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Exchange Rate Volatility Determinant in Indonesia and Malaysia

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ABSTRACT: In the case of Indonesia and Malaysia, the positive and significant correlation between real effective exchange rate (REER) and capital and financial account explain that when capital inflows augment to domestic, then REER is more volatile. This result enhances IMF study (2006) show that capital inflow on ASEAN countries is dominated by short-term capital than long-term capital. In addition, the positive and significant correlation between REER and exchange rates regime indicates that when exchange rate regime becomes more flexible, then REER becomes volatile. We can analyze in the shifting of fixed exchange rate and managed floating exchange rate then to floating exchange rate. The negative and significant correlation between REER and interest rate on national currency market in Indonesia indicates this result is appropriate with Frenkel (1981) and Blanchard-Cohen (2007) empirical studies. In the case of Malaysia, this relationship is still significantly positive.

KEYWORDS: real effective exchange rate (REER), current account, financial and capital accounts, interest rate, exchange rate volatility regimes, Southeast Asia.

JEL Classification: E00, F30, O53

I. INTRODUCTION

Various factors contribute to fluctuations in exchange rates, such as economic openness, the supply of domestic currency and foreign currencies, exchange rate regimes, the independence of the Central Bank, the level of output, income, inflation and unforeseen circumstances. The impact of each factor varies and depends on the economic condition of each country. However, after the 1997 crisis, the Southeast Asian countries were more vulnerable to external shocks that correspond to a process of regional economic integration in the form of trade and financial liberalization. In this section, we begin by analyzing the most important factors, namely economic openness, current account, capital flows, interest rates in these countries, and exchange rate regimes. The remaining paper is outlined as follow. In section II, we explain the theoretical approach to analyze exchange rate volatility determinants. We take into account openness economy as a proxy of current account (X_1), capital and financial account as the second independent variable as a proxy of financial liberalization (X_2), interest rate in national currency market as the third independent variable (X_3) and exchange rate regime as the dummy variable (X_4). The period of fixed exchange rate regimes, we justify on two points, the period of managed floating exchange rate regimes, we choose one point, and finally, the period of flexible exchange rate, we justify on the numerical 0. Section III deliberates data and method used. Section IV discusses the results and findings while section V summaries the conclusion.

II. PREVIOUS RESEARCH

In this section, we try to explain openness economic and exchange rate volatility relationship, capital inflow and exchange rate volatility, interest rate on money market and exchange rate volatility, exchange rate regime and exchange rate volatility.

2.1. Economic openness and exchange rate volatility

One of the reasons to establish the European Monetary Union was the desire to promote a more open economy and achieve stability in exchange rates between the countries of the European Union. (Hau, 2002) analyzed the economic openness and its impact on the movement of exchange rates. He finds that trade integration and the exchange rates volatility were correlated and there was a negative relationship between them. Hau uses a small open economy where there has been a tradable and non-tradable sector. It shows that in a more open economy, the aggregate price level is more flexible. This flexibility lowers the effect of unanticipated shocks to the money supply. This result is achieved in a condition where there is low volatility of exchange rates and a more open economy. In his research, Hau has taken samples of 48 countries over a period of 19 years. He took the ratio of

imports to GDP as a proxy of economic openness. The volatility of exchange rates is measured by the standard deviation of percentage changes in real effective exchange rate at an interval of more than 36 months. He found that half of the variation in exchange rates could be explained by the opening of the economy. However, this study does not yet explain precisely which countries, since each is represented by an arithmetic mean value for all periods.

2.2. Capital inflows and exchange rate volatility

According to the (IMF, 2006), during the period 2003 - 2004, 61% of capital flows to Asia were dominated by those received by China, most of the capital under the form of foreign direct investment. The private capital flows to other countries such as South Korea, Malaysia and Thailand accounted for only 5% to 12% of GDP. Other countries such as Indonesia and the Philippines have received little capital because of their weak economic fundamentals and political uncertainties in these countries. These private capitals provide the benefit of liquidity in the recipient countries and reflect the increased integration of the real sectors and financial sectors in the area. Capital markets and financial institutions are developing. Barriers at the exit of capital flows have two dimensions: (i) the fiscal dimension, which involves applying the state tax on private capital outflows to increase revenues; and (ii) the prudential dimension, including obstacles put in place to reduce volatility of exchange rates that could potentially cause a crisis in exchange rates. In fact, in developing countries, countries are open to the input of capital to increase production capacity by means of increased demand for labor and inputs in the foreign direct investment (FDI). However, repatriation of profits of the portfolios in the short-term cause uncertainty. For this reason, capital outflows should be restricted. In general, during the period 1960 - 1989, the barriers to capital outflow could be implemented in developing countries where there was a high proportion of the government expenditure, a low level of international trade, the lack of independence of the Central Bank, and a current account deficit. Per capita GDP is low and countries choose a fixed exchange rate regime.

2.3. Interest rate and exchange rate volatility

Macroeconomics explains so that there is a negative impact of interest rate to exchange rate via current account and capital account. Based on US data, (J.A, 1981) shows in the inflationist period, there is a positive impact of interest rate on exchange rate volatility. Actually, we begin to analyze the link between interest rates and exchange rate volatility on equilibrium financial market. We assume this relation on IS-LM models. We suppose the economic agent chooses liquid currencies and assets. Now, we are considering that the economy is opened. We have a third choice between domestic assets and external assets. When we consider interest rate determinant in IS-LM models, we describe that there is equilibrium between supply of money and demand for money as follows:

$$\frac{M}{P} = YL(i) \qquad (1)$$

We consider supply of money, in the left equation. We suppose that real demand for money in right equation depends on transaction volume of economy which is measured by real product (Y) and opportunity cost to prefer money to assets, is equal to nominal interest rate level (i). In the open economy, demand for domestic currency remains in demand of this domestic population and this demand always depends on the same factors as before. This justifies why we continue to use equation 1 to analyze the determination of interest rate in the open economy. Interest rate must be equal with supply of money or demand for money[1]. When supply of money increases, then interest rate decreases.

In order to consider the choice between foreign assets (bond) and domestic assets, we base our assumption on which investors (both domestic residents and external residents) try to find higher return of capital. This implies that in equilibrium condition, domestic and external obligation must have the same return of capital. If not, these investors mustn't hold any assets, and it is not in equilibrium. This assumption implies that there is an arbitrate relation in accordance with true interest rate parity:

$$i_t = i_t^* + \frac{E_{t+1}^e - E_t}{E_t} \qquad (2)$$

Domestic interest rate i_t must be equal to foreign interest rate i_t* plus level of expectable depreciation of national currency $(E_{t+1}^e - E_t)/E_t$[2]. Since, we consider expectation depreciation rate of national currency in $\overline{E^e}$ symbol. Based on this assumption and excluding temporary index, interest parity rate becomes:

1. Balance in the financial market first condition: supply of money=demand for money (LM).
2. Balance in the financial market second condition: the expected rate of return on foreign bonds and domestic must be equal. Or, equivalently, the domestic interest rate must be the foreign interest rate plus the expected rate of depreciation of the currency.

$$i = i^* + \frac{\overline{E^e} - E}{E} \quad (3)$$

When we modify this equation, we obtain exchange rate actual as a function of exchange rate expectable and domestic interest rate and foreign interest rate:

$$E = \frac{\overline{E^e}}{1 + i - i^*} \quad (4)$$

Equation 4 implies negative correlation between domestic interest rate (i) and exchange rate. Because of exchange rate expectable and foreign interest rate relationship, an increasing of domestic interest rate causes decreasing in real exchange rate, or real appreciation of international reserve. A decreasing of domestic interest rate causes an increasing of real exchange rate. This correlation between exchange rate and interest rate plays an important economic role.

2.4. Exchange rate regimes and exchange rate volatility

The exchange rate regimes affect also exchange rate volatility. The South East Asian countries' experience show in the Asian crisis when exchange rate regimes become free, exchange rates becomes more volatile. In these countries, exchange rate movement from managed exchange rate to the floating exchange rate led to the greater exchange rate volatility in each country. It will be important to determine, when each country implements one of the three choices of exchange rate regime, and in what condition. In this paper, in order to analyze the impact of each independent variable, we consider exchange rate regimes as a dummy variable.

III. DATA AND METHOD

This explanatory research adopted a quantitative approach and utilized data to explain the relationship between independent variables and dependent variable. Furthermore, the research aimed to prove the hypothesis about the impact of factors such as the number of females aged 15 years, the provincial minimum wage, average years of schooling, and economic growth on the LFPR in Central Sulawesi Province between 2016 and 2021. The countries under study are Indonesia and Malaysia. Because of unavailability data of REER, the Indonesian data cover 59 observations from the first quarterly of 1995 to the third quarterly 2009. The interval data for Malaysia starts from the third quarterly of 1996 until the second quarterly of 2009. The real effective exchange rate (REER) is the domestic currency vis-à-vis the foreign currency, the US dollar.

In this study, current account, capital and financial account, interest rate on national money market refers to the CD-ROM International Financial Statistics International Monetary Fund (IFS-IMF) and website of each Central Bank country data and reports of the central banks concerned. The approach used in estimating the relationship between REER and its independent variables (current account, capital-financial account, interest rate on national money market, exchange regimes) is based on (Dickey & Fuller, 1981), Johansen co-integration test, maximum likelihood, regression analysis using ARCH-GARCH models. Since the employed econometric techniques are quite standard, the detail will not be presented in this paper.

The multiple regression model of the volatility of exchange rates of national currencies is measured by using the variance of variable REER in the period 1995Q1 - 2009Q3. The samples are 59 in number. The REER is relatively affected by current account, financial and capital account, the interest rate on national currency market of each country and exchange rate regimes applied. To differentiate between the changes in exchange rate regimes, we use the dummy variable. In the fixed exchange rates regime, while D=2, in the period of managed floating exchange rate regimes, D=1, while in the period of the floating exchange rate regimes, D=0. The form of principle equation is:

$REER_t = A_0 + A_1X_t + A_2KA_t + A_3\Delta KA_t + A_4IRT + \varepsilon_t$ (5)

Where

$REER_t$ = exchange rate volatility of each country currency leads to the variance of REER in year t;

A_0 = intercept (constant), the value $REER_t$ when the independent variables=0;

X_t = current account in year t;

KA_t = financial and capital account in year t;

ΔKA_t = exchange rate regimes;

IRT = the interest rate on the national currency market.

The conditional variance equation is as follows:

$\sigma^2_t = C_0 + \alpha_1\varepsilon^2_{t-1} + \alpha^2\varepsilon_{t-2} + \beta_1\sigma^2_{t-1} + X_1 KA_t + X_2 \Delta KA_t$ (6)

(Azid & Kousar, 2005) applied the method of GARCH (generalized autoregressive conditional heteroscedasticity) to measure the movements of exchange rates and prediction. These choices are based on various reasons such as (i) "autoregressive" describes the mechanism of reactions, which is an observation in the recent past analysis, (ii) "conditional" means the dependence of observations immediately past, and (iii) “heteroscedasticity” is the variance varied over time (volatility). The ARCH model allows the error term to have variance varied over time. This section outlines the foundations of autoregressive conditional heteroscedasticity models (ARCH) and generalized ARCH approach (GARCH). The emphasis is on intuitive economic reasons for using these models rather than the details of the estimation procedures and algorithms. We start with a simple ARCH model and then we construct the generalized ARCH model.

The autoregressive conditional heteroscedasticity model (ARCH) is simple. The basic idea of ARCH is that the variance of the hazard at time t depends on the magnitude of hazards to the square of prior periods. However, there are several ways to model this basic idea, and the relevant literature is quite abundant. Note $\mu_t$time t the hazard associated with any regression model. So original ARCH model can be written:

$$\sigma_t^2 = E\left(\frac{\mu_t^2}{\Omega_t}\right) = \alpha + \gamma_t\mu_{t-1}^2 + \gamma_2\mu_{t-2}^2 + \cdots + \gamma_p\mu_{t-p}^2, \quad (7)$$

Ω_t which means all information, σ_t^2 the variance of μ_t must be conditioned. Typically, this set contains all the information indexed by t-1 and previous periods. This particular model is called ARCH (p). Its resemblance to the AR (p) is striking and justified the name given to these models. We can see from (7) that the conditional variance of μ_t depends on the values of μ_t^2 made in the past. To ensure that the conditional variance is always positive, we must assume that α and all γ_i are not negative. The simple t version of (7) is the process ARCH (1).

Models generalized autoregressive conditional heteroscedasticity (GARCH). Several variants of the ARCH model have been proposed. A variant is particularly useful model generalized ARCH, or GARCH, suggested by (Bollerslev, 1986). The GARCH (p, q) can be written:

$$\sigma_t^2 = \alpha + \sum_{i=1}^{p}\gamma_i\mu_{t-i}^2 + \sum_{j=1}^{q}\delta_j\sigma_{t-j}^2 \quad (8)$$

Where, in a more compact notation,

$$\sigma_t^2 = \alpha + A(L,\gamma)\mu_t^2 + B(L,\delta)\sigma_t^2, \quad (9)$$

Where γ and δ are vectors of parametric standard elements and γ_i et δ_j respectively, and A (L, γ) and B (L, δ) polynomials of the lag operator L. In the GARCH, the conditional variance σ_t^2 depends both on its own past values as lagged values of σ_t^2. In practice, a GARCH model with few parameters is often added as well as an ARCH model with many parameters.

We use the White test for heterocedastity testing. This test is based on a significant relationship between the square residual and one or more variables in level and squared in the same regression equation:

$$e_t^2 = a_1x_{t1} + b_{1t}^2 + a_2x_{2t} + b_2x_{2t}^2 + \ldots + a_kx_{kt} + b_kx_{kt}^2 + a_0 + v_t \quad (10)$$

Let n be the number of observations available to estimate model parameters and the coefficient of determination R^2. If any of these regression coefficients is significantly different from 0, then we accept the hypothesis of heteroscedasticity. We can do this test using either a classical Fisher test of nullity of coefficients:

$$H0 : a_1 = b_1 = a_2 = b_2 = \ldots = a_k = b_k = 0$$

If we reject the null hypothesis, then there is a risk of heteroscedasticity. Or use the LM statistic is distributed as a χ2 with p = 2k degrees of freedom (as much as we think of coefficients except the constant term), if nx R2> χ2 (p) read in the table at the threshold α, we reject the hypothesis of homoscedasticity of the errors. Next, we apply the test for normality of residual.

IV. RESULT AND DISCUSSION

4.1. The determinant analysis of exchange rates volatility and the political economic analysis in Indonesia

The Johansen’s test presents the long run impact of current account, financial and capital account, interest rate on national currency market, and exchange rate regimes on exchange rate volatility (REER). The empirical results show the impact of these variables on REER in the long run. In managed floating exchange rate regime, we couldn’t use Johansen test to measure long run relationship because there is an insufficiency of the observation number. We can apply this test in floating exchange rate regime.

In the managed floating exchange period, we could prove that ARCH (1) is the best method. In addition, effet ARCH test show there is no ARCH effect because Chi-2 probability value (1) is superior at 5% and normality test show that Jarque-Bera value is superior at 5%. In other words, we accept null hypothesis, which explains errors distributed normally. We could write ARCH (1) models for managed floating exchange rate regime as follow:

$Y = 132.9565 - 0.002132X_1 + 0.002653X_2 - 32.52921X_3 + 0.725507_{AR(1)}$

(**19.82**)*** (-1.77) (**8.14**)*** (-**4.28**)*** (**2.43**)***

$\sigma^2_t = 8.255952 + 0.487742\varepsilon^2_{t-1}$

(**2.37**)** (0.89)

R^2=0.89; DW=1.60

In the floating exchange rate period, we also conclude that **ARCH (2)** is the best method due to lower value of AIC and SC criteres. We could write principle and conditional variance equation of ARCH(2) as follows :

$Y = 109.2457 + 0.000821X_1 + 0.000415X_2 - 7.819891X_3 + 0.833542_{AR(1)}$

(**64.41**)*** (**8.09**)*** (**4.16**)*** (**2.12**)** (**59.17**)***

$\sigma^2_t = 7.332120 + 1.681926\varepsilon^2_{t-1} - 0.387741\varepsilon^2_{t-2}$

(**4.10**)*** (**4.39**)*** (-**3.98**)***

R^2=0.85; DW=2.26

These equations indicate that all relationships are significant, high determination coefficient, there is no autocorrelation and we accept null hypothesis, which explains that errors are distributed normally. Meanwhile, we do not analyze financial-capital liberalization to exchange rate volatility (REER), when exchange rate regime becomes free, as a consequence, financial-capital effect become greater, because there are different methods between managed floating exchange rate regime and floating exchange rate regime. In addition, the observation number is not sufficiently to launch co-integration test.

Indonesia implemented fixed exchange rate regime since 1970 to November 1978. Then, since December 1978 until August 13, 1999, Indonesia applied managed floating exchange rate. Since, August 14, 1999, after the Asian crisis, this country implemented floating exchange rate. During several certain periods, especially during the exchange rate fluctuation, Indonesia applied foreign devise sterilization in order to maintain the exchange rate stability. From 1995 until mid-1997, the Indonesian currency market was dominated by short-run foreign capital movement. This phenomenon was relatively affected by the great difference between domestic interest rate and foreign interest rate, by the assets market development, by domestic economic growth and by exchange rate stability.

In order to overcome negative effect of the short-term capital movement, Bank of Indonesia changed four times and spread intervention in the 1992 – 1996, periods. Firstly, on September 16, 1992, Bank of Indonesia extended this spread from Rp6,- to Rp10,-. Then, it was extended from Rp10,- to Rp20,- on January 3, 1994. Thirdly, Bank of Indonesia extended this spread from Rp20,- to Rp30,- on September 5, 1994. Finally, this spread was expanded from Rp30,- to Rp40,- on June 30, 1995 (Arifin, 2004). Although rupiah depreciated to the US dollar at 3.8% during the 1990s, the economic actors always believe the strong macroeconomic fundamentals of Indonesia. The rapid capital inflow stimulates 8.2% depreciation of rupiah vis-à-vis to the others foreign currency at the beginning of 1996. The pressing contagion effect of the Thailand crisis obligated Bank of Indonesia to float exchange rate on August 14, 1997. At this moment, rupiah met uncertainly with greater volatility until 2005.

In this section, we try to explain our analysis. Firstly, we discuss the chronology of the rupiah crisis; secondly, we focus on rupiah stabilization, a decade after the Asian crisis.

a. Chronology of the rupiah crisis

In the macroeconomic context, exchange rate fluctuation is affected by macroeconomic fundamentals. Although, the Indonesian government launched several structural economic programs, according to market actors, they were late because the financial crisis was transformed to an economic crisis and finally to a multidimensional crisis. In the microeconomic, the great pressing of the depreciation after the Asian crisis implicated various structural weakness such as: (i) excess of domestic demand to the foreign currency, which are not covered by domestic financial source, aggravated by the **bandwagon** effect in the buying of foreign devises; (ii) financial market structure that has been segmented and the **hedging** market, which was under-developed. The market segment causes the prices dysfunction; (iii) the domination of the short-term capital movement; (iv) the financial system suffered liquidity excess due to banking dysfunction. In macroeconomic, excess demand to the external money could be indicated by the monetary flow deficit in the trade balance, although annually trade balance of Indonesia always is surplus. As a consequence, step-by-step, exchange rates begin to become vulnerable to the international change when demand excess to the foreign currency is supported by external finance, in which a certain part of these sources are invested on assets, SWAP, or market securities of the Bank of Indonesia. In brief, external finance source is vulnerable to capital sudden stopping or capital flight. We decipher this part in the sub-section of mini-crisis in 2005 (Arifin, 2004).

The sign of the Asian crisis appeared in July 1997 after the Bath Meltdown, with the fall of the Siam economy. Rupiah began to suffer a decrease as the first sign of contagion. The principle factors of this pressing could be briefly analyzed on the demand side and supply side.

On the demand side, we find six factors as follows : *firstly*, the contagion effect of Thailand's monetary crisis involves capital flight to the others regions outside of ASEAN; secondly, the increasing of US dollar demand to pay external debt of private sectors and the increasing of « hedging » speculative on private sectors external debt; *thirdly*, the augmentation of speculative action to the rupiah by the non-residents in domestic and foreign territory correspond to internalization of Indonesian rupiah; *fourthly*, the fall of foreign investors' belief in the future Indonesian economy, especially the capacity of the Indonesian government to face capital movement; *fifthly*, the trend of the US dollar appreciation to overall international currency stimulates market actors to dispose their financial assets on US dollar; s*ixthly*, the appearance of non-economic rumor about the health deterioration of Indonesia's President (Suharto) caused the capital flight hold by the China Diaspora toward Singapore.

On the supply side, this crisis was affected by diminution of international reserve in US$ on the money market due to slowdown of capital inflow and capital flight. In order to prevent this crisis, on July 11, 1997, Bank of Indonesia extended « spread intervention » from 8% to 12%, or in floor price at Rp2.374,- and in the ceiling price at Rp2.678,- per US$ (in nominal value from Rp192,- to Rp304,-). Bank of Indonesia intervened several times on the market by buying US dollars and implemented strict control to augment step-by-step interest rate of the overnight certificate of Bank of Indonesia from 7% to 14%, between July 21-23, 1997. Bank of Indonesia removed itself out of the transaction of assets market since July 24, 1997.

Meanwhile, these various efforts couldn't ensure the market actors. Capital outflowed little by little and speculative pressing augmented. As a consequence, Indonesian rupiah continued to slowdown and by mid August 1997, the rupiah exchange rate on the interbank currency market reached the ceiling limit of intervention. In order to ensure international reserves, on August 14, 1997, Bank of Indonesia decided to remove out "spread of intervention" and let freely exchange rate rupiah on market mechanism. At this occasion, Indonesia passed from managed exchange rate regime to the floating exchange rate. After this floating, the speculative increasing caused an « overshooting phenomenon ». Rupiah fluctuated vis-à-vis US$ since mid July occurred only between Rp2.500,- and Rp3.000,- per US$. On the other hand, SWAP premium augmented from 9% to 30%. This condition is the consequence of selected policy applied by Bank of Indonesia such as monetary control, SWAP, buying limited amount of US$ by domestic banks and non-residents. In addition, financial aid and technical assistance from Bank of Tokyo and Monetary Authority of Singapore were launched on November 5, 1997. This intervention had a positive effect on market actor confidence throughout Indonesian rupiah. In the final of November 1997, rupiah returned to Rp3.200,- per US$. In December 1997, the increasing of US$ demand by private sector in order to reimburse their external debt, the buying of US$ by foreign investors for financial reimbursement toward the final year, and the political rumor and the downward ranking of several Indonesian enterprises had a negative effect on rupiah. In the final December 1997, rupiah exchange rate was being fixed at Rp5.000,- per US$.

In the beginning of 1998, rupiah suffered strong pressing when Suharto's regime recommended policy that was non-realistic with the government budget. This condition was not favorable to Indonesia because, the rumor disperses in Indonesia in which domestic enterprises could not reimburse their external debt and banking sectors would pay this debt in rupiah and international banking demanded their credit reimbursement on national banking. As a consequence, rupiah dropped freely at Rp16.000,- per US$ on January 22, 1998. Indonesian government tried to overcome this crisis by currency board arrangement (CBA). This policy had a favorable effect on rupiah, and it returned to Rp7.000,- per US$ on February 11, 1998. But IMF postponed financial aid to Indonesia in March of 1998 because IMF thought that Indonesia did not totally implement economic reform. This condition implies rupiah depreciation at Rp8.500,-. One year after the exchange rate floating, rupiah depreciated at 70.9% (it was 3.4% before the crisis). In June of 1998, after Suharto's fall, rupiah went down to Rp16.500,- per US$. Yen depreciation at 146Y per US$ also affected the collapse of the rupiah.

The rupiah depreciation continued in 2000 - 2001 with high volatility of average exchange rate at Rp8.400,- per US$, then in December 2000, rupiah exchange rate depreciated to Rp9.675,- per US$. This condition caused great disparity between demand and supply of foreign currency and an increasing of rupiah internalization by non-residents. In order to prevent the rupiah depreciation, on January 12, 2001, Bank of Indonesia published the rule of Bank Indonesia number 3/3/2001, which directed to limit a certain number of commercial banks, rupiah transactions and foreign currency credit. In 2001, rupiah depreciated in mid-year at 17.7% from Rp8.438,- to Rp10.255,- per US$. This depreciation was aggravated by an increasing of the country-risk ranking by international agency such as Political & Economic Risk Consultancy (PERC): the Indonesia risk augmented from 7.3 to 7.6 several months before extraordinary meeting of National Assembly to impeach President KH. Abdurrahman Wahid. Although domestic political condition was improved, in contrast, public debt became a charge in government budget and inflation level rapidly augmented.

In 2002, rupiah was appreciated through 2001 from Rp10.400,- per US$ to Rp8.950,- per US$. This is the highest appreciation in South East Asia at this moment. Due to Bali I bomb on October 12, 2002, rupiah depreciated to before and maintained at Rp9.000,- per US$. The reinforcement of rupiah was affected by balance of payments surplus, the downturn of balance capital deficit and augmentation of current account surplus. The factors that stimulated rupiah appreciation, an advance of restructuration program, which include: rescheduling external debt, debt liquidation to credit IMF and privatization of public enterprises. The rupiah appreciation augmented at 6.3% in 2003 from Rp8.950,- per US$ to Rp8.420,- per US$. The rupiah stabilization during this period was possible due to diminution of the risk-country, an improvement of external debt ranking of Indonesia according to international agency, and due to diminution of the SWAP premium and disparity diminution between « Yield Yankee Bond » of Indonesia and « *US Treasury Note* ». The rupiah depreciation reached the nadir point in May 2004 (Rp9.440,- per US$) and was caused by the *bandwagon effect* of the short-term capital. This depreciation caused economic actors to augment their foreign currency hoarding on the spot market in order to anticipate the weakness of rupiah. This anticipative action on the spot market is one of the under development of hedging market in Indonesia. Political instability at the moment of legislative election and the direct president election in August and September 2004, and the bomb explosion in front of the Australian embassy in September 2004 also affect this depreciation. After this event, rupiah remained at Rp8.965,- per US$ in December 2004.

After rupiah stabilization in 2004, rupiah redepreciated at Rp10.218,- per US$ in September 2005. This phenomenon was caused by balance of payment deficit which fell to only US$0.4 million due to an increasing in world petroleum prices (West Texas Intermediate) about 36.5% until US$56.6 per barrel in 2005, and due to strong monetary policy implemented by US government, especially interest rate from 2.25%, in the beginning of the year to 4.25% in the end of the year. This increasing stimulates US dollar appreciation vis-à-vis yen and euro caused the slowdown of South East Asian currencies. However, this condition temporarily implied portfolio flight before yuan reevaluation about 2.1% in July 2005. Nevertheless, in domestic, an increasing of import and an increasing of US dollars are in demand by private enterprises to reimburse external debt. This appeared to press rupiah. As a consequence, this condition involved an increasing of inflation, liquidity excess on the financial market and capital flight. In order to overcome this problem, especially liquidity excess in national currency, Bank of Indonesia tried to implement classical monetary policy such as an increasing of interest rate (Bank Indonesia rate), open market operation, an increasing of coefficient in reserve requirement, and sterilization of assets in foreign currencies. This monetary policy was supported by various other measures such as return of international reserves from export, margin trading prohibitive on the rupiah vis-à-vis to the foreign currencies, and control of capital movement. In fiscal policy, in order to support this monetary policy, the Indonesian government augmented the petroleum premium prices step-by-step. As a consequence, since September 2005, rupiah stabilized toward Rp9.831,- per US$ in December 2005. At the same occasion, there was the buying down of foreign currency and an increasing to capital inflow. Why wasn't an economic instability crisis caused like in July of 1997? In 2005, the Indonesian macroeconomic fundamentals were stronger than in 1997. Debt service ratio diminished, from 44.5% in 1997 to 18.4% in 2005, and debt ratio to GDP descended from 60.3% to 47.2% in 2005; import to international reserve ratio represents 4.4 months of import in 2005. This condition was a consequence of IMF's debt reimbursement acceleration launched by Habibie's government (the fourth former Indonesian President, although, he only holds this mandate nine months).

b. The rupiah stabilization: a decade after crisis

After economic turbulence which occurred over the course of a decade (1997 - 2007), rupiah rate stabilized in 2006 - 2007, and rupiah exchange rate volatility trend to diminish from 4.9% in 2005 and 3.9% in 2006 to 1.4% in 2007. At this moment, Joedoyono-Kalla government (selected in the first direct election for the five years period of 2004 - 2009) implemented inflation targeting policy and fiscal policy, which included augmenting petroleum premium prices (reduction in petroleum subvention or petroleum grant-in-aid) in 2007 and in 2008 in order to anticipate an increasing of world crude oil. Rupiah appreciated at an average level of Rp8.838,- per US$ in May 2007. This appreciation was justified by an increasing of portfolio investment by current account surplus of US$11billion, by the lower inflation at 6.59% and by an increase in international reserves at 56.9 billion in 2007 (42.6 billion in 2006). In the second semester of 2007, rupiah met with depreciation due to global risk of subprime mortgage in the United States. The uncertainty in American affected international investors who retired their high-risk assets in the financial market, including in the emergent countries. This condition implied capital reversal on the market. As a consequence, this condition caused rupiah depreciation. In addition, the increase of crude oil prices due to rupiah fluctuation terminated by rupiah stabilization in late 2007 at Rp9.393 per US$.

In July 2006, the government promoted the rule of law to simplify bureaucratic procedures such as: investment procedure permit from 150 days to only 30 days, diminution on private enterprises tax from 30% to 27% and then to 25% in 2010; simplification of custom duties, modernization of working condition, the job division of administrative responsibility between central and local government. Nevertheless, the Indonesian economy always suffered political and social instability, endemic

corruption, technical and bureaucratic failure, and bad infrastructure. For example, Tanjung Priok seaport in Jakarta was the highest charged compared with Singapore and Portklang in Malaysia in South East Asia. Indonesia must simplify its comparative advantage in external trade and modernize their petroleum sectors, agriculture and manufacturing industries to be competitive as an engine of growth, and also Indonesia must continue its banking reform.

4.2. Exchange rate volatility determinants and the political economic analysis in Malaysia

The stationary test indicates that during the fixed exchange rate regimes (1998Q1 - 2005Q2) and floating exchange rate (2005Q3 - 2009Q2), there is a short-term relationship between REER and its determinant in Malaysia at the first difference (I=1) and for the probability α=1% and α=5%.

The Johansen's test presents long run impact of independent variables on REER volatility in Malaysia during the fixed exchange rate regimes (1998Q1 - 2005Q2). Based on trace test, there is a co-integration relationship in which trace statistics are superior at 5% critical value (73.10747>47.85613) and for the probability value at p=1%. Maximum Eigen Value also indicates a co-integration relationship in which Maximum Eigen Value Statistics is superior at 95% critical values (44.42911>27.58434) and for the probability value at p=1%.

The Johansen's test presents also long run impact of independent variables on REER volatility in Malaysia during the floating exchange rate regimes (2005Q3 - 2009Q2). Based on trace test, there are two co-intégration relationships in which trace statistics are superior at 95% critical values (61.54252>47.86513 and 30.07990>29.79707) and for the probability value at p=5%. Maximum Eigen Value also indicates a co-integration relationship in which Maximum Eigen Value Statistics is superior at 95% critical values (31.46262>27.58434) and for the probability value at p=5%. Then, there is a long-term relationship between REER and its determinant variables in Malaysia.

We could conclude during the fixed exchange rate regimes, among nine methods, **ARCH (2)** is the best. We can write this model as follows:

$$Y = 106.2905 - 0.001015X_1 + 0.000007X_2 + 63.51967X_3 + 0.776554_{AR(1)}$$
(**70.08**)*** (**-14.91**)*** (**2.56**)** (1.60) (**39.24**)***

$$\sigma^2_t = 5.726375 - 0.330847\varepsilon^2_{t-1} - 0.276264\ \varepsilon^2_{t-2}$$
(**4.04**)*** (**-3.22**)*** (**-2.55**)**

R^2=0.85; DW=1.85

The first equation indicates a negative and significant relationship between REER and current account, and a positive and significant relationship between REER and financial and capital account. There is no relationship between REER and interest rate on the money market of Malaysia. The second equation explains that the relationship between the residual variance in the actual date and the residual t-1, and the relation between the residual variance in the actual date and the residual variance t-2 are of negative significance at the p 1%.

In the floating exchange rate regimes, we can confirm that among nine methods tested, **GARCH (2,1)** is the best model, because all variables in the principle equation are positive and significant at the critical level p=1%, and AIC and SC values are lowest. R^2 value is (0.55), which means that 55% of REER fluctuation are determined by current account, financial and capital account and interest rate on Malaysian currency market. The DW value is 2.10, which means there is no autocorrelation.

We could write principle equation and conditional variance equation of the GARCH (2.1) models as follow:

$$Y = 94.21 + 0.0008X1 + 0.000085X2 + 180X3 + \varepsilon$$
(**63.77**)***(**8.47**)*** (**2.49**)** (**7.51**)***

$$\sigma^2_t = 0.74 + 0.13\varepsilon^2_{t-1} - 0.45\varepsilon^2_{t-2} + 1.05\ \sigma^2_{t-1}$$
(**3.67**)*** (0.32) (-0.82) (**3.06**)***

R^2=0.55; DW=2.10

The conditional variance equation indicates there is no significance relationship between residual variance actual (σ^2_t) and the residual variance in the past (t-1) (ε^2_{t-1}), and between the residual variance actual (σ^2_t) and the residual variance in time t-2 (ε^2_{t-2}). On the contrary, there is a negative and significant relationship between the residual variance actual (σ^2_t) and the residual variance in time t-1 (σ^2_{t-1}=GARCH(-1)). The heteroscedasticity test shows there is no ARCH effect because p value is superior at 5% (0.61). In addition, normality test of residuals indicates that we accept null hypothesis in which errors are normally distributed because p value is superior at 5% (0.79).

However, we do not analyze financial and capital effect to REER. Capital inflow step-by-step is greater than before, when exchange rate regimes become freely, because there relatively is a difference between the best method in the fixed exchange rate regimes.

In order to prevent ringgit depreciation in the Asian crisis, the Malaysian government implemented five political economic plan as follows : ***Firstly***, fixed exchange rate policy since third quarterly of 1998 until the second quarterly of 2005. Before the Asian crisis, the ringgit exchange rate was 2.52 per US$1,-, in the second quarterly of 1998, this exchange rate freely diminished at 4.17 ringgits per US$1. This policy induces IMF and World Bank concern. On the other hand, Paul R. Krugman sent a private letter to ex-former Malaysian Prime Minister, Mahathir Muhammad who explained the Malaysian policy should destroy the Asian market. But, Malaysia always remained and applied their fixed exchange rate during seven years (1998 - 2005) at 3.8 ringgit per US$1. At the same time, Central Bank of Malaysia (Bank Negara Malaysia) did not permit ringgit to be traded both in Malaysia and in foreign markets especially in Singapore. This policy succeeded to prevent the ringgit speculation and ensure the Malaysian capacity to reimburse their external debt.

Secondly, in order to improve world demand, Malaysia diminished their interest rate during three months from 9.5% to 8%, and it also diminished their liquid assets from 17% to 15% through their total commitments. In addition, Malaysia decreased their reserves requirement level in order to augment their liquidity. Malaysian government also diminished their interest rate in order to stimulate credit expansion and in order to improve investment and consumption.

Thirdly, Malaysia augmented their public expenditure in order to stimulate economy recovery.

Fourthly, in order to improve the microeconomic sectors, Malaysian government implemented financial restructuration policy and banking recapitalization, and created an institution to manage this policy called « **Danamodal** ». The Malaysian government avoided banking liquidation and at the same moment, Indonesian government followed IMF's proposal to liquidate 16 private banks, which caused a rush to the other best private banks of Indonesia. In addition, the Malaysian government implemented blanket guaranty to the banking clients and tried to overcome credit non reimbursement due to the Asian crisis, and created an institution to manage these assets called « **Danaharta** ». This policy could maintain community confidence to the banking system. In order to solve private debts problems, Malaysian government created a commission to restructure private debts.

Fifthly, the Malaysian government also implemented control of capital movement especially to the capital outflow in short-term hold by non-Malaysian residents and Malaysian, included domestic enterprises. In order to stop over the ringgit internalization and to control speculation, Malaysian government applied to return the country all revenue from buying of assets on ringgit in foreign and from export revenue. In order to diminish capital flight, the Malaysian government did not permit the foreign investor to send their revenue during a year to their home country. In order to minimize capital control effect through foreign direct investment (FDI), the Malaysian of Central Bank (Bank Negara Malaysia) permitted to allocate return of profit and dividends in origin from FDI and permitted to do foreign currency transaction at the current account level. In fact, these political combinations such as interest rate policy, fiscal policy, and banking restructuration policy are the Keynesian thinking implemented in the United States in 1929 - 1934, in order to terminate the Great Depression. These various measurements of economic policy could be implemented in Malaysia. In contrast, IMF avoided these political combinations in other Asian countries like Indonesia, South Korea and Thailand. Several economists thought that Malaysia could very rapidly recovery from the Asian crisis thanks to FDI and an increasing of consumption. The Malaysian government succeeded without IMF intervention. They believe in their self-capacity.

V. SUMMARIES AND CONCLUSIONS

After analyzing the determinants of the volatility of exchange rates in the two countries of South East Asia, we concluded the following regarding Indonesia: in the period of managed floating rate regime in Indonesia, the relationship is significantly positive between REER and capital-financial account. This means, as more capital inflows increase, the REER is more volatile. The relationship between REER and the interest rate on money market is negative. However, in the period of floating exchange rate regime, the relationship between REER and current account is significantly positive. This means that when economy is more open, the REER is more volatile. While the relationship between REER and the interest rate is still significantly positive. In the period of fixed exchange rate in Malaysia, the relationship between REER and the current account is negatively significant. However, the relationship between REER and capital-financial account is significantly positive. This means when there is an increasing of capital inflows, REER will be volatile. The relationship between REER and the interest rate is significantly positive. In the period of floating exchange rate regime, the relationship between REER and its three determinants is significantly positive.

Exchange Rate Volatility Determinant in Indonesia and Malaysia

Except for Malaysia, the transition from managed floating exchange rates regime to floating exchange rates regime leads to higher current account. This means the more the exchange rate is free, the more open the economy can be and more trade integrated. The passage of managed floating exchange rate to floating exchange rate regime lead to increased capital inflows. This is a consequence of capital liberalization since the 1990s in Southeast Asia.

Various reforms have been implemented by Southeast Asia: (i) reform of the banking sector to strengthen the regulation; (ii) reform to strengthen the precautionary principle; (iii) reform to reduce the moral hazard; (iv) reform to enact liberalizing the capital account; and (v) reform to strengthen the governance of financial institutions.

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