

Study of Perspective and Prospective Aspects on Indonesia Balance of Payment in 1980-2017

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Abstract—This study aims to analyze the influence of Interest Rate, Economic Growth, Domestic Credit and Foreign Exchange against Foreign Reserves. The analysis is based on Monetary Approach to the Balance of Payment (MABP) theory. The object of research is the value of Indonesia Foreign Exchange Reserve. This study uses quarterly time series data from 1980 to 2017. Data analysis methods used are Auto Regressive Conditional Heteroscedasticity (ARCH) with GARCH (1,1), ARCH in mean (ARCH-M), Threshold ARCH (TARCH) and GARCH (1,1) with the Variant Regressor. The selection of the best model is based on the level of significance, the value of Akaike Info Criterion (AIC) and Schwarz Criterion. The selected model is the TARCH estimation method. Based on the TARCH output, it can be concluded that all independent variables have significant effect on the Foreign Exchange Reserve, except Domestic Credit. The direction of the relationship of each variable is consistent with the theory of Monetary Approach to the Balance of Payment (MABP).

Keywords—foreign reserves; Monetary Approach to the Balance of Payment (MABP); Auto Regressive Conditional Heteroscedasticity (ARCH)

I. INTRODUCTION

There are several theories that become the basis for analyzing changes in the value of a country's foreign exchange reserves [1]. These theories can be grouped into [2-10]: 1) Pre-Classic BOP Theory, 2) Classical BOP Theory, 3) Keynesian BOP Theory, 4) Neo-Classical or Monetary BOP Theory and 5) The Balance of Payments Constrained Growth Model. The differences in each of these theories are seen from the aspects of assumptions, variables and propositions.

This study aims to analyze the effect of variable interest rates, economic growth, domestic credit and foreign exchange rates on foreign exchange reserves. The analysis is based on the Monetary Approach to the Balance of Payment (MABP) theory [1,11].

The research on International Reserves with Constrained Growth Model, Equilibrium Model, A Structural Economic Dynamics Approach and with The Monetary Approach [3-7]. The results of those studies were various. Some found the positive effect on International Reserves and some found the negative effect on International Reserves. The others no conclusion.

Masdjojo stated there were some of the previous studies that were conducted for Indonesia case [1]. Most of these studies use a Monetary approach with varied results. The others use Keynesian approach and the rest use mixed approach. This research then attempts to re-analyze changes in Indonesia's International Reserves in the period 1980 to 2017.

Description of the empirical phenomenon of the Indonesian Balance of Payments (BOP) can be seen from the Financial Transaction Balance (NTF) at the beginning of the observation period which tends to be a deficit, but after 2008 it tends to be surplus with a volatile value. Then at the beginning of the observation period the Current Transaction Balance (NTB) tended to be a surplus, but after 2008 the deficit tended to be quite sharp. But overall the balance of payments tends to be surplus, but with a very volatile value. The eventual impact of increasing foreign exchange reserves tends to rise, but with fluctuating values.

Based on the above research gap and empirical gap, this study was designed using Auto Regressive Conditional Heteroscedasticity (ARCH) with GARCH (1,1), ARCH in mean (ARCH-M), Threshold ARCH (TARCH) and GARCH (1,1) with Variant Regressor [11, 12].

II. RESEARCH METHOD

This study uses secondary data about Balance of Payments proxied by Indonesia's Foreign Exchange Reserves in the period 1980-2017. Then this study uses Generalized Auto Regressive Conditional Heteroscedasticity (GARCH)

technique to analyse that data with the proposed research model is [1]:

$$\begin{aligned} \ln DEV_{t-1} = & \psi_0 + \psi_1 \ln PN_{t-1} + \psi_2 \ln KD_{t-1} + \psi_3 \ln NTV_{t-1} \\ & + \psi_4 TB_{t-1} + \psi_5 \varepsilon_{t-1} \end{aligned} \quad 1)$$

Ln = Logaritma Natural.

III. RESULTS AND DISCUSSION

A. Data Analysis

One of the assumptions underlying the estimation using the Ordinary Least Square (OLS) method is that residuals must be free from autocorrelation [12-15]. Besides autocorrelation, other assumptions that are often used are confounding variables or residuals that are constant over time. If residuals are not constant, then there is a problem of heteroscedasticity.

Furthermore, when this assumption was violated, the OLS method was not Best Linear Unbiased Estimator (BLUE) [12,15]. As a way out, you can use the Auto Regressive Conditional Heteroscedasticity (ARCH) model with variations of Generalized Auto Regressive Conditional Heteroscedasticity (GARCH). There are many types of ARCH / GARCH models. In this study will focus on the method:

- GARCH (1,1) characterized by a conditional variant (because depending on the previous period) has three parts: average, volatility of the previous period and variant of the previous period.
- ARCH in mean (ARCH-M)
- Threshold ARCH (TARCH)

Before analyzing the research data with the 3 ARCH / GARCH methods, in this study the data were first analyzed using the Ordinary Least Square OLS method with the improvement of heteroscedasticity problems using the Weighted Least Square (WLS) method. However, because the results of the WLS method analysis have not been able to overcome the problem of heteroscedasticity, the analysis is continued with the ARCH / GARCH method.

TABLE I. AUGMENTED DICKEY-FULLER (ADF) TEST STATISTIC

MODEL	ADF STAT	PROB	ADF TABLE	CONCLUSION
GARCH (1,1)	-6.061932	0.0000	3.44	autocorrelation
ARCH-M	-4.046555	0.0094	3.44	autocorrelation
TARCH	-2.829544	0.1894	3.44	No autocorrelation

Source: EViews Output, Computation February 2018

1) *GARCH analysis results (1,1)*: Estimation results using the GARCH (1,1) regression method show that all independent variables have significant relationship with foreign exchange variable. RESID variable (-1) ^ 2 has a significant relationship with the Variance variable, but GARCH (-1) has no significant relationship with the Variance variable.

The model still has problems of autocorrelation and heteroscedasticity which is proven by the results of the data stability test with the ADF method below. The ADF is still greater than the absolute critical value (6.06> 3.44), so the residual still contains autocorrelation problem.

2) *ARCH-M analysis*. Estimation results using the ARCH-M regression method show that all independent variables have a significant relationship with foreign exchange reserve. The variable @SQRT (GARCH) has negative but it is not significant relationship with the Foreign Exchange Reserve. RESID variable (-1) ^ 2 has a significant relationship with the Variance variable, but GARCH (-1) has no significant relationship with the Variance variable.

This model has problems of autocorrelation and heteroscedasticity which is proven by the results of the data stability test with the ADF method below. ADF is still greater than the absolute critical value at 5% alpha (-4.0465> -3.44), so that the residuals still contain autocorrelation problems.

3) *TARCH analysis*. Estimation results using regression TARCH method show that all independent variables have a significant relationship with foreign exchange variables. The variable @SQRT (GARCH) is positive and has no significant relationship with the Foreign Exchange variable. RESID variable (-1) ^ 2 has a significant relationship with the Variance variable, but the GARCH (-1) and GDP variables are not significantly related to the Variance variable. This model has no autocorrelation problem. ADF value is smaller than alpha 5% (ADF statistics -2.83 < ADF table -3.44). Thus the residual value does not contain autocorrelation problems.

This model also has no problem with heteroscedasticity. This is evidenced by the results of the LM-test method with a probability value of 0.062 greater than alpha 5%. Thus, the residual value does not contain heteroscedasticity problems. This model has also been normally distributed. Based on the results of the Jarque Bera test shows the probability value 0.801 is greater than alpha 5%. Thus, the residual value is normally distributed.

TABLE II. NORMALITY AND HETEROSKEDASTICITY TEST

	Statistic	Probability	Conclusion
Normality Test : Jarque-Bera	0.442625	0.801466	Normal
	Statistic	Probability	Conclusion
Heteroskedasticity Test: ARCH	0.0620	0.0620	No Heteroskedasticity

Source: EViews Output, Computation February 2018

B. Discussion Based on Selected Model

After obtaining several models that are "worthy of use", the next task is to choose the best model as a tool to predict changes in foreign exchange reserves in this study. There are several ways that can be used to choose the best model [13,15], namely:

- See R2 value. The model with the highest R2 value means the best.

- See the Akaike Info Criterion (AIC) coefficient and the Schwarze Info Criterion (SIC). The lowest model of AIC and SIC is the best.
- The best model is a model whose predictive numbers are close to reality.

Based on these provisions, it can be seen the results from the table 3 to determine the best model in this study. After comparing several important indicators in the selection of the model, then the analysis of this study uses the TARCH estimation method. Estimation results using regression TARCH method show that all independent variables have a significant relationship with foreign exchange variables. The variable @SQRT (GARCH) is positive and has no significant relationship with the Foreign Exchange variable. RESID variable (-1)² has a significant relationship with the Variance variable, but the GARCH (-1) and GDP variables are not significantly related to the Variance variable. Then this model has no problem of autocorrelation as evidenced by the results of the data stability test with the ADF method below. ADF is smaller than the absolute critical value at 5% alpha (2.83 < 3.44), so that the residuals do not contain autocorrelation problems.

TABLE III. THE ESTIMATION MODEL

	GARCH (1,1)	ARCH-M	TARCH
R2	0.962108	0.962789	0.899577
AIC	-0.496725	-0.510080	-0.747861
SIC	-0.326215	-0.318257	-0.534724
ADF	-6.061932	-4.046555	-2.829544
JB TEST		0.007	0.8014
C	2.326912	2.631654	1.457613
Economic Growth	-0.016814	-0.023240	0.182624
Domestic Credit	0.109246	0.159992	0.108256
Foreign Exchange Rate	0.518369	0.449625	0.484375
Interest Rate	0.208296	0.189504	-0.012949
SQR (GARCH)		-0.185702	0.034002

Source: EViews Output, Computation February 2018

C. Interpretation of the Results

1) *Economic growth.* The influence of economic growth on foreign exchange reserves is positive and significant. This condition occurs if there is no absolute sterilization. In the case of Indonesia this happens for the long term. While for the short term it is not significant because of government intervention. The estimation results have shown that the sterilization process is not non-existent, but not absolute, which is indicated by the offset coefficient not equal to -1. So that the increase in the balance of payments is partly sterilized into domestic credit. The study that can be used to support the above thesis is in lower middle income countries including Indonesia has a tendency not to show the role of economic growth in export growth in the short term [1,11-12].

2) *Domestic credit.* The effect of changes in domestic credit to foreign exchange reserves is positive and significant. These results are different from the results of studies conducted by Masdjojo et al and Lutkepohl [1,13]. This implies that Bank Indonesia has the ability to carry out

sterilization perfectly in the face of changes that occur primarily in the short term. Monetary policy instruments can be used to influence the money market.

3) *Foreign exchange rate.* Changes in the Foreign Exchange Rate have a direct effect in the form of an increase in the prices of exported goods and imported goods domestically. The Foreign Exchange Rate used is Real Effective Exchange Rate (REER) or real effective exchange rate which is often used as an index to measure the level of competitiveness of a country's exports. The real exchange rate is the nominal exchange rate divided by the ratio of the price index in the country and abroad. The real exchange rate can be defined as the relative purchasing power of domestic output. If the rate of inflation growth in Indonesia is faster than in the United States, assuming that the nominal rupiah exchange rate against the US dollar remains unchanged, the real exchange rate of the rupiah against the US dollar will decrease or the value of the rupiah in real terms will appreciate. For the case of Indonesia since 1980 shows a positive trend of the REER index [1,11]. This means that the general price level of Indonesia's export goods becomes relatively cheap compared to the general price level of the same goods from other countries (USA). Based on this development it can be concluded that the level of competitiveness (price competitiveness) of Indonesia's exported goods increases in the world market [11].

4) *Interest rate.* The effect of changes in interest rates on foreign exchange reserves is negative and significant. In the long run the effect remains negative and significant. The Interest Rate variable negatively affects the Foreign Exchange Reserves through changes in the balance in the domestic money market. An increase in the interest rate will affect domestic money demand due to the increasingly high motive to speculate which will further reduce the demand for domestic money. This will worsen the balance of payments, and reduce a country's international reserves. The Interest Rate variable along with the Currency Exchange Value variable is the forming variable of money demand in the context of Purchasing Power Parity [5-8]. If there is an increase in the money supply, then the core money or monetary base will also increase. Because here it is assumed that the export activities of goods and financial assets are deemed not to occur, then the increase in the amount of money requested can be considered as a reflection of an increase in export revenues. the adjustment process continues. If the process towards equilibrium will continue to run, then the foreign exchange reserve fraction against the core money moves between 1 and 0. If the balance on the money market occurs, the fraction number becomes zero [7].

IV. CONCLUSION

Based on the significant effect of Economic Growth, the Domestic Credit, the Foreign Exchange Rate and the Interest Rate on Balance of Payment shows that the Monetary Approach of Balance of Payment theory is relevant. This

implies that the change of those variables in Indonesia economy can affect the domestic money market equilibrium through the change of the domestic demand of money. If the increase in domestic demand of money is not follow by the expansion of Domestic Credit, then the domestic interest rate will increase. Furthermore, this will increase the capital inflow so that it can bring in additional foreign exchange reserves.

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