that the export variable has a significant effect on the IDR/USD exchange rate in the short term.

Long-term Estimation Results

Estimates in the long run between the effects of inflation, money supply, and exports are summarized in Table 3.

Table 3. Long-term Estimation Results

Variable	Coefficient	Prob. (5%)	Hypothesis	Conclusion
Constanta	7.832033	0.0000	Ha Accepted	Significant
INF	0.018691	0.0001	Ha Accepted	Positive Significant
LMS	0.591530	0.0000	Ha Accepted	Positive Significant
LX	-0.324431	0.0000	Ha Accepted	Negative Significant
Goodness OfFit Test				
Adj. R^2			0.952115	
Prob. F-Stat			0,000000	

Sources: IFS and BI (Processed by E-views 9)

Based on the short-term estimates in Table 3, the long-term ECM equation in this study can be formulated as follows:

$$LER = \alpha + \beta_1 INF + \beta_2 LMS - \beta_3 LX + e$$

Plugged into the equation:

$$LER = 7.832033 + 0.018691INF + 0.591530LMS - 0.324431LX + e$$

The results of the classical assumption test are summarized in Table 2, which shows that there is no interference with the classical assumption, so that the basic BLUE assumption in this equation is fulfilled. After knowing that there was no further violation of the classical assumption in the long-

term equation, a statistical test was carried out consisting of the coefficient of determination (R^2) test, F-statistical test, and t-statistical test.

Coefficient of Determination Estimation Results (R^2)

The coefficient of determination (R^2) is 0.952115, which indicates that variations in inflation, money supply, and exports of 95.21% can explain other variables outside the model, explaining the IDR/USD exchange rate variable 4.79%.

Simultaneous Estimation Results (F-statistical Test)

The Prob. F-statistic value is $0.000000 < 0.05$, the results show that inflation, money supply, and export variables significantly affect the IDR/USD exchange rate simultaneously in the long term.

Partial Estimation Results (t-statistical test)

The inflation variable has a value of Prob. of $0.0001 < 0.05$, meaning that H_a is accepted. So the inflation variable affects the IDR/USD exchange rate significantly in the long term. The money supply variable has the value Prob. $0.0000 < 0.05$, meaning that H_a is accepted. So partially, the money supply variable significantly affects the IDR/USD exchange rate in the long term. Finally, the export variable has a value of Prob. of $0.0000 < 0.05$, meaning that H_a is accepted and H_0 is rejected. So partially, the export variable significantly affects the IDR/USD exchange rate in the long term.

The Effect of Inflation on the IDR/USD Exchange Rate

H1: Inflation has a positive effect on the movement of the IDR/USD exchange rate in the short and long term

Based on estimates, it shows that inflation does not affect the IDR/USD exchange rate in the short term. Inflation does not affect the movement of the IDR/USD exchange rate in the short term because, in the short term, the inflation rate is more volatile than in the long term (Williamson, 2014). This result is not in accordance with the theory proposed by the researcher as the hypothesis in this study.

This finding supports the results of research from Ginting et al. (2017) that in the short term, inflation does not affect the IDR/USD exchange rate because, during the study period, the IDR exchange rate is influenced by the inflation variable. The findings from Demak et al. (2018) will also not occur because the effect of inflation in the community's short term does not, and in the short term, changes in their spending behavior from expensive domestic goods to cheaper imported goods. However, the results of this study refute the findings of Laksono (2016) that there is a positive relationship between inflation and the IDR/USD exchange rate.

In the long term, inflation positively affects the IDR/USD exchange rate. An increase in inflation in this study will strengthen the IDR/USD exchange rate and depreciate the rupiah currency. This result is in accordance with the theory of value for money that a price increase will decrease the value of money. This theory is explained by the classical theory of money's quantity theory, where money supply influences inflation. When there is an increase in money supply, which is not accompanied by an increase in output, it will push prices up, thereby lowering the value of money. PPP theory also explains that the value movement is influenced by differences in inflation between countries. The higher the domestic inflation, the higher the exchange rate and the rupiah currency will depreciate.

The results of this study are in accordance with previous findings by Laksono (2016), Marlina and Amiruddin (2016), and Demak et al. (2018) that, in the long term, inflation has a positive effect on the IDR/USD exchange rate. It is in accordance with the theory put forward by the monetarists. The rate

of inflation influences international trade. A high inflation rate will encourage a decline in exports because domestic prices are not competitive. Meanwhile, imports will increase to meet demand at a more competitive price. Under such conditions, the country will depreciate the domestic currency because foreign exchange earnings will decline. While the findings from Ginting et al. (2017) show that inflation does not affect the movement of the IDR/USD exchange rate in the long term. It can happen because the inflation variable influences the IDR/USD exchange rate movement in the study period.

The Influence of the Money Supply on the IDR/USD Exchange Rate

H2: The money supply has a positive effect on the movement of the IDR/USD exchange rate in the short and long term

The estimation results show that money supply has a positive and significant effect on the IDR/USD exchange rate, both in the short and long term. When the money supply increases, the IDR/USD exchange rate will increase. It means that when the money supply increases, the rupiah depreciates.

Based on the theory of value, an increase in money supply will impact a decrease in the value of money. A decrease in the value of money to obtain one unit of foreign currency requires relatively more domestic currency. In the theory of money demand, Keynes reveals that the demand for money is motivated by changes in income and interest rates. When income increases or interest rates fall, the demand for money for transactions and precautions will also increase so that the money supply in the economy increases and money will decrease, as explained in the theory of the value of money. The classical quantity theory of money by Irving Fisher that an increase in money supply will push up prices. It will strengthen the IDR/USD exchange rate and depreciate the rupiah due to a decline in export demand based on domestic prices that do not follow the trade approach's theory.

The coefficient value shown from the regression estimation results shows that in the short term, the money supply variable is more elastic in influencing the IDR/USD exchange rate than in the long term. For example, the coefficient value of the money supply variable in the short term and long term is 1.006641 and 0.591530. Therefore, in the short term, money supply growth of 1% will strengthen the IDR/USD exchange rate and depreciate the rupiah currency by 1%, while in the long term, 1% money supply growth will only increase the IDR/USD exchange rate and increase the rupiah currency by 0.59%. These results show that aggregate demand is more elastic in the short run than in the long run.

The finding of this study is that there is no sticky price as determined by Keynesians in the short term. So that in the short and long term, the AS curve will be vertical where the level of production reaches full working conditions. This means that in both the short and long term, there is a supply of money growth that affects the AD curve so that the economy is in a condition that is always potential. This shows that BI's monetary policy was successful through expansionary and contractionary policies after the 2008-2009 global financial crisis.

The results of this study support the previous findings of Djulius and Yudi (2014) that money supply has a positive and significant effect both in the short and long term. The existence of money supply's influence in the short term indicates no sticky prices in the short term, as stated by Dornbusch (Djulius and Yudi, 2014). One of the reasons for the absence of price rigidity in the short term is that the increase in aggregate demand does not encourage producers to improve the production process and increase the output produced but instead encourages producers to increase prices (Syamsuddin, 2015). Therefore, according to Djulius and Yudi (2014), PPP conditions occur both short and long term.

Yuliyanti (2014) and Ginting et al. (2017) also reveal that money supply has a positive and significant influence in the long term. It follows the money supply theory by Irving Fisher, which shows a positive relationship between money supply and the exchange rate. An increase in the money supply

causes the rupiah's value to decrease. It means that the IDR/USD exchange rate strengthened, and the domestic currency depreciated.

The Effect of Exports on the IDR/USD Exchange Rate

H3: Exports have a negative effect on the movement of the IDR/USD exchange rate in the short and long term

The estimation results show that exports have a negative and significant effect on the IDR/USD exchange rate. This is shown by the estimation results issued by E-views 9 both in the short and long term. On the other hand, the increase in exports will strengthen the IDR/USD exchange rate, which the rupiah currency will appreciate.

This study follows the H-O international trade theory, where differences in the availability of production factors between countries will cause trade between two countries. The existence of trade activities carried out by the two countries will affect the movement of exchange rates. Based on the trade approach (trade approach), exports that are smaller than imports will cause foreign exchange earnings to decline. The decline in foreign exchange increases the exchange rate of the domestic currency against foreign currencies, and the domestic currency will weaken.

The coefficient of the export variable in the short term is -0.196846, while in the long term, it is -0.32441. It means that the export variable is more elastic in the long term in influencing the IDR/USD exchange rate during this research period. An increase in exports of 1% in the short term will increase the IDR/USD exchange rate by 0.19%, while in the long term, a 1% increase in exports will reduce the IDR/USD exchange rate or appreciate the rupiah currency by 0.32%.

The results of this study strengthen the results of previous studies by Ginting et al. (2017), which have a negative influence between exports and the IDR/USD exchange rate. Nachrowi and Usman revealed that exports are one of the country's sources. An increase in exports will impact increasing demand for domestic currency, so that the exchange rate will weaken, meaning that the domestic currency will appreciate (Ginting et al., 2017).

Sedyaningrum et al. (2016) and Natalia (2020), in their research, also show that exports have a negative and significant effect on the IDR/USD exchange rate. Sedyaningrum et al. (2016) and Natalia (2020) also mention that the results of this study are in accordance with trade theory (trade approach). A country with a high export value will increase the demand for domestic currency, which will strengthen or experience appreciation. So it can be said that the higher the value of Indonesian exports, the higher the IDR/USD exchange rate.

Research from Djulius and Yudi (2014) takes different results, wherein the short term, exports have a positive effect on the exchange rate, while it has a negative impact in the long term. The results in the short term state that when exports increase, the exchange rate will appreciate, and the rupiah will weaken. It is necessary for the authorities to make improvements to the foreign exchange earnings by exporters to strengthen the existing foreign exchange reserves in the national banking system. In the long term, an increase in exports will impact a sharp appreciation, with a large coefficient and a high level of significance.

CONCLUSION

The results of data processing show that the short-term ECM estimation is declared valid. This means that there is an improvement towards balance in the long term. From the results of the t-statistical test both in the short term and in the short term, it can be said as follows:

Inflation affected the movement of the IDR/USD exchange rate in the short and long term in a positive direction after the 2008-2009 global financial crisis. This is because in the short term there is no price rigidity. This result follows the hypothesis that the researcher did. Because following the theory of value for money.

The money supply variable has a positive and significant effect on the IDR/USD exchange rate in the long and short term after the 2008-2009 global financial crisis. These results align with the theory of value for money and the classical theory of money quantity, which says that money supply has a positive relationship with the exchange rate through prices and exports.

Exports had a negative effect on the movement of the Rupiah/USD exchange rate after the 2008-2009 global financial crisis, namely in 2010-2020, both in the short and long term. The results follow the trade approach, which states that when there is an increase in exports, foreign exchange earnings will increase, thereby encouraging a decrease in the IDR/USD exchange rate that the rupiah currency will appreciate.

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