The Effect of Foreign Debt on the Exchange Rate and its Impact on Monetary Policy in Indonesia

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A B S T R A C T

The objectives of this study are to analyze the effect of foreign debt on the exchange rate that seen from the foreign debt and the exchange rate, and add the variable of inflationary monetary policy and the interest rate of BI Rate to test its impact on monetary policy in Indonesia. The approach in this study is quantitative approach. Data that used are Time Series data from Asian Development Bank and Indonesian World Bank in 1986-2013. Variables that used are exchange rate, foreign debt, inflation and the interest rate of BI Rate. Method that used in this study is Vector Auto Regression (VAR) analysis. The stages that used in this study testing are stationary test, optimal lag test, Granger causality test, impulse response test, and variance variance decomposition. The results of Granger causality test of all variables in this study are unlikely to have a relationship and there are only two variables that give an effect. Based on the results of Granger causality, it shows that there is bidirectional between foreign debt variable that has an effect on the exchange rate in Indonesia and the exchange rate has an effect on the foreign debt in Indonesia. While the foreign debt has an effect on the interest rate of BI Rate. For the results of impulse response test show that the exchange rate variable gives the biggest respond to the shock of foreign debt variable, compared to inflation and the interest rate of BI Rate variables. The results of Variance decomposition show that the contribution which given by foreign debt variable on the exchange rate is relatively bigger compared to the contribution that given by inflation and the interest rate of BI Rate variables.

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INTRODUCTION

The dynamic and worldwide-integrated economic development give an important implication for the economs especially in the macro-economy policy-making. In supporting Indonesian economics, many funding sources, which consists of external and internal source, were urgently needed. The internal funding source consists of government savings, foreign exchange surplus, and national private investment. While the external funding source consists of foreign fund, in the form of direct foreign investment, indirect foreign investment such as portfolio investment and foreign debt, either the private and national sector. Chaudhry et. al. (2009), governance mechanism for the use and monitoring of funds generated through external borrowing needs much ardent improvement because of its strong and significant impact on savings and investment. The foreign debt becomes one of factors which cause Rupiah depreciation through US Dollar needs to pay the main, interest, and installment of the debt. The due date of the foreign debt which should be paid will also increase the demand on the foreign exchange. The increase on the foreign exchange demand to pay he debt in due date causes the currency depreciation. This will make the debitors pay the debt in due date which will decrease the foreign exchange stock owned by the country (Sugeng et. al., 2009). According to Sene (2004), the relationship between the external public debt and the real exchange rate in the developing country by using the extension of Obstfield and Rogoff model. The result of the research showed that the debt tends to creep on to the real exchange rate appreciation in the long term. Kouladoum (2018) finding suggests that external debts positively and significantly affect real exchange rates.

Saheed et. al (2018) argue that with continuous increase in public expenditures, and low capital formation in many developing countries, many governments have resorted into borrowing either or both within and outside the country. However, most borrowings come with interest attached, which results in debt servicing. Serving external debt may involve demand for foreign currency which tends to affect the exchange rate of the country. This research findings reveals that all the dependent variables, that is, external debt, debt service payment and foreign reserve proved to be statistically significant in explaining exchange rate fluctuation in Nigeria within the period of observation, with debt service payment having the strongest effect.

The role of exchange rate changes in eliminating international trade imbalances suggests that we should expect countries with current trade surpluses to have an appreciating currency, whereas countries with trade deficits should have depreciating currencies (Bunescu, 2014). The exchange rate becomes the most important economics indicator since the exchange rate movement has a wide effect on the economics aspect of a country. Besides, the exchange rate has an important role on the trading level of a country, where it is something critical for the world free trade economy. The essential thing of the exchange rate as one of economic indicators grows an interest to discuss and observe the topic related to its change and fluctuation which can be affected by various factors (Noviyanti, 2015). The Rupiah stabilization performed by Bank Indonesia by controlling the interest rate, and interest level change will affect the flow of funds of a country which will also affect the exchange rate demand and offer. Anidiobu (2016) argue that foreign exchange rate had a positive response to foreign debt, and foreign exchange rate had a non-significant response to foreign debt. Based on findings, this paper recommends for a realistic exchange rate to be achieved, foreign debt should be geared towards increased production in the non-oil sectors, government

should import less and export more.

On its progress, inflation may causes deficit and current transaction and also increase the foreign debt. Besides, the high inflation will also cause the capital flight abroad. Reviewed from the the foreign exchange rate, Rupiah will be more depreciated than the foreign echange, which will cause other serious problems, such as the increase of government debt on the foreign creditors. The foreign debt amount which is relatively high and the fluctuative Rupiah exchange rate movement will be a serious problem for the economics development in Indonesia. It will affect the monetary policy in Indonesia. Based on the description above, it is quite interesting to do this research. Therefore, the writer presents a paper entitled "The Effect of Foreign Debt on the Exchange Rate and Its Effect on Monetary Policy in Indonesia".

This research aims to (i) analyze the effect of foreign debt on the exchange rate, (ii) alayze the exchange rate on the monetary policy in Indonesia, and (iii) analyze the effect of foreign debt on monetary policy in Indonesia.

METHODS

The approach used in this research was the quantitative approach. The use of quantitative method was aimed to perform calculation in answering the problems on the research. Data used in this research were the exchange rate, foreign debt, inflation, and interest rate. The data source was taken from Bank Indonesia, Asia Development Bank, World Bank, other papers and litteratures related to the topic. The econometrics method of the research was Vector Autoregression (VAR). In Econometrics, Baltagi (2008) showed that the Vector Autoregression was the modern alternative approach on the double equation model. Besides, VAR is one of models which could analyze the dependence on the time series variables. VAR which was developed by Sims is different than the model.

The VAR model equation was built by considering to minimize the theory approach in order to be able to capture the economics phenomenon well. Thus, VAR is an unstructural or atheoritical model. The VAR suppoerters emphasized on the policy in their method, such as (1) a simple method, no need to differenciate the endogenic and exogenic variable, (2) a simple estimation, in the form of the famous OLS method which can be applied on each equation partly, (3) the prediction obtained from this method, in several cases, is better than a more complex continuous equation model (Gujarati, 2013).

The VAR model claimed that all economic variables are depending each other. To determine the relationship among exchange rate, foreign debt, inflation, and interest rate, a simple VAR model with four endogenic variables can be formulated as follows:

$$\text{Kurs}_t = \beta_{01} + \sum_{i=1}^{p} \beta_{i1} \ kurs_{t-1} + \sum_{i=1}^{p} \alpha_{i1} \ HLN_{t-1}$$
$$+ \sum_{i=1}^{p} \pi_{i1} \ inflasi_{t-1} + \sum_{i=1}^{p} \theta_{i1} \ BIR_{t-1} + e_{1t}$$

$$\text{HLN}_t = \beta_{02} + \sum_{i=1}^{p} \beta_{i2} \ kurs_{t-1} + \sum_{i=1}^{p} \alpha_{i2} \ HLN_{t-1}$$
$$+ \sum_{i=1}^{p} \pi_{i2} \ inflasi_{t-1} + \sum_{i=1}^{p} \theta_{i2} \ BIR_{t-1} + e_{1t}$$

$$\text{Inflasi}_t = \beta_{03} + \sum_{i=1}^{p} \beta_{i3} \ kurs_{t-1} + \sum_{i=1}^{p} \alpha_{i3} \ HLN_{t-1}$$
$$+ \sum_{i=1}^{p} \pi_{i3} \ inflasi_{t-1} + \sum_{i=1}^{p} \theta_{i3} \ BIR_{t-1} + e_{1t}$$

$$\text{BIR}_t = \beta_{04} + \sum_{i=1}^{p} \beta_{i4} \ kurs_{t-1} + \sum_{i=1}^{p} \alpha_{i4} \ HLN_{t-1}$$
$$+ \sum_{i=1}^{p} \pi_{i4} \ inflasi_{t-1} + \sum_{i=1}^{p} \theta_{i4} \ BIR_{t-1} + e_{1t}$$

The Stationarity Test of The Time Series Data

The data stationarity test can be performed by using the ADF unit root test which was affected by the length of lag. The length of ADF root test lag was conducted through criteria from Akaike Information Criterion (AIC) and Scwartz Information Criterion (SIC) or the other criteria (Widarjono, 2013). The root tst of Dickey-Fuller on the equation was the simple model which could be applied if only the time series data followed the AR patterns (1). However, there are many cases that the time series data contained too much higher AR element that the asumption stated that there was no autocorrelation on the error variable e, was not fulfilled. Dickey-Fuller then develop it by adding higher AR element on the model and adding the differentiation variable lag at the right side of the equation which then was called as the Augmented Dickey-Fuller (ADF) test. This ADF test which is frequently used to detect the stationerity.

Determining data stationarity could be accomplished by comparing the ADF statistic value with the statistic distribution critical value. The ADF statistic value was shown by the value of t statistic coefficient yYt-1. If the ADF absolute value is bigger than the critical value, then the observed data showed stationarity. If the opposite happened, then the data is not stationary.

Optimum Lag Determination

The problem happens on the stationarity test is determining the optimum lag. If the lag amount used in the stationarity test is too small, the regression residual will not show white noise that the model cannot estimate the actual error accurately. It will cause the y and error standard will not be estimated well. However, adding too much lag will decrease the ability in rejecting Ho because too much parameter addition will decrease the degrees of freedom. In determining the optimum lag by using the information criteria, the criteria which has the least final fredical error correction or the number of AIC, SIC, and HQ among various lag submitted will be choosen.

Granger Causality Test

After doing the VAR moel estimation, then the next step is determining the the causal relationship or the causality test among endogenic variables in the VAR system. This causality can be tested by using Granger causality test among the observed variables. The method used in thus causality test was developed by Granger.

The causality test was conducted to determine whether an endogenic variable can also be considered as the exogenic variable or not. If there were two variables of Y and X, then if Y caused X or X caused Y or both or there were no any relation between them. Variable Y caused variable X which means the amount of X at the current period can be explained by the X value of the previous period and the Y value of the previous period.

Impulse Response Analysis

Impulse Response is one of important analysis in the VAR model. Impulse Response analysis tracked the response of the endogenic variable in the VAR system because of the shock or change in the error variable (e). Besides, by using impulse response we can track shock for the next periods.

The Variance decomposition Analysis

Beside the impulse response, VAR has the variance decomposition analysis. It gives different method in describing the dynamic system of VAR rather than the impulse response. The variance decomposition analysis describes relatively the importance of each variable in the VAR system because the existence of shock. Variance decomposition is used to predict the variant percentage contribution of each variable because there were certain variable changes in the VAR system.

FINDINGS AND ARGUMENT

Before analyzing the data regres-

sion, the first step taken on the VAR model is the data stationerity test in each endogenic variable in the form of Unit Root test on each variable.

ables. Besides, the optimum lag of Granger Causality test is used to determine the VAR estimation in the impulse response analysis and variance decomposition result.

Table 1
The Stationerity Test

Variable	ADF Statistic	MacKinnon Critical Value (1%)	Conclusion
LKURS	-4.43	-2.96	Stasioner
LHLN	-4.47	-3.36	Stasioner
INFLASI	-5.76	-3. 66	Stasioner
BI RATE	-5.76	-3. 66	Stasioner

Table 2
VAR Estimation Test

	LKURS	LHLN	INFLASI	BI_RATE
LKURS(-1)	5.60	3.29	6.52	2.38
(Standart Error)	(0.49)	(0.32)	(3.81)	(2.05)
LHLN(-1)	5.10	1.28	0.21	-0.17
(Standart Error)	(0.43)	(0.21)	(0.24)	(0.13)
INFLASI(-1)	2.08	2.88	6.46	0.52
(Standart Error)	(0.01)	(5.49)	(0.36)	(0.34)
BI_RATE(-1)	11.44	14.9	0.08	0.13
(Standart Error)	(4.09)	(7.05)	(0.82)	(0.44)
C	0.73	35.32	28.88	11.56
(Standart Error)	(0.92)	(4.49)	(51.92)	(27.93)

According to Walter Enders (2015), for the estimation purpose, the VAR did not neet to be read since if the estimation was read it will be called as overparameterized. This is caused by the number of insignificant variable. However, the essential purpose of this estimation is to find the interrelation among variables.

Optimum Lag determination

The optimum lag determination on the VAR model is very important where the optimum lag become the reference to determine the causal relationship (Granger Causality Test), the optimum lag was used to determine the length of lag among vari-

Besides, the optimum lag is used to determine the length of lag among variables.

The lag optimum test can be determined through information criteria recommended by the smallest value from the Akaike Information Criterion (AIC) Schwartz Information Criterion (SIC), Hannan-Quinn Information Criterion (HQ), Schwarz Bayesian Criterion (SBC), Likelihood Ratio (LR) and Final Prediction Error (FPE). The optimum lag selection criteria is in the largest LR or the smallest AIC, SC, FPE, and HQ. The eviews program has provided a hint with asterisk for the optimum lag.

Table 3
Lag Leght Optimal Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-560.80	n.a	39.12	40.34	40.53	40.40
1	-448.54	184.44*	49.09	33.47	34.42*	33.76

The optimum lag test can be seen at table 3 that the asterisk on the calculation result of Akeike Information Creteria (AIC), Schwartz Information Criteria (SIC), Hannan Quinn Creteria (HQC), Schwarz Bayesian Creteria (SBC), Likelihood Ratio (LR), and Final Prediction Error (FPE) showed the optimum lag was on the first lag position.

Granger Causality Test

On the granger causality test on the VAR model conducted to determine the relation among variables or the causal relationship among endogenic variables on the foreign debt track on the exchange rate and its effect on the monetary policy in Indonesia.

which means that the exchange rate affect the foreign debt. While the foreign debt variable on exchange rate with 0.2140 probability and $\alpha = 1\%$ means that the foreign debt affect the exchange rate. It can be concluded that both variables have an in line relationship. While the inflation did not affect the exchange rate, and vice versa. BI rate did not affect the exchange rate and vice versa. Inflation did not affect the foreign debt and vice versa. BI rate did not affect the foreign debt and vice versa. BI rate did not affect the inflation and vice versa.

Table 4
Kausalitas Granger Test

Null Hypothesis:	Obs	Prob
LHLN does not Granger Cause LKURS	31	0.2140
LKURS does not Granger Cause LHLN		0.0774
INFLASI does not Granger Cause LKURS	31	0.2016
LKURS does not Granger Cause INFLASI		0.2092
BI_RATE does not Granger Cause LKURS	31	0.4591
LKURS does not Granger Cause BI_RATE		0.5849
INFLASI does not Granger Cause LHLN	31	0.1870
LHLN does not Granger Cause INFLASI		0.3521
BI_RATE does not Granger Cause LHLN	31	0.1597
LHLN does not Granger Cause BI_RATE		0.2433
BI_RATE does not Granger Cause INFLASI	31	0.8140
INFLASI does not Granger Cause BI_RATE		0.2279

Based on the Granger causality test on the exchange rate variable on foreign debt with 0.0774 probability and $\alpha = 1\%$

Impulse Response

The impulse response is used to determine the response of the endogenic

variable in the VAR system due to the existence of shock or changes in the error variable (e), the horizontal axis showed the time in quartal during the research and the vertical axis explained the error variable shocks change rate level in the endogenic variable. 10 periods oof injury time was used for each variable in the impulse response.

Based on the impulse response test of the foreign debt variable on the exchange rate explained that there was a shock/change on the foreign debt in responding the shock/change of the foreign exchange variable. The graphic explained that there was a shock/change on the foreign debt variable in responding the exchange rate variable. At the beginning of the period, the shock on the foreign debt variable was in the 0 point and in the 2nd period the shock reached its peak and tend to be not neutral until the last periode and had a positive effect or increased.

Based on the impulse response test of the foreign debt on BI rate explained that tere was a shock/change on the foreign debt variable in responding the BI rate. At the beginning of the period, the shock on the BI rate was in the 0 point. Then, the shock reached its peak right before the second period until the last period and was not neutral.

Variance Decomposition

This was used to predict the variant percentage contribution of each variable to describe the other variables and the importance of other variable in the VAR model which was caused by the contribution of shock. To see how much the effect of variables percentage in the variance decomposition in 10 periods, it is listed on the table below for the chart of foreign debt on the exchange rate and its effect on the monetary policy in Indonesia as follows:

Based on the variance decomposition analysis of the exchange rate variable, it showed that at the 1st period, the exchange rate variable was predicted to give a largest contribution that affect the variable itself (100%). However, at the 2nd period the foreign debt gave a contribution of 0.56%, this value increased until the 10th period for 21.4%. While the inflation contributed for 0.22%, this value increased into 0.37% at the 10th period. Then the BI rate contributed for 0.02% and increased into 0.94% at the 10th period.

Based on the variance decomposition analysis of the foreign debt variable, it showed that at the 1st period, the foreign debt variable was predicted to give a largest contribution that affect the variable itself (99,9%). However, at the 2nd period the exchange rate gave a contribution of 6.57%, this value increased until the 10th period for 29.9%. While the inflation contributed for 0.005%, this value increased into 0.019% at the 10th period. Then the BI rate contributed for 1.2% and increased into 3.7% at the 10th period.

Based on the variance decomposition analysis of the inflation variable, it showed that at the 1st period, the inflation variable was predicted to give a largest contribution that affect the variable it self (13.19%). However, at the 2nd period the exchange rate gave a contribution of 86.2%, this value decreased until the 10th period for 86%. While the foreign debt contributed for 0.30%, this value increased into 1.14% at the 10th period. Then the BI rate contributed for 0.34% and increased into 0.38% at the 10th period.

Based on the variance decomposition analysis of the interest rate variable, it showed that at the 1st period, the interest rate variable was predicted to give a largest contribution that affect the variable it self (7.77%). However, at the 2nd period the exchange rate gave a contribution of 71.7%, this value decreased until the 10th period for 70.9%. While the foreign debt contributed for 0.35%, this value increased into 1.63% at the 10th peiod. Then the inflation contributed for 20.1% and decreased into 19.7% at the 10th period.

CONCLUSION

In this variable, there is a one-way causality relationship between variables. foreign debt affects the exchange rate in Indonesia. In the Impulse Response analysis, the exchange rate will experience a shock/change at the beginning of the period and close to the second period the highest shock occurs until the end of the period and does not lead to neutral and negative or to the end period. In addition, the shock on the foreign debt variable was at point 0 and in the second period the highest start shock tended not to be neutral until the end period and had a positive or increasing effect to the end of the period.

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