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Analysis of Rupiah or Yen With Hooper Morton Exchange Determination Model Approach

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***Abstract*— Our study aims to analyze the behavior of the Rupiah / Yen exchange rate using the Hooper-Morton model approach. The method used is ARDL during 2000: 1-2017: 4. The estimation results show that the factors that influence have a significant relationship to the exchange rate of IDR / Yen both short and long term. In the short terms M2 growth variable, the difference in economic growth has a significant and negative influence on the exchange rate of Rp. Yen. In the long-term variable interest rates have a significant and negative effect on the exchange rate of Rp / Yen, the inflation difference variable, the difference in the trade balance growth has a significant and positive effect on the exchange rate of Rp / Yen.**

Keywords—ARDL, exchange rate Rp/Yen, Hooper Morton

I. INTRODUCTION

The stability of the exchange rate in the foreign exchange market is an important problem to always pay attention to. This is because stability is the first criterion that an exchange rate needs to have. Unstable exchange rates will disrupt a country's economic performance, but conversely if the exchange rate is stable it will have a positive effect on the results of a country's economic performance [1]. Indonesia is an example of a country that often changes the exchange rate system. This means that the exchange rate system that was followed before was not right to improve Indonesia's economic performance. In the period (1945 - 1956) the exchange rate system policy in Indonesia established a fixed exchange rate system followed by various deregulations, and even the government tended to carry out a devaluation policy, and applied a floating exchange rate system that was useful to encourage activities certain economy [2] [3] [4] [5].

The case taken in this study is between the Rupiah / Yen exchange rate. This is due to the phenomenon of fluctuations in the Rupiah / Yen exchange rate. Yen was chosen because Japan is Indonesia's main trading partner country. Indonesia is also the largest recipient of government-level development assistance from Japan. According to BI [6], Indonesia has a great opportunity in the export and import markets of Japan, so that the stability of the exchange rate of the Rupiah against the Yen is very important to analyze. This study analyzes the behavior of the rupiah / yen exchange rate using the Hooper-Morton model while the reference literature only analyzes Indian rupees [7]. The model was chosen because it included trade balance variables and could be used to see long-term and short-term movements. The method used in this study is ARDL while the reference literature uses VAR.

This study have diferentitation with the prvious study [8] [9] [10] [11], such as includes the difference in the money supply variable because it relates to foreign exchange demand and supply. The difference in economic growth is included in this study because economic growth shows indicators of a country's performance. Interest rate differences are included in this study in accordance with the theory of interest rate parity. The inflation difference included in this study is in accordance with the PPP theory. The difference in the trade balance is included in this study because the trade balance has a direct relationship with the exchange rate.

II. LITERATURE REVIEW

The rupiah / Yen exchange rate behavior previously explained can be analyzed by exchange rate modeling. One model used to analyze the behavior of the rupiah / Yen exchange rate is the Hooper Morton model. According to Dua & Rajan, [12], the Hooper-Morton model is an extension of sticky price formulation by including changes in exchange rates in the long run. Hooper & Morton [13] assume changes in long-term exchange rates correlate with the shock of the trade balance. Understanding exchange rates proposed by Stockman [14], the exchange rate between two countries is where the residents of both countries agree on the price level in conducting trade.

Table 1.Components and Correlation of the Hooper-Morton Model with Exchange Rate

Variable	Coefficient
M-M*	+
Y-Y*	-
i-i*	-
π-π*	+
TB-TB*	-

The exchange rate is divided into two, namely, the real exchange rate and the nominal exchange rate. The nominal exchange rate is the price of the currency of a country with another country. The real exchange rate for the nominal exchange rate divided by the domestic and foreign relative prices (trading partner countries). To measure the competitiveness of a country with other countries, then use the reference of the real exchange rate.

Table 1 explains that the effect of π-π ^ * on exchange rates is if the level of expectations of domestic inflation is greater than the level of foreign inflation expectations, then the demand for domestic real money will decrease, so that the domestic exchange rate is under pressure. Y-Y variable * has a sign "-", meaning the Y-Y * variable has a negative impact on the exchange rate. Exchange rates will appreciate if domestic real income grows faster than foreign real income. The difference in i-i * variable has a negative sign, this means that an increase in interest rates will result in increased capital inflow which then has a positive effect on the domestic exchange rate, causing the domestic exchange rate to strengthen (appreciation). The variable TB-TB * in the Hooper-Morton model has a "-" sign, meaning that the trade balance difference variable (TB-TB *) has a negative impact on the exchange rate. A country's trade balance increases, meaning that the value of net exports increases, so that it will cause an increase in demand for the domestic currency so that the domestic currency appreciates as a result of the exchange rate falling [15].

The use of the trade balance variable is based on Morton's opinion that there is a change in the exchange rate in the long run related to the trade balance. Hooper-Morton argues that the coefficient of the trade balance (TB) value cannot be zero. The trade balance (TB) of a country that experiences a deficit continuously will cause a weakening of the exchange rate of the domestic currency because the trade balance deficit requires foreign currency to close it. Vice versa, if the trade balance experiences a surplus, the exchange rate of the domestic currency will strengthen against foreign currencies.

The Hooper-Morton exchange rate model is shown in Table 1. The variables M-M * and π-π ^ * have the "+" sign which means the variables M-M * and π-π ^ * have a positive impact on the exchange rate. The exchange rate is predicted to depreciate if the domestic money supply grows faster compared to foreign money supply [15].

Research on the behavior of exchange rates with the Morton Hooper model was carried out by Mishra and Yadav in India [16], and the purpose of their research is to test and analyze Rupee behavior using the Hooper Morton model. The method used is VAR. The results of the study state that there is no cointegration that occurs between variables and differences in interest rates and the amount of money in circulation that contributes significantly to Rupee behavior.

Barnett and Kwag [17] conducted a study of US dollar / UK with the Hooper Morton model approach. The aim of their research is to test and analyze the behavior of the US dollar / UK pound exchange rate with the Hooper Morton model. The method used was ECM during the period 1970-2003. The conclusion of their research is the difference in interest rates, the difference in economic growth, and the difference between the US trade balance and the UK has a significant effect on the US dollar / UK pound in the long and short term

Wongpunya [18] examines exchange rates in Thailand. The purpose of the study was to test and analyze Thai baths against US, UK, EU, China, Japan and Korea currencies after the 1997 crisis. The method used was OLS during the period 1999-2013. The research conclusions, namely the difference in interest rates and the difference in Thailand's trade balance with US, UK, EU, China, Japan and Korea have a significant effect on the Thai Bath rate.

Hassan and Gharleghi [19] analyzed the behavior of exchange rates in the Republic of Maldives by using the Morton Hooper approach from 2000 to 2013. The purpose of the study was to test and analyze exchange rate behavior in the Republic of Maldives with the Hooper Morton approach. The method used in the study is OLS. The conclusions obtained are money supply, inflation, and gross domestic product which have a significant influence on the Maldivian Rufiyaa / US $ exchange rate, whereas interest rates do not have a significant effect on the Maldivian Rufiyaa / US $ exchange rate.

III. METHODOLOGY

The approach used in this study is the ARDL method. The Autoregressive Distributed Lag (ARDL) model is a method that changes economic theory whose stats are dynamic, with an explicit calculation of the role of time [20]. The type of data used in this paper is secondary data. Secondary data is data taken directly from statistical institutions that have been processed statistically. This study uses time series data. The period used is 2000Q1-2017Q4. This period was used because of the post-monetary economic crisis. Samples taken were Indonesia and Japan. The model used in this study is the ARDL model. The following is the ARDL model to explain the rupiah / Yen exchange rate:

$$\Delta y_{1t} = \lambda_1 + \sum_{i=1}^{p} \theta_1 \Delta y_{1t-i} + \sum_{i=0}^{p} \theta_2 \Delta z_{1t-i} + \sum_{i=0}^{p} \theta_3 \Delta z_{2t-i} + \sum_{i=0}^{p} \theta_4 \Delta z_{3t-i} + \sum_{i=0}^{p} \theta_5 \Delta z_{4t-i} + \sum_{i=0}^{p} \theta_6 \Delta z_{5t-i} + e_{t-1} + \rho_1 z_{1t-1} + \rho_2 z_{2t-1} + \rho_3 z_{3t-1} + \rho_4 z_{4t-1} + \rho_5 z_{5t-1} + e_t$$

Information:
Y1 : Exchange rate of Rupiah / Yen
Z1 : difference in the growth of M2 between Indonesia and Japan
Z2 : difference in economic growth between Indonesia and Japan
Z3 : difference in interest rates between Indonesia and Japan
Z4 : inflation difference between Indonesia and Japan
Information:
Z5 : difference in the growth of Indonesia's trade balance with Japan
p : total lag of the dependent variable
i : total lag of the independent variable
θ1 ... θ6 : short-term parameters
ρ1 ... ρ5 : long-term parameters
e : error term
e(t-1) : error correction term

IV. RESULT AND DISCUSSION

In estimating economic models with time series data needed to test the data stationary or not. Time series data is said to be stationary if the mean, variance, and covariant are constant over time. The following are the results of stationarity tests:

Table 2. ADF Stationary Test Results I (0) and I (1)

Variable	Prob ADF I(0)	Prob ADF I(1)
LnY	0,0140*	0,0000*
Z1	0,4354	0,0000*
Z2	0,1494	0,0000*
Z3	0,1953	0,0024*
Z4	0,0747	0,0000*
Z5	0,0000*	0,0000*

Based on table 2 shows that the level or I (0) is only the variable exchange rate of Rupiah / Yen (LnY) and the difference in the growth of the trade balance between Indonesia and Japan (Z5), so that all variables must be first difference or I (1). Process I (0) produces all stationary variables at 5%. After stationarity test, the variables used in this study have stationary level at I (1), then the cointegration test of the Autoregressive Distributed Lag (ARDL) Bounds Test method is carried out.

Table 3. Bound Cointegration Test Results

Test Statistic	Value	K
F-statistic	11.54560	5
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Table 3 shows that the Bound cointegration test results on the ARDL method. The ARDL model is said to have cointegration if the F-statistic is greater than the critical value of Bound at 5 percent both I0 Bound and I1 Bound. Based on the results of the cointegration test bound test shows that the F-statistic is 11.54 while I (0) Bound is 2.62 and I (1) Bound 3.79. This indicates that there is cointegration in the ARDL model.

Table 4. Short Term and Long Term Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNY(-1))	0.285424	0.104970	2.719092	0.0093*
D(Z1)	-1.617067	1.161890	-1.391756	0.1708
D(Z1(-1))	-2.094778	1.039050	-2.016051	0.0498*
D(Z2)	-6.419614	2.278326	-2.817689	0.0072*
D(Z2(-1))	3.340664	2.459500	1.358269	0.1811
D(Z2(-2))	1.878387	2.345761	0.800758	0.4275
D(Z2(-3))	-7.678100	2.017453	-3.805838	0.0004*
D(Z3)	12.826297	5.460015	-2.349132	0.0233*
D(Z3(-1))	15.580597	8.838011	1.762908	0.0847
D(Z3(-2))	14.140915	8.411437	-1.681153	0.0997
D(Z3(-3))	11.235044	4.651600	2.415307	0.0198*
D(Z4)	1.085073	1.998894	0.542837	0.5899
D(Z5)	-0.136530	0.091626	-1.490072	0.1432
D(Z5(-1))	0.062938	0.099339	0.633570	0.5296
D(Z5(-2))	-0.124419	0.089128	-1.395951	0.1696
D(Z5(-3))	-0.301650	0.093244	-3.235050	0.0023*
CointEq(-1)	-0.834907	0.106567	-7.834575	0.0000*
Long-term coefficients Long Run Coefficients				
Z1	0.135093	0.914991	0.147644	0.8833
Z2	1.615622	1.050724	1.537627	0.1311
Z3	-9.415094	2.085404	-4.514757	0.0000*
Z4	6.666765	2.232275	2.986533	0.0046*
Z5	0.594991	0.279908	2.125664	0.0391*
C	9.453466	0.153414	61.620702	0.0000

*) 5% significance level
Source: Processing using Eviews 9

A. Relationship of M2 Growth to Exchange Rate of Rupiah / Yen (Z1 Lag 1)

The results of the analysis in Table 1.4 show that the M2 growth variable in the short term has a significant and negative effect on the 5% significance level of the rupiah / yen exchange rate with a coefficient of -2.094778. This means that if there is a change in M2 of one percent, the exchange rate of the rupiah / yen will change by -2.094778 percent.

This result is in accordance with the research of Mishra and Yadav [16] which examined Rupee behavior in India. When the amount of money supply was too much in the

community, this condition caused pressure in the foreign exchange market. Variable M2 growth was under pressure due to the expansionary monetary policy implemented by Japan. This resulted in a decline in yen demand, so investors preferred to buy rupiah in the form of deposits.

B. Relationship between Economic Growth Difference and Exchange Rate of Rupiah / Yen (Z2)

The results of the analysis in table 1.4 show that the difference in economic growth variables in the short term has a significant and negative effect on the significance level of 5% against the exchange rate of the rupiah / yen with a coefficient of -6.419614. This means that if there is an increase of one percent on the difference in economic growth, it will cause a decline in the rupiah / yen exchange rate by -6.419614 percent. These results are in line with [17] study which stated that economic growth had a significant effect on the rupiah / yen exchange rate.

C. Interest Rate Difference Relation to Exchange Rate of Rupiah / Yen (Z3)

The results of the analysis in table 1.5 show that the difference in interest rates in the long run has a significant and negative effect on the significance level of 5% against the exchange rate of the rupiah / yen with a coefficient of -9.415094. This means that if there is a one percent increase in the difference in interest rates, it will cause a decline in the rupiah / yen exchange rate of -9.415094. This shows that the smaller the gap between the two variables will cause the rupiah / yen exchange rate to experience pressure, because the higher the BOJ interest rate compared to Bank Indonesia interest rates will occur capital flight from Indonesia abroad, so that Bank Indonesia must be able to anticipate and compensate.

D. Relationship of Inflation Difference to Exchange Rate of Rupiah / Yen (Z4)

The results of the analysis in table 1.5 show that the difference in inflation variables in the long run has a significant and positive effect on the significance level of 5% against the exchange rate of the rupiah / yen with a coefficient of 6.666765. This means that if there is an increase of one percent in the difference in inflation, then it causes an increase in the rupiah / yen exchange rate of 6.666765.

E. Relationship between the Difference in Trade Balance Growth against Exchange Rates of Rupiah / Yen (Z5)

The results of the analysis in table 1.5 show that the difference in the trade balance growth difference in the long run has a significant and positive effect on the significance level of 5% against the exchange rate of the rupiah / yen with a coefficient of 0.594991. This means that if there is a one percent increase in the difference in the growth of the trade balance, it will cause an increase in the rupiah / yen exchange rate of 0.594991. This suggests that the concept of Hooper Morton has not been able to explain the behavior of the Rupiah / Yen exchange rate. The estimation results are in line with the research of Barnett and Kwag [17], Wongpunya [18], and Chin [21]. The results of their research showed the same results, namely the difference in trade balance has a significant effect on the exchange rate. These results indicate that the trade balance is very instrumental in influencing exchange rates.

V. CONCLUSION

Based on the results of data analysis and discussion that has been described previously, it can be concluded that in the short term the M2 difference variable has a significant and negative influence on the exchange rate of Rp / Yen, the difference in economic growth variable has a significant and negative effect on the exchange rate of Rp / Yen. In the long term variable interest rates have a significant and negative effect on the exchange rate of Rp / Yen, the inflation difference variable has a significant and positive effect on the exchange rate of IDR / Yen and the trade balance growth difference variable has a significant and positive effect on the exchange rate of Rp / Yen. It is expected that Bank Indonesia can control the amount of money in circulation, coordinate to maintain and even increase economic growth with the right policies.

REFERENCES

[1] Zhang, Shidong, Thomas C. Lowinger, and Jie Tang. "The monetary exchange rate model: long-run, short-run, and forecasting performance". Journal of Economic Integration, 2007, pp.397-406.

[2] Yunus, A. M. A., and Zain, M. Y. "Is Real Exchange Rate of Indonesian Domestic Rupiah to USD Really Affected by Fiscal and Monetary Policy? ". Scientific Research Journal, 5(11), 2017, pp. 80–83.

[3] Masbar, R., Murtala, and Nasir, M. "Fluctuation Analysis Rupiah Exchange Rate of Dollar United State in Indonesia". European Journal of Agriculture and Forestry Research, 5(6), 2017, pp. 37–50.

[4] Shylajan, C. S., Sreejesh, and Suresh. "Rupee-Dollar Exchange Rate And Macroeconomic Fundamentals: An Empirical Analysis Using Flexible-Price Monetary Model". *Journal of International Business and Economy*, 12(2), 2011, pp.90–105.

[5] Isaac, A. G., and Mel, S."The Real-Interest-Differential Model after Twenty Years". Journal of International Money and Finance, 5(2), 2011, pp.110–119.

[6] BI. Laporan Perekonomian Indonesia Tahun 2015. Jakarta: Bank Indonesia, 2015.

[7] Srinivasan, P., and Kalaivani, M. Exchange Rate Volatility and Export Growth in India: An Empirical Investigation. Working Paper MPRA, 2(4), 2012, pp. 1–25.

[8] Edwards, K., and Sahminan. Exchange Rate Movements in Indonesia: Determinants, Effects, and Policy Challenges. Bank Indonesia Working Paper, WP/25/2008.

[9] Gharleghi, B., and Hassan, S. M. N. Is Monetary Variable a Determinant in the Ringgit-Dollar Exchange Rates Model?: A Cointegration Approach. *Sains Malaysiana*, 41(9), 2012, pp. 1163–1169.

[10] Santosa, A. B. Equilibrium and Disequilibrium Exchange Rate: Case of Rupiah Exchange Rate. International Journal of Economics and Financial Issues, 7(2), 2017, pp. 81–85.

[11] Suidarma, I. M., Sanica, I. G., Ayu, P. C., and Diatmika, I. N. D. Overshooting Indonesian Rupiah's Exchange Rate towards US Dollar: Dornbusch Model Hypotheses Test. International Journal of Economics and Financial Issues, 8(5), 2018, pp. 52–58.

[12] Dua, P., and Rajan, R. Modelling and Forecasting The Indian RE/US Dollar Exchange Rate. Working Paper of Department of Economics, Delhi School of Economics, (197), 2011.

[13] Hooper, P., and Morton. Fluctuations in the Dollar: A Model of Nominal and Real Exchange Rate Determination. Journal of International Money and Finance, 1(2), 1982, pp. 39–56.

[14] Stockman, A. C. A theory of exchange rate determination. Journal of political Economy, 88(4), 1980, pp. 673-698.

[15] Acheampong, K. I. A Monetary Approach to Exchange Rate Liberalization Regime in Ghana. International Journal of Management Research and Technology, 3(12), 2007, pp. 1–20.

[16] Mishra, A., & Yadav, R.. Exchange Rate Behaviour And Management In India: Issues And Empirics. Journal of Monetary Economics, 2(7), 2012, pp. 127–147.

[17] Barnett, W. A., & Kwag, C. H. Exchange Rate Determination from Monetary Fundamentals: an Aggregation Theoretic Approach. Frontiers in Finance and Economics, 2005, pp.1–23.

[18] Wongpunya, N. Empirical Exchange Rate Models of Thailand after 1997. *Southeast Asian Journal of Economics*, 3(2), 2015, pp. 91–122.

[19] Hassan, Mariyam Himmath, and Behrooz Gharleghi. "Exchange rate determination in Maldives: A study based on the sticky price monetary model." *International Journal of Business and Management* 10, no. 7 2015, 85.

[20] Karomah, Ainil, and Suhartono Suhartono. "Peramalan netflow uang kartal dengan model variasi kalender dan model Autoregressive Distributed Lag (ARDL)." *Jurnal Sains dan Seni ITS* 3, no. 2, 2014, D103-D108.

[21] Chin, L. The Effects of Trade Openness on Malaysian Exchange Rate. *MPRA Working Paper N*o. 45185, 2011.