CHAPTER V

RESEARCH RESULT AND DISCUSSION

A. Research Result

Below are the result and discussion for each analysis step.

1. Descriptive Statistic Result

Descriptive statistics describe the basic features of the data in a study. They provide simple summaries about the sample and the measures.

Table 5.1. Descriptive Statistic

	VAR_ EXC_RATE	VAR_ EXPORT	VAR_ JCI	VAR_ M2	VAR_ BI_RATE
Mean	11035.57	14322.84	4385.228	3512488.	6.72
Median	10625.28	14472.62	4453.700	3506574.	6.50
Maximum	14468.00	18647.83	5568.110	5016983.	7.75
Minimum	8574.79	9649.504	2549.030	2066481.	5.75

Resource: *Data Processing*

2. Unit Roots Test Result

The unit root test was conducted through Augmented-Dickey-Fuller Test (ADF-test). If the t-statistics absolute value is bigger than the absolute critical value, it means that the data is stationary. Otherwise, the data is non-stationary.

This unit root test was conducted initially at level. If all variables are stationary at level, then variables can be analyzed using VAR methods. But if at least one variable is not stationary at level, then unit root test proceed at the differenced level until all variables are tested to be stationary at the same level. After all variables are stationary on certain level, research can run ECM (and VECM as well, if preferred).

Table 5.2. Unit Root Test (ADF-test) of Variables Result

	Test on Level			Test on First Difference		
Variable	**t-statistic**	**Prob**	**Stationary?**	**t-statistic**	**Prob**	**Stationary?**
LOG_ EXC_RATE	-2.470749	0.3416	**No**	-6.751445	0.0000	**Yes**
LOG_ EXPORT	-3.145516	0.1027	**No**	-15.72281	0.0001	**Yes**
LOG_ JCI	-2.969739	0.1468	**No**	-9.153810	0.0000	**Yes**
LOG_ M2	-0.947726	0.9449	**No**	-11.55550	0.0001	**Yes**
VAR_ BI_RATE	-1.623025	0.7757	**No**	-5.259911	0.0000	**Yes**

Resource: *Data Processing*

The results in table above shows that the exchange rate, export, Jakarta Composite Index, and money supply which are in natural logarithm form, plus the variable of Bank Indonesia rate, were non-stationary in level, but they were stationary in first difference level. therefore, it was an I(1) stochastic process.

3. Cointegration Test Result

After knowing that there is non-stationary data on level, the next step is identifying whether the data are cointegrated. The cointegration test gives an early indication that the model has a long-term relationship (cointegration relation).

The result of cointegration test was obtained by forming the residual obtained by regressing the independent variable to the dependent variable by OLS. The residual must be stationary at the level to be said to have cointegration. Below is the result of unit root test of the residual:

Table 5.3. Unit Root Test (ADF-test) of ECT Result

Null Hypothesis: ECT has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic - based on SIC, maxlag=11)			
		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-5.833728	0.0000
Test critical values:	1% level	-3.509281	
	5% level	-2.895924	
	10% level	-2.585172	
*MacKinnon (1996) one-sided p-values.			

Resource: *Data Processing*

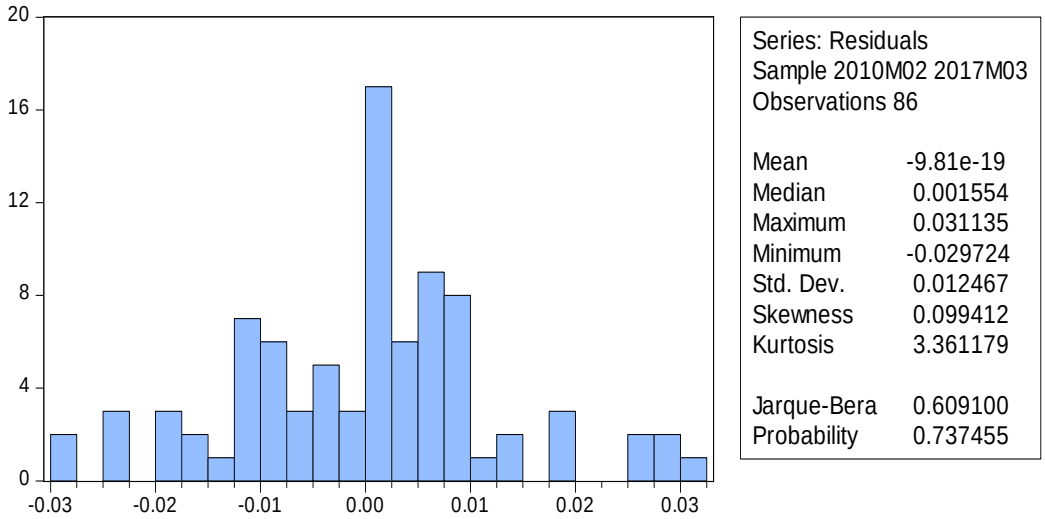
The p-value was 0.0000, less than even for 1% significance level. It showed that the residual (which is Error Correction Term) was stationary at level. Therefore, there was cointegration among variables, there was long run relationship between independent and dependent variables.

B. Classical Assumption Test Result

1. Normality Test Result

This paper used the Jarque-Berra (JB) test of normality in order to find out whether the residual was normally distributed or not.

Table 5.4. Normality Test Result



Resource: *Data Processing*

The Jarque Berra value was 0.6091 with p value 0.737455. Because p value was greater than α = 10%, we accepted H_0: residual was normally distributed. Therefore, it was concluded that there is no normality problem (residual was normally distributed).

2. Autocorrelation Test Result

In this research, to know whether there is autocorrelation in the model, researcher used Lagrange Multiplier test (LM). In LM testing procedure, if the value of Obs * R-Squared is smaller than the value of the table then the model can be said does not contain autocorrelation. It can also be seen from the probability value of chi-squares (), if the probability value is greater than the value of α selected then there is no autocorrelation problem.

Table 5.5. Autocorrelation Test Result

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	4.086961	Prob. F(2,78)	0.0205
Obs*R-squared	8.157424	Prob. Chi-Square(2)	0.0669

Resource: Data Processing

Because Prob. Chi-Square(2) of Obs*R-squared value was greater than α = 5%, it accepted $H_{0:}$ residual was not autocorrelated. It was concluded that there is no autocorrelation problem.

3. Linearity Test Result

The linearity test used in this research was using Ramsey Reset test. If the value of F-count less than the F-critical value at a certain α, the model is precise. Another way to check linearity, if the p-value of f-statistic is greater than selected α, it accepts null hypothesis stating the model is linear, thus the model is precise.

Table 5.6. Linearity Test Result

Ramsey RESET Test
Equation: EQ_ECM
Specification: D_LOG_EXC_RATE D_LOG_EXPORT D_LOG_JCI
D_LOG_M2 D_VAR_BI_RATE ECT C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.077551	79	0.9384
F-statistic	0.006014	(1, 79)	0.9384
Likelihood ratio	0.006547	1	0.9355

Resource: *Data Processing*

Based on result above, the p-value of F-statistics > α = 10%. It accepted H_0: model was linear. It was concluded that there is no linearity problem.

Multicollinearity Test Result

Multicollinearity is the existence of a linear relationship between independent variables in the regression model. To examine the presence or absence of multicollinearity in the model, the researchers used partial methods among independent variables. The rule of thumb of this method is that if the correlation coefficient is high enough above 0.85 then there is likely to be multicollinearity in the model. Conversely, if the correlation coefficient is relatively low then the model assumption does not contain multicollinearity (Ajija at al, 2011).

Table 5.7. Multicollinearity Test Result

Correlation	LOG_EXPORT	LOG_JCI	LOG_M2	VAR_BI_RATE
LOG_EXPORT	1.000000			
LOG_JCI	-0.090134	1.000000		
LOG_M2	-0.376445	0.799070	1.000000	
VAR_BI_RATE	-0.295740	0.299291	0.411128	1.000000

Resource: *Data Processing*

Based on the test with partial correlation method between independent variables above, there was no multicollinearity problem in model because the values of all correlation matrix (correlation matrix) were less than 0.85.

4. Heteroscedasticity Test Result

This paper implies White's heteroscedasticity test in order to find out whether the heteroscedasticity is present or not. The result of White's test is as follows:

Table 5.8. Heteroscedasticity Test Result

Heteroskedasticity Test: White

F-statistic	1.556865	Prob. F(20,65)	0.0926
Obs*R-squared	27.85399	Prob. Chi-Square(20)	0.1129
Scaled explained SS	28.45572	Prob. Chi-Square(20)	0.0990

Resource: *Data Processing*

Based on test result above, the p-value of Obs*R-squared was 0.1129, greater than α = 5%. Because the p-values was greater than α = 5%, it accepted H_0: residual is in homoscedasticity condition. Therefore, there was no heteroscedasticity in the model.

C. Statistic Test Result

Below are analysis results of long-run and short run estimation using Eviews.

Table 5.9. Long-Run Estimation Result

Dependent Variable: LOG_EXC_RATE
Method: Least Squares
Sample: 2010M01 2017M03
Included observations: 87

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_EXPORT	-0.200074	0.024171	-8.277598	0.0000
LOG_JCI	-0.269933	0.038613	-6.990737	0.0000
LOG_M2	0.674887	0.029600	22.80040	0.0000
VAR_BI_RATE	0.058007	0.004247	13.65759	0.0000
C	2.927566	0.358888	8.157334	0.0000

R-squared	0.983132	Mean dependent var	9.294107
Adjusted R-squared	0.982309	S.D. dependent var	0.172660
S.E. of regression	0.022965	Akaike info criterion	-4.653921
Sum squared resid	0.043247	Schwarz criterion	-4.512202
Log likelihood	207.4455	Hannan-Quinn criter.	-4.596855
F-statistic	1194.793	Durbin-Watson stat	1.139767
Prob(F-statistic)	0.000000		

Resource: *Data Processing*

Table 5.10. Short-Run Estimation Result

Dependent Variable: D_LOG_EXC_RATE
Method: Least Squares
Sample (adjusted): 2010M02 2017M03
Included observations: 86 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D_LOG_EXPORT	-0.025327	0.017484	-1.448564	0.1514
D_LOG_JCI	-0.163769	0.033964	-4.821856	0.0000
D_LOG_M2	0.425501	0.110641	3.845786	0.0002
D_VAR_BI_RATE	0.027263	0.010894	2.502573	0.0144
ECT-1	-0.370436	0.067818	-5.462244	0.0000
C	0.001262	0.001806	0.698927	0.4866

R-squared	0.499567	Mean dependent var	0.004230
Adjusted R-squared	0.468290	S.D. dependent var	0.017624
S.E. of regression	0.012851	Akaike info criterion	-5.803563
Sum squared resid	0.013212	Schwarz criterion	-5.632329
Log likelihood	255.5532	Hannan-Quinn criter.	-5.734649
F-statistic	15.97234	Durbin-Watson stat	1.489427
Prob(F-statistic)	0.000000		

Resource: *Data Processing*

1. t-Test Result

This summarize the result whether each independent variable individually has significant influence toward exchange rate, separately in long-run and short-run estimation.

H0: Independent variable individually is NOT significant affecting exchange rate

H1: Independent variable individually is significant affecting exchange rate

For each t-statistic value, if the absolute value of t-statistic is greater than the t-table value, H0 is rejected and H1 is accepted, this means that the corresponding variable individually is significant affecting exchange rate.

Table 5.11. T-Test Result

Long-Run Estimation				
Variable	**t-statistic**	**t-table (df:80 , α:0.05)**	**p-value**	**Effect is Significant?**
LOG_EXPORT	-8.277598	1.990	0.0000	Yes
LOG_JCI	-6.990737	1.990	0.0000	Yes
LOG_M2	22.80040	1.990	0.0000	Yes
VAR_BI_RATE	13.65759	1.990	0.0000	Yes
C	8.157334	1.990	0.0000	
Short-Run Estimation				
Variable	**t-statistic**	**t-table (df:80 , α:0.05)**	**p-value**	**Effect is Significant?**
D_LOG_EXPORT	-1.448564	1.990	0.1514	No
D_LOG_JCI	-4.821856	1.990	0.0000	Yes
D_LOG_M2	3.845786	1.990	0.0002	Yes
D_VAR_BI_RATE	2.502573	1.990	0.0144	Yes
ECT-1	-5.462244	1.990	0.0000	Yes
C	0.698927	1.990	0.4866	

Resource: *Data Processing*

In long-run estimation, all independent variables, individually, had significant effect on exchange rate (absolute value of t statistic > t-table value).

In short-run estimation, export was not significant affecting exchange rate (absolute value of t statistic < t-table value), while Jakarta Composite Index, money supply, and BI rate, individually, were significant affecting exchange rate (absolute value of t statistic > t-table value).

2. F-Test Result

This summarized the result whether all independent variables simultaneously have significant influence toward dependent variable, separately in long-run and short-run estimation.

This test used significance level α = 1% and compared F-Statistic with F-table values. This process needs to determine the degree of freedom of numerator (dfn) and degree of freedom of denumerator (dfd).

dfn = k – 1
dfd = n – k

where:
k = number of variables (both dependent and independent)
n = number of observations.

H0: Independent variables jointly is NOT significant affecting exchange rate

H1: Independent variables jointly is significant affecting exchange rate

Table 5.12. F-Test Result

Estimation Period	F-Statistic	F-Table α , dfn , dfd	F-Table Value	p-value	Effect is Significant?
Long-Run	1194.793	0.01 , 4 , 80	3.56	0.0000	Yes
Short-Run	15.97234	0.01 , 5 , 80	3.26	0.0000	Yes

Resource: *Data Processing*

Both in long-run and short-run estimation, the F-Statistic values (1194.80 and 15.97) were greater than the F-Table Value (3.56 and 3.26). Thus, H0 is rejected and H1 is accepted, which means that all independent variables jointly had significant influence toward exchange rate, either in long-run or in short-run estimation. Besides, the p-values in both estimation were 0.0000, it means that the probability that results could have happened by chance was very small (0.0000).

3. R^2 (Determination Coefficient) Result

This shows the proportion of the variance in the dependent variable that was predictable from the independent variable, separately in long-run and short-run estimation.

Table 5.13. Determination Coefficient Result

Estimation Period	Adjusted R^2
Long-Run	0. 983132
Short-Run	0. 499567

Resource: *Data Processing*

In long-run estimation, the determination coefficient of 0.98 means that in this regression model, the independent variables could predict the variance of dependent variable by 98%. While the rest, 2% was affected by variables outside of this model.

In short-run estimation, the determination coefficient of 0.50 means that in this regression model, the independent variables could predict the variance of dependent variable by 50%. While the rest, 50% was affected by variables outside of this model.

D. Discussion

Below is the table summary of significance test of each independent variable toward dependent variable both in long run and short run estimation.

Table 5.14. Coefficient Estimation Summary

Long-Run Estimation			
Variable	**Effect is Significant?**	**Coefficient**	**Relationship with exc. rate**
LOG_EXPORT	**Yes**	-0.200074	Negative
LOG_JCI	**Yes**	-0.269933	Negative
LOG_M2	**Yes**	0.674887	Positive
VAR_BI_RATE	**Yes**	0.058007	Positive
C	**Yes**	2.927566	-
Short-Run Estimation			
Variable	**Effect is Significant?**	**Coefficient**	**Relationship with exc. rate**
D_LOG_EXPORT	**No**	-0.025327	-
D_LOG_JCI	**Yes**	-0.163769	Negative
D_LOG_M2	**Yes**	0.425501	Positive
D_VAR_BI_RATE	**Yes**	0.027263	Positive
ECT-1	**Yes**	-0.370436	-
C	**No**	0.001262	-

Resource: *Data Processing*

1. Export

Coefficient Interpretation

Based on analysis result, export had significant negative influence toward exchange rate in long-run estimation. When export increased by 1%, exchange rate will appreciate by 20%, ceteris paribus. While in short-run estimation, export had no significant effect on exchange rate.

Previous Research Comparison

The negative relationship between export and exchange rate is in line with the research findings by Yudha and Hadi (2009), Andry Prasmuko and Donni Fajar Anugrah (2010), and Siti Aminah (2012).

Explanation

When Indonesia receive the payment of export, Indonesia will receive US dollar or any foreign currency which can be exchanged with US dollars.

The more export, the more US dollar supply. The increase US dollar supply makes dollar less valuable against Rupiah, thus, Rupiah currency will appreciate. Therefore, higher Indonesia export causes Rupiah to strengthen.

2. Jakarta Composite Index (JCI)

Coefficient Interpretation

Based on analysis result, Jakarta Composite Index has significant negative influence toward exchange rate in long-run estimation. When Jakarta Composite Index increased by 1%, exchange rate will appreciate by 26.99%, ceteris paribus.

While in short-run estimation, Jakarta Composite Index had significant negative influence toward exchange rate. When Jakarta Composite Index increased by 1%, exchange rate will appreciate by 16.38%, ceteris paribus.

Explanation

Jakarta Composite Index price fluctuates because of the force of demand and supply forces. When the index increases, it may be caused by the increasing of demand force of stock within Indonesia. The increase of demand force leads the price equilibrium of stocks to increase. This means that there is more capital used to purchase Indonesia stocks.

Because stocks registered in JCI are open for international trading, the purchase and sale may be made by foreign investors. Such transactions make foreign capital flow in and out Indonesia. When index of JCI increases, part or even all of the increasing demand force may be caused by

foreigner investor demand. Such condition means that there is stock purchase from foreigner which makes capital inflow from abroad. In this case, Indonesia will receive foreign capital in USD currency or any other currency that can be exchanged with USD. With the increase of USD supply, USD will be less valuable relative to IDR. Thus, when JCI increases, IDR appreciate.

3. Money Supply

Coefficient Interpretation

Based on analysis result, money supply had significant positive influence toward exchange rate in long-run estimation. When money supply increases by 1%, exchange rate depreciated by 67.49%, ceteris paribus.

While in short run estimation, money supply had significant positive influence toward exchange rate. When money supply increased by 1%, exchange rate depreciated by 42.55%, ceteris paribus.

Previous Research Comparison

This result supported the results of research conducted by Adwin Surja Atmadja (2002), it concluded that the variable money supply has a significant effect on the movement of the rupiah against the US dollar. Research by Triyono (2008) stated that the money supply variable has a significant influence on exchange rate with positive direction. Research by Wen-jen Hsieh (2009) concluded that the nominal exchange rate has a positive relationship with the money supply. This finding is also in line with research by Siti Aminah (2012).

Explanation

"Other things remaining unchanged, as the quantity of money in circulation increases, the price level also increases in direct proportion and the value of money decreases and vice versa.". (Irving, 1991). Therefore, as the value of money (i.e. Rupiah) decreases, its value compared to other currency, which is the exchange rate against foreign currency, will be weakened (depreciated).

Based on the quantity theory of money by Irving Fisher, MV = PT, the money supply (MS) capable of causing something called inflation, which in turn could push the price level changes in currency values. This is also reinforced with purchasing power parity theory that states increasing supply of money will cause inflation in the country against inflation outside country, this make domestic currency exchange rate depreciated against currency abroad.

4. BI Rate

Coefficient Interpretation

Based on analysis result, BI rate had significant positive influence toward exchange rate in long-run estimation. When BI rate increased by 1%, exchange rate depreciated by 5.8%, ceteris paribus.

While in short run estimation, BI rate had significant positive influence toward exchange rate. When BI rate increased by 1%, exchange rate depreciated by 2.73%, ceteris paribus.

Explanation

A higher interest rate offers higher return relative to other countries, this should attract foreign investor and make capital inflow. Capital inflow will increase demand of rupiah and/or increase supply of USD. This makes appreciation of Rupiah. Therefore, higher interest rate may appreciate Rupiah.

However, the analysis shows that the increasing BI rate, in the contrary, depreciated exchange rate. It means that the increase of BI rate didn’t attract foreign investors. This may happen because, for some reasons, during that period Indonesia were not more preferable to invest compared to other countries.

Another possible reason is that because the higher interest rate leads to higher inflation. If inflation in the country is much higher than in others, or if additional factors serve to drive the currency down, higher interest rate even lead to depreciation of Rupiah currency.

This finding is in line with the International Fisher Effect (IFE) theory. It is an economic theory that states that an expected change in the current exchange rate between any two currencies is approximately equivalent to the difference between the two countries' nominal interest rates for that time.

The rationale for the IFE is that a country with a higher interest rate will also tend to have a higher inflation rate. This increased amount of

inflation should cause the currency in the country with the high interest rate to depreciate against a country with lower interest rates.

5. Error Correction Term

ECT imbalance correction coefficients in the form of absolute values explain how fast time is required to obtain the equilibrium value. The value of ECT coefficient of -0. 370436 means that the difference between the exchange rate value with its equilibrium would be adjusted by 0. 370436 within 1 month.