Assessing Monetary Model of Exchange Rate Determination: Case of Indonesia

Yuniarto Hadiwibowo and Raynal Yasni

Abstract — The main purpose of this paper is to assess the exchange rate determination in Indonesia after the Asian financial crisis. We use the Monetary Model to assess the prediction of the Indonesian Rupiah against the United States Dollar and other currencies of the largest trade partners of Indonesia. The models are the Flexible Price Monetary Model and the Sticky Price Monetary Model. We estimate short-run and long-run relationships using the Error Correction Model. The Monetary Model can explain partially the exchange rate variations, but the signs of money, income, and fiscal balance are not as expected. The causality may run from the exchange rate to money and price level.

Index Terms — Exchange Rate; Monetary Model; Flexible Price Monetary Model; Sticky Price Monetary Model.

I. INTRODUCTION

There is extensive literature on exchange rate prediction or modeling. The literature contains different alternatives of predictors, models/approaches, countries/samples, time horizons, and evaluation methods [24]. Several literature surveys had been conducted to predict the exchange rate using various models such as Frankel and Rose [11], Engel, Mark, and West [7], and Melvin, Prins, and Shand [21]. The objective of this paper is to assess the efficacy of the monetary model to determine the exchange rate in Indonesia as a representation of developing economies in Asia.

After the Asian financial crisis in 1997/1998, Indonesia has changed its economic policy towards a more flexible exchange rate regime. Figure 1 shows the development of the Indonesian Rupiah (IDR) since 1970. Before 1998 we can see clearly that IDR was managed and stable with several devaluations in 1978Q4, 1983Q2, 1986Q3, and huge depreciation happened in 1998. IDR has been floating afterward.

Fig. 1. Exchange Rate IDR/USD.

We choose the period of floating exchange rate after the crisis. We estimate exchange rates of Indonesian Rupiah (IDR) against currencies of the largest trade partners. Based on export and import data in 2018, we assess Indonesian Rupiah against these currencies: USD (United States Dollar), EUR (Euro), GBP (United Kingdom Pound Sterling), JPY (Japanese Yen), SGD (Singapore Dollar), AUD (Australian Dollar), KRW (Korean Won), CNY (Chinese Yuan).

The rest of the paper is organized as follows. Section 2 reviews the theoretical framework. Section 3 presents the methodology and data. The result and discussion are presented in Section 4. Finally, section 5 concludes.

II. THEORETICAL FRAMEWORK

We follow the framework of the Monetary Model of exchange rate following Messe and Rogoff [20], Wongpunya [26], and Afat et al. [1]. The framework is based on the demand for real money balance and Purchasing Power Parity (PPP), assuming perfect capital mobility.

The demand for real money balance (M/P) can be stated as a function of income (Y) and interest rate (i):

$$M / P = L(Y, i) \quad (1)$$

In logarithm form:

$$m_t - p_t = \alpha y_t - \beta i_t \quad (2)$$

Therefore, the domestic and foreign price can be expressed as follows:

$$p_t = m_t - \alpha y_t + \beta i_t \quad (3)$$

$$p_t^* = m_t^* - \alpha^* y_t^* + \beta^* i_t^* \quad (4)$$

If PPP holds, the exchange rate (S, expressed as the domestic currency price of a unit of foreign currency) can be stated as the ratio of the domestic price (P) and foreign prices (P*).

$$S_t = P_t / P_t^* \quad (5)$$

In logarithm form:

$$s_t = p_t - p_t^* \quad (6)$$

Substituting Equation (3) and Equation (4) to Equation (6):

$$s_t = (m_t - \alpha y_t + \beta i_t) - (m_t^* - \alpha^* y_t^* + \beta^* i_t^*) \quad (7)$$

$$s_t = (m_t - m_t^*) - (\alpha y_t - \alpha^* y_t^*) + (\beta i_t - \beta^* i_t^*) \quad (8)$$

Equation (8) implies that the parameters of domestic money and foreign money are 1. Therefore, the first model restricts the coefficient of domestic and foreign money as unity. Assuming identical income elasticities and interest rate elasticities of money demand for both countries, the restricted model represents the Flexible Price Monetary Model or the Frenkel-Bilson Model [10], [16]:

$$s_t = (m_t - m_t^*) - \alpha (y_t - y_t^*) + \beta (i_t - i_t^*) \quad (9)$$

The second model is the Sticky Price Monetary Model (the Dornbusch-Frankel model) [6] which allows for slow domestic price adjustment and deviation from the PPP as in Messe and Rogoff [20] and Rossi [24]. The model includes inflation differential between two countries.

$$s_t = (m_t - m_t^*) - \alpha (y_t - y_t^*) + \beta (i_t - i_t^*) + \theta (\pi_t - \pi_t^*) \quad (10)$$

The Forward-Looking Monetary Model [1] incorporates rational expectation, exchange rate can be stated as the present value of all expected future values of fundamentals, i.e. money supply and real income.

$$s_t = (m_t - m_t^*) - \alpha (y_t - y_t^*) \quad (11)$$

Also, Hooper and Morton [13] proposed that exchange rate movements are also influenced by trade balance and current account balance. In short, the models imply that factors that influence the exchange rate are domestic and foreign money, income, interest rate, inflation, and balance of payment.

III. METHODOLOGY AND DATA

In this paper, we use the most general model which includes all the factors. In this sense, we can derive the relevance of the models using parameters of the result. To simplify, we modify the names of the variables using: $mon = (m_t - m_t^*)$, $inc = (y_t - y_t^*)$, $int = (i_t - i_t^*)$, and $infl = (\pi_t - \pi_t^*)$.

We use the change of reserve of Indonesia instead of trade and current account balance to incorporate the influence of financial account. We also include fiscal balance of Indonesia in the equation. We estimate the relationship of this model:

$$s_t = a + b_1 mon_t + b_2 inc_t + b_3 int_t + b_4 infl_t + b_5 res_t + b_6 fis_t \quad (12)$$

The expected parameters for Equation (12) based on models in Section 2 are as follows. For the Flexible Price Monetary Model, the expected parameters are $b_1 = 1$, $b_2 < 0$, $b_3 > 0$, $b_4 = 0$. For the Sticky Price Monetary Model, we expect $b_1 = 1$, $b_2 < 0$, $b_3 < 0$, $b_4 > 0$. For the Forward Looking Monetary Model, the expected parameters are $b_1 = 1$, $b_2 < 0$, $b_3 = 0$, $b_4 = 0$ [1], [4], [14]. According to conventional macroeconomic theory, expected parameters of reserve is $b_5 < 0$ [26], [13] and fiscal balance is $b_6 > 0$ [3], [25].

Because the data is time-series, we use the augmented Dickey-Fuller unit root tests to check the stationarity of all variables. We select the lag length used in the estimation based on the Akaike Information Criterion. If all variables are stationary, we can safely conduct the regression. Regression in the level is sufficient.

On the other hand, if the variables are not stationary, then the first option is to regress the first difference of the variables. However, with this approach, we have the risk of losing the long-run relationship. If the variables are non-stationary, we may use the variable in level, if a cointegration relationship exists. Regression using the variable in level will reveal long-run relationships. Therefore, the second option is using the variable in level [9].

The third option is using the dynamic specification to estimate short-run and long-run relationships between variables using the Error Correction Model (ECM). The ECM constitutes a transformation of the autoregressive distributed lag (ARDL) model [2], [5].

The specification of the ECM is:

$$\Delta s_t = a + b_1 \Delta mon_t + b_2 \Delta inc_t + b_3 \Delta int_t + b_4 \Delta infl_t + b_5 \Delta res_t + b_6 \Delta fis_t + c (s_{t-1} - d_1 mon_{t-1} - d_2 inc_{t-1} - d_3 int_{t-1} - d_4 infl_{t-1} - d_5 res_{t-1} - d_6 fis_{t-1}) \quad (13)$$

In this model, short-run relationships are represented by b_1 - b_6 , while d_1 - d_6 signifies a long-run or level relationship. Therefore, both the short-run and the long-run coefficient are directly testable in this specification.

Coefficient c signifies a cointegration relationship. If c is zero or positive, the cointegration relationship does not exist. If c is zero, the deviation from the long-run relationship caused by the short-run parameters will not be adjusted. If c is positive, the long-run relationship is not possible.

When the value of c is negative, the deviation from the long-run relationship caused by the short-run relationship will be adjusted. The gap will be decreasing the next period by the value of c . Furthermore, the value of c also represents the speed of adjustment to shocks [23]. For example, if the value is -0.5, then the adjustment to the long-run equilibrium will be completed in the next two periods.

We use the data mainly from OECD and then fill the gap using data from the Bank of Indonesia and the International Financial Statistics of the International Monetary Fund (IMF IFS). Money is the narrow money (M1) seasonally adjusted (MANMM101.STSA.Q). Income is Gross Domestic Product by expenditure at constant prices seasonally adjusted (NAEXKP01.STSA.Q). The interest rate is the deposit rate (IR3TIB01.ST.Q). Inflation is the Consumer Price Index all items growth rate compared to the same period the previous year (CPALTT01.GY.Q). Data for Singapore is taken from IMF IFS (money Q.SG.34__SA_XDC; income Q.SG.NGDP_R_K_XDC, seasonally adjusted using X12-ARIMA; interest rate Q.SG.FIDR_PA; inflation Q.SG.PCPI_PC_CP_A_PT). Exchange rates are taken from OECD for IDR/US Dollar, but other rates are from Bank Indonesia.

IV. RESULT AND DISCUSSION

The results of the augmented Dickey-Fuller unit root tests show that all variables are stationary at first difference. Therefore, we use Error Correction Model to estimate the relationship.

First, we show the result of the Sticky Price Monetary Model because it includes all the variables in all models. Table 1 provides the parameter estimates of money, income, interest rate, inflation, reserve, and fiscal balance. The short-run parameter estimates are b_1 (money), b_2 (income), b_3 (interest rate), b_4 (inflation), b_5 (reserve), and b_6 (fiscal balance). The long-run parameter estimates are d_1 (money), d_2 (income), d_3 (interest rate), d_4 (inflation), d_5 (reserve), and d_6 (fiscal balance).

TABLE 1: STICKY PRICE MONETARY MODEL

$$\Delta S_t = a + b_1 \Delta \text{mon}_t + b_2 \Delta \text{inc}_t + b_3 \Delta \text{int}_t + b_4 \Delta \text{infl}_t + b_5 \Delta \text{res}_t + b_6 \Delta \text{fis}_t + c (s_{t-1} - d_1 \text{mon}_{t-1} - d_2 \text{inc}_{t-1} - d_3 \text{int}_{t-1} - d_4 \text{infl}_{t-1} - d_5 \text{res}_{t-1} - d_6 \text{fis}_{t-1})$$

	USD	EUR	JPY	SGD	CNY	AUD	GBP	KRW
a	2.892 *** (0.890)	3.570 *** (1.281)	6.009 *** (0.614)	0.632 (1.275)	2.282 *** (0.000)	4.387 *** (0.000)	2.506 * (0.000)	3.637 *** (0.000)
b1	0.119 (0.208)	-0.280 (0.396)	-0.617 (0.199)	0.156 (0.205)	0.033 (0.000)	0.067 (0.000)	0.387 * (0.000)	0.041 (0.000)
b2	-0.365 (0.878)	0.433 (0.616)	2.193 *** (0.069)	0.393 (0.638)	-0.061 (0.000)	0.395 (0.000)	-1.099 * (0.000)	0.215 (0.000)
b3	0.021 *** (0.008)	-0.011 (0.014)	0.001 (0.009)	0.010 (0.006)	0.015 (0.000)	-0.009 (0.000)	-0.009 (0.000)	-0.007 (0.000)
b4	-0.002 (0.004)	0.000 (0.004)	-0.004 (0.003)	-0.004 (0.004)	-0.003 (0.000)	-0.003 (0.000)	0.001 (0.000)	0.002 (0.000)
b5	-0.005 ** (0.002)	-0.001 (0.003)	-0.006 * (0.002)	-0.002 (0.003)	-0.001 (0.000)	0.002 (0.000)	-0.003 (0.000)	-0.001 (0.000)
b6	-0.004 * (0.002)	-0.004 ** (0.003)	0.000 (0.003)	-0.004 *** (0.002)	-0.008 ** (0.000)	0.001 (0.000)	-0.001 (0.000)	-0.001 (0.000)
c	-0.257 *** (0.082)	-0.359 *** (0.093)	-0.499 *** (0.064)	-0.168 *** (0.066)	-0.199 *** (0.000)	-0.549 *** (0.000)	-0.224 *** (0.000)	-0.255 *** (0.000)
d1	-0.455 ** (0.194)	0.098 (0.213)	-0.038 (0.519)	0.018 (0.593)	1.119 ** (0.000)	0.386 (0.000)	0.180 (0.000)	-0.505 *** (0.000)
d2	1.103 ** (0.441)	0.290 (0.532)	0.705 (0.569)	-1.412 * (0.894)	-0.005 (0.000)	0.549 (0.000)	0.038 (0.000)	2.937 *** (0.000)
d3	-0.024 ** (0.012)	-0.053 *** (0.010)	-0.019 * (0.014)	-0.024 (0.010)	-0.026 * (0.000)	-0.021 *** (0.000)	-0.038 *** (0.000)	-0.055 *** (0.000)
d4	0.003 (0.011)	0.022 *** (0.007)	0.001 (0.012)	-0.014 (0.012)	-0.013 (0.000)	0.001 (0.000)	0.023 * (0.000)	0.028 *** (0.000)
d5	-0.016 * (0.008)	-0.001 (0.006)	-0.008 (0.010)	-0.008 (0.011)	0.008 (0.000)	-0.002 (0.000)	-0.018 (0.000)	-0.007 (0.000)
d6	-0.025 ** (0.010)	-0.019 * (0.011)	0.001 (0.012)	-0.054 *** (0.017)	-0.060 *** (0.000)	0.006 (0.000)	-0.014 (0.000)	-0.015 (0.000)
Adj. R2	0.283	0.178	0.260	0.192	0.193	0.244	0.110	0.085
AIC	-217.215	-194.757	-158.082	-228.945	-171.542	-197.416	-197.637	-188.538
DW	1.951	2.232	1.874	2.248	2.257	2.383	1.905	2.420

Note: Standard errors in parentheses. Significance levels: * at 10% level, ** at 5% level, *** at 1% level.

We can see from the long-run relationship that almost all parameter estimates are significantly different from zero especially in the estimation of Rupiah against USD. Parameter estimates of money, income, interest rate, and fiscal balance are significant at the 0.05 significance level. The p-value of the parameter of reserve is not small enough to reject the irrelevance of reserve at the 0.1 significance level. However, the parameter estimates of reserve are significant at the 0.01 significance level in the estimation against Euro and KRW and at the 0.1 significance level against GBP.

Table 2 shows the result of the Flexible Price Monetary Model. The model excludes inflation or restricts the parameter of inflation to zero. In the estimation against USD, JPY, SGD, CNY, and AUD, the estimated values of adjusted R-squared are larger in Table 2 than in Table 1. Also, the estimated values of the Akaike Information Criterion are smaller.

The parameter estimates of the short-run and the long-run

In the short-run, the parameter estimates of interest, reserve, and fiscal balance are significant, each at the significance level of 0.01, 0.05, and 0.1 respectively against USD. Parameter estimates of fiscal balance are significant in the estimation against four currencies, i.e. USD, Euro, SGD, and CNY, while parameter estimates of reserve are significant only against USD and JPY. Parameter estimates of income against JPY and GBP are significant, although with different signs. The short-run movement of the exchange rate based on these parameters will be adjusted to reflect the long-run relationship [23]. In this sense, we focus on the long-run relationship in the rest of the paper.

relationship in Table 2 are similar to the estimates in Table 1. All long-run parameter estimates are significant at the 0.05 significance level, except reserve, which is significant at the 0.1 significance level. The short-run parameter estimates are also similar to Table 1.

The sign of the parameter estimates of interest, reserve, and fiscal balance are consistent for all pairs which parameters are significant. The signs of interest parameter estimates are negative for all pairs. The exchange rate appreciates while the interest rate increases. This is as expected by the Sticky Price Monetary Model and conventional macroeconomics theory.

The estimated parameters of reserve are negative as expected. An increase in reserve constitutes trade surplus or capital inflows. The exchange rate appreciates while reserve increases.

On the other hand, the parameters of fiscal balance are not as expected. Theoretically, we expect the parameter estimates of fiscal balance is positive, i.e. fiscal surplus will cause a depreciation of the currency. The results show that the

parameter estimates of fiscal balance are negative in pairs against the USA, SGD, CNY (Table 1 and Table 2), and Euro (Table 1). The exchange rate appreciates while fiscal surplus increases. This “twin divergence” is similar to Kim and Roubini [18].

The signs of the parameter estimate of money and income are not consistent for all pairs. The signs of parameter

estimate of money and income in pairs against USD and KRW are not as expected. The exchange rate appreciates as money increases and depreciates as income increases. This result is similar to the estimation of Hsing [15] and some in Moosa [22]. This might be driven by the liquidity demand effect which might be different between developed and developing countries [12].

TABLE 2: FLEXIBLE PRICE MONETARY MODEL
 $\Delta s_t = a + b_1 \Delta \text{mon}_t + b_2 \Delta \text{inc}_t + b_3 \Delta \text{int}_t + b_4 \Delta \text{res}_t + b_5 \Delta \text{fis}_t + c (s_{t-1} - d_1 \text{mon}_{t-1} - d_2 \text{inc}_{t-1} - d_3 \text{int}_{t-1} - d_4 \text{res}_{t-1} - d_5 \text{fis}_{t-1})$

	USD	EUR	JPY	SGD	CNY	AUD	GBP	KRW
a	2.721 *** (0.849)	2.458 *** (1.232)	5.864 *** (0.580)	0.364 (1.338)	2.464 *** (0.000)	4.584 *** (0.000)	2.661 * (0.000)	2.173 ** (0.000)
b1	0.151 (0.201)	-0.156 (0.377)	-0.528 (0.202)	0.095 (0.211)	0.008 (0.000)	0.113 (0.000)	0.473 ** (0.000)	0.063 (0.000)
b2	-0.408 (0.897)	0.024 (0.638)	2.248 *** (0.068)	0.470 * (0.702)	-0.057 (0.000)	0.320 (0.000)	-0.949 (0.000)	0.293 (0.000)
b3	0.020 ** (0.008)	-0.005 (0.011)	-0.001 (0.007)	0.003 (0.006)	0.011 (0.000)	-0.009 (0.000)	-0.004 (0.000)	-0.001 (0.000)
b4	-0.005 ** (0.002)	-0.001 (0.003)	-0.006 * (0.002)	-0.002 (0.002)	-0.001 (0.000)	0.002 (0.000)	-0.002 (0.000)	-0.001 (0.000)
b5	-0.004 * (0.002)	-0.003 (0.003)	0.000 (0.003)	-0.004 *** (0.002)	-0.008 *** (0.000)	0.001 (0.000)	0.000 (0.000)	-0.001 (0.000)
c	-0.245 *** (0.081)	-0.236 *** (0.089)	-0.486 *** (0.067)	-0.165 *** (0.053)	-0.214 *** (0.000)	-0.550 *** (0.000)	-0.147 *** (0.000)	-0.166 *** (0.000)
d1	-0.394 ** (0.192)	0.340 (0.222)	-0.014 (0.485)	-0.129 (0.915)	1.056 ** (0.000)	0.472 ** (0.000)	0.864 (0.000)	-0.564 ** (0.000)
d2	1.002 ** (0.432)	-0.172 (0.542)	0.670 (0.503)	-1.632 ** (1.351)	-0.062 (0.000)	0.279 (0.000)	-1.229 (0.000)	2.768 *** (0.000)
d3	-0.020 ** (0.010)	-0.042 *** (0.007)	-0.015 ** (0.010)	-0.039 *** (0.013)	-0.036 *** (0.000)	-0.018 *** (0.000)	-0.030 ** (0.000)	-0.044 ** (0.000)
d4	-0.016 * (0.008)	-0.003 (0.006)	-0.008 (0.008)	-0.006 (0.018)	0.010 (0.000)	0.000 (0.000)	-0.023 (0.000)	-0.013 (0.000)
d5	-0.026 ** (0.010)	-0.021 (0.011)	0.001 (0.011)	-0.058 *** (0.025)	-0.057 *** (0.000)	0.006 (0.000)	-0.014 (0.000)	-0.022 (0.000)
Adj. R2	0.299	0.112	0.275	0.196	0.209	0.257	0.107	0.053
AIC	-220.414	-190.844	-160.774	-230.856	-174.184	-200.276	-199.010	-187.677
DW	1.963	2.238	1.899	2.295	2.233	2.352	1.927	2.440

Note: Standard errors in parentheses. Significance levels: * at 10% level, ** at 5% level, *** at 1% level.

The parameter estimates of inflation in Table 1 are significant only in pairs with Euro, GBP, and KRW. Also, Table 2 has better R-squared estimates and lower Akaike Information Criteria. These may imply that the contribution of the inflation rate to the exchange rate is not dominant. This may signify that causality runs from the exchange rate to price level [19] because of the sterilization policy to maintain the exchange rate [17].

One of the important notes is the values of adjusted R-squared in all models are less than 30%. It means that the monetary model only explains less than 30% of the exchange rate value. This might suggest further research on the exchange rate in Indonesia, or other developing economies in general. Further research may rely on not only the traditional predictors such as interest rates, prices, money, and output differentials but also Taylor Rule fundamentals, external imbalance measures, commodity prices, or other predictors [8]. Moreover, there might be the existence of the Meese and Rogoff puzzle, which states random walk works better than any economic model [20].

V. CONCLUDING REMARKS

The findings suggest the existence of a long-run relationship between exchange rate and other traditional monetary model predictors, such as money, income, interest rate, and inflation. However, predictions using the relationship between the exchange rate and these predictors

may not be exhaustive. Some of the predictors have different behavior and the estimated values of the adjusted R-squared are not quite high. Further researches are necessary to have better prediction using other predictors or more advanced econometric techniques.

REFERENCES

- [1] Afat, D., Gómez-Puig, M., and Sosvilla-Rivero, S. (2015). The Failure of the Monetary Model of Exchange Rate Determination. *Applied Economics*, 47(43), 4607-4629.
- [2] Banerjee, A., Dolado, J., and Mestre, R. (1998). Error-Correction Mechanism Tests for Cointegration in a Single-Equation Framework. *Journal of Time Series Analysis*, 19(3), 267-283.
- [3] Beck, S.E. (1994). The Effect of Budget Deficits on Exchange Rates: Evidence from Five Industrialized Countries. *Journal of Economics and Business*, 46(5), 397-408.
- [4] Chin, L., Habibullah, M.S., and Azali, M. (2009). Tests of Different Monetary Aggregates for the Monetary Models of the Exchange Rate in Five ASEAN Countries. *Applied Economics*, 41(14), 1771-1783.
- [5] Davidson, R., and MacKinnon, J. G. (1993). *Estimation and Inference in Econometrics*. New York: Oxford University Press.
- [6] Dornbusch, R. (1976). Expectations and Exchange Rate Dynamics. *Journal of Political Economy*, 84(6), 1161-1176.
- [7] Engel, C., Mark, N. C., and West, K. D. (2007). Exchange Rate Models Are Not as Bad as You Think. *NBER Macroeconomics Annual*, 22, 381-441.
- [8] Engel, C., Lee, D., Liu, C., Liu, C., and Wu, S. P. Y. (2019). The Uncovered Interest Parity Puzzle, Exchange Rate Forecasting, and Taylor rules. *Journal of International Money and Finance*, 95, 317-331.
- [9] Engle, R. F., and Granger, C. W. (1987). Co-integration and Error Correction: Representation, Estimation, and Testing. *Econometrica: Journal of the Econometric Society*, 55(2), 251-276.

- [10] Frankel, J. A. (1984). Tests of Monetary and Portfolio Balance Models of Exchange Rate Determination. In Bilson, J.F.O., and Marston, R.C. (eds.), *Exchange Rate Theory and Practice*. University of Chicago Press.
- [11] Frankel, J. A., and Rose, A. K. (1995). Empirical research on nominal exchange rates. In Grossman, G.M. and Rogoff, K. (eds), *Handbook of International Economics*, 3. Elsevier.
- [12] Hnatkovska, V., Lahiri, A., Vegh, C.A. (2016). The Exchange Rate Response to Monetary Policy Innovations. *American Economic Journal: Macroeconomics*, 8(2), 137-81.
- [13] Hooper, P., and Morton, J. (1982). Fluctuations in the Dollar: A Model of Nominal and Real Exchange Rate Determination. *Journal of International Money and Finance*, 1, 39-56.
- [14] Hsing, Y. (2016). Comparison of the Fundamental and Monetary Models of the Determinants of the Argentine Peso/US Dollar Exchange Rate. *Economia Internazionale/International Economics*, 69(4), 379-388.
- [15] Hsing, Y. (2017). Comparison of the Fundamental and Monetary Models of the Canadian Dollar/US Dollar Exchange Rate. *International Journal of Economics and Business Research* 2017, 13(1), 22-29.
- [16] Ibhagui, O. W. (2019). Monetary Model of Exchange Rate Determination under Floating and Non-Floating Regimes. *China Finance Review International*, 9(2), 254-283.
- [17] Ito, T., and Sato, K. (2008). Exchange Rate Changes and Inflation in Post-Crisis Asian Economies: Vector Autoregression Analysis of the Exchange Rate Pass-Through. *Journal of Money, Credit and Banking*, 40(7), 1407-1439.
- [18] Kim, S., and Roubini, N. (2008). Twin Deficit or Twin Divergence? Fiscal Policy, Current Account, and Real Exchange Rate in the U.S. *Journal of International Economics*, 74(2), 362-383.
- [19] Makin, A.J. (2005). A Monetary Model of Exchange Rate and Balance of Payment Adjustment. *Economic Issues*, 10(1), 25-36.
- [20] Meese, R. A., and Rogoff, K. (1983). Empirical Exchange Rate Models of the Seventies: Do They Fit Out of Sample? *Journal of International Economics*, 14(1-2), 3-24.
- [21] Melvin, M., Prins, J., and Shand, D. (2013). Forecasting Exchange Rates: an Investor Perspective. In Elliott, G., Granger, C., and Timmermann, A. (eds.), *Handbook of Economic Forecasting*, 2. Elsevier.
- [22] Moosa, I.A., (2006). The Monetary Model of Exchange Rates Revisited. *Applied Financial Economics*, 4(4), 279-287.
- [23] Pelgrin, F., and Schich, S. (2008). International Capital Mobility: What Do National Saving-Investment Dynamics Tell Us? *Journal of International Money and Finance*, 27(3), 331-344.
- [24] Rossi, B. (2013). Exchange Rate Predictability. *Journal of Economic Literature*, 51(4), 1063-1119.
- [25] Stocker, J. (1999). The Government Deficit and the Exchange Rate. *Review of International Economics*, 7(4), 753-763.
- [26] Wongpunya, N. (2015). Empirical Exchange Rate Models of Thailand after 1997. *Southeast Asian Journal of Economics*, 3(2), 91-122.