# Financial Integration and Real Exchange Rate Volatility: Evidence from South and South East Asia

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**Abstract**

Real exchange rate fluctuations take a central place in the discussions over the choices of economic policies in developing economies. It is essentially the dependence with respect to imports and the specialization in exports that account for real exchange rate fluctuations on the economic performances of developing countries. The accessibility to the world financial market also plays an important role in helping to smooth out consumption in financing trade balance disequilibrium.

Identifying the sources of real exchange rate fluctuations enables one to measure, on the one hand, the consequences of economic policies implemented by the government on the real exchange rates, and on the other, the room policy makers have at their disposal to deal with possible real exchange rate movements harmful to economic activity. In this perspective, we address in the paper the main question: does financial liberalization contribute to real exchange rate fluctuations in South and South East Asia?

Our study suggests that openness helps to reduce real exchange rate fluctuations but financial integration increases real exchange rate volatility. We encourage the countries of South and South East Asia to improve the flexibility of their exchange system and to pursue the sequential liberalization policy.

**Keywords:** Real Exchange Rate, Volatility, International Financial Integration, GMM, South and South East Asia

## 1. Introduction

Understanding the impact of financial integration on macroeconomic volatility in general and the exchange rate in particular, remains a major challenge for the theoretical and empirical studies. In theory, financial integration could help to lower macroeconomic volatility in developing countries as it provides access to foreign capital which can help to diversify production capacity that is affected by a stability of the exchange rate.

The impact of the increase in financial flows on the volatility of the exchange rate depends on several factors, including the composition of these flows, and the quality of the economic structures, particularly the financial system. For example, the financial liberalization in a less developed financial system can lead to an increase in volatility.

International financial integration must, in theory, help the developing countries to reduce macroeconomic volatility. But the empirical studies suggest that the developing countries did not reach the potential advantages of a financial liberalization. The process of liberalization of capital account was often accompanied by an increased vulnerability with crisis. Globalization raised the risks since the interconnection between financial markets, may amplify the real and financial shock effects.

Independent of the effects on volatility of production, theory suggests that financial integration should reduce

exchange rate volatility. Reduction of exchange rate fluctuations is considered as a determinant of economic welfare. Access to the international markets provides better opportunities for countries to share macroeconomic risks and, in this way, to reduce uncertainty.

The empirical studies on the effects of globalization on exchange rate volatility remain vague. In particular, evidence on the effects of financial integration on volatility is limited and non-conclusive. Moreover, the existing literature is devoted, to a great part, to analyzing the effects of financial integration on consumption volatility with little interest to exchange rate volatility. This work now provides some new evidences on the subject. We investigate the link between capital controls (international payments restrictions) and currency stability for a sample of countries of South and South East Asia.

The analysis of the factors affecting exchange rate volatility is based on a panel of 10 economies (Note 1) for the period 1979 - 2004. Volatility is related to macroeconomic fundamentals—most notably, real GDP growth, government consumption (in percent of GDP), domestic investment, money and trade openness (measured by the sum of exports and imports relative to GDP). Controlling for the effect of these macroeconomic variables, we examine the effect of financial liberalization on the real exchange rate volatility. Volatility is computed as the standard deviation of the logarithm of the quarterly real exchange rate. We use the GMM system estimator in panel dynamic (Blundell, M. and Bond, S., 1998), as estimation technique.

The goal of the present paper is twofold: First, posit a structural relationship between real exchange rate (RER) volatility and the volatility of RER fundamentals. Second, test the following hypotheses: (i) RER fluctuations are less volatile in more integrated economies, and (ii) financial liberalization helps attenuate RER fluctuations in South and Southeast Asia.

**2. Financial Liberalization and Real Exchange Rate Volatility**

A large literature on the appropriate sequencing of financial liberalization suggests that early lifting of controls on the capital account may destabilize the economy. McKinnon (1973, 1993), for example, maintains that decontrol of the capital account should come at the end of the reform sequence, following domestic financial liberalization, bank reform, and trade liberalization. In particular, McKinnon argues that a rapid inflow of (official or private) capital will cause real appreciation of the exchange rate, making it difficult for domestic tradable producers “to adjust to the removal of protection” (1993, p. 117). Thus, “ a big injection of capital at the time the liberalization increases imports while it decreases exports and throws out the wrong long-run price signals in private markets” (*ibid.*).

Capital controls may also have a destabilizing effect. Restrictions on the international capital account may in fact lead to a net capital outflow and precipitate increased financial instability. Dooley and Isard (1980) point out that controls preventing investors from withdrawing capital from a country act like a form of investment irreversibility: by making it more difficult to get capital out in the future. Controls may make investors less willing to invest in a country. Following this reasoning, Bartolini and Drazen (1997a, b) show that imposing capital controls can send a signal of inconsistent and poorly designed future government policies.

Capital controls may also be ineffective and result in distortions. Edwards et al.(1999), for an example, argue that legal capital restrictions frequently prove ineffective, and are easily sidestepped by domestic and foreign residents and firms. They document how capital controls may lead to economic distortions and government corruption that in turn contribute to economic instability.

The theoretical impact of the increase in financial flows on the volatility of the rate of exchange depends on several factors, including the composition of these flows, specialization, and the quality of the economic structures, particularly the financial system. For example, if the financial opening is associated with a little developed financial system, this could lead to an increase in volatility.

In the literature, we notice a convergence of the research results on the effect of capital liberalization on the growth (Eichengreen 2001). Studies that concentrate on the liberalization of the stock and shares market find positive effect of liberalization (Bekaert, Harvey and Lundblad (2001, 2004), Romer (1993)). In addition, they discover that the international liberalization is often associated to less inflation that in turn can reduce exchange rate volatility.

International financial integration must, in theory, help the developing countries to reduce macroeconomic volatility. The empirical studies suggest that developing countries, in particular, did not reach the potential advantages of a financial liberalization. The process of liberalization of the capital account was often accompanied by an increased vulnerability to crisis.

The International Monetary Fund in its 2002 report provides evidences indicating that in developing countries, the financial openness is associated with a less macroeconomic volatility. However, Bekaert, Harvey, and Lundblad (2002) confirm in particular that capital account liberalization increases the volatility of production and the volatility

of consumption in the emerging countries.

A more conclusive econometric study is presented by Kose, Prasad, and Terrones (2003a) that used measurements of restrictions of the capital account rather than rough financial flows in order to show the different aspects of financial integration. This analysis confirms the increase of the relative volatility of consumption for the countries having more significant financial flows. However, the authors also identify that more financial integration considerably reduces volatility. O' Donnell (2001) examines the effect of financial integration on the volatility of output growth over the period 1971-94 for 93 countries. He finds that a high financial level of integration is associated with lower volatility. These results also suggest that a higher level of financial development favor a fall in output volatilities through financial integration. In particular, Bekaert, Harvey, and Lundblad (2002) find that the capital account liberalization reduces production and consumption volatility.

Certain older empirical work finds mitigated and non-conclusive results concerning the effect of the financial openness on macroeconomic volatility. Easterly, Islam and Stiglitz (2000) working on a sample of 74 countries over the period 1960-97, conclude that neither the financial opening nor the volatility of flows of capital has a significant impact on macroeconomic volatility. However, they show that a higher level of development of the financial sector reduced the volatility of the growth. On the other hand, an increase in the degree of commercial opening generates an increase in the volatility of production, especially in the developing countries. Their results indicate that neither the financial opening nor the volatility of capital flows have any considerable impact on the volatility of production. On the other hand, Buch, Dopke, and Pierdzioch (2002) do not find a logical empirical relationship between financial openness and real exchange rate fluctuation. Gavin and Hausmann (1996) studied the sources of output volatility in developing countries over the period 1970-92 and they do not find any significant positive correlation between capital flows and output volatility.

Independent of the effects on output volatility, the theory suggests that financial integration should reduce the volatility of the exchange rate. The capacity to reduce the fluctuations in the exchange rate is regarded as a determining factor of the economic welfare. In addition, access to the international money markets provides better opportunities for the countries to share the macroeconomic risks and by way, to reduce uncertainty.

In a sufficiently general model, Obstfeld (1984) tried to cover the two extreme cases of closed capital account and free mobility of private capital. It stipulates that the liberalization of the capital account is generally accompanied by an initial period of real appreciation. Indeed, in the short run, an increase in the stock of net foreign assets increases demand for non-tradable and thus to an appreciation of the real exchange rates. Otherwise, he suggests that the suppression of constraints on the capital account can contribute to a real appreciation and an external deficit.

Dornbusch, Goldfajn and Valdés (1995) suggest that independent of exchange regimes; financial integration can make countries vulnerable to the external shocks. But according to Calvo et al. (2000), the effect of financial liberalization on economic fragility can be reduced by a more flexible exchange system. Indeed, the rise in the exchange rate volatility can be compensated in the financial markets by a strong capital mobility that helps to absorb external shocks. However, it cannot be a guarantee against the prolonged misalignments in exchange rates resulting from bad resource allocation and macro-economic instability.

Frankel (1996) studied the effect of tax on the exchange transactions. He showed how capital controls can reduce the effect of speculators' behaviour on exchange rates. Frequent monetary crisis in the emergent markets, caused by an increased volatile flow of capital, highlights the imperfections of the international financial liberalization. Multiplication of crisis in the emergent countries confirms risks of an immediate and unconditional financial liberalization. In this context, restrictions on capital movements may be necessary to reduce the real exchange rate volatility.

De Gregorio,, Eichengreen, Ito and Wyplosz (2000) support that the control of capital account in the short-term is the best way for the harmful effects of capital movements. Indeed, long run capital flows, in particular the FDI, are generally advantageous. Whereas short run flows involve instability and more vulnerability to financial crisis. Ferrari (2000) notes that an important increase in capital movement combined with floating exchange rate is generally accompanied by a strong short-term volatility.

Corden (2002) underlines: «...Inevitably, when there is a boom, there will be real appreciation irrespective of whether the exchange rate is fixed or flexible… There is little reason why a boom that is based on, or at least ends, in euphoria should not go on its merry way under a currency board or a floating regime as much as under a fixed-but-adjustable-regime. For avoiding the adverse effect of a boom, exchange controls or taxes that discourage excessive short-term borrowing matter».

Krugman and Obstfeld (2003) showed that globalization and liberalized capital lead to exchange rate fluctuations. Hau (2002) finds an optimistic result according to which real exchange rate is less volatile for the most open

countries (financial and commercial openness). The study was carried out on the 23 OECD countries for the period 1980 - 1998. Calderon (2003) evaluated the determinants of real exchange rate volatility for 21 industrialized countries. He showed that trade openness is likely to affect the RER volatility. Calderon (2004 b) studied the effect of the financial and commercial opening on the RER volatility for a panel of industrialized and emergent countries over the period 1974-2003. Using the recent dynamic GMM technique, the author found a positive effect of liberalization on the reduction of the RER volatility. However, Edwards and Rigobon (2005) studied the case of Chile for 1990s and showed that the capital controls decrease exchange rate vulnerability to external shocks.

From the above discussion, it appears that the findings of empirical studies on the effects of globalization including financial integrations on exchange rate volatility are rather vague and non-conclusive for the developing countries. Moreover, the existing literature is devoted in a great part to analyzing the effects of financial integration on consumption volatility, with little interest in exchange rate volatility.

## 3. Data and Methodology

In the present section, we describe the data used for our empirical evaluation of real exchange rate volatility and we present the econometric technique used.

### *3.1The Data*

We have gathered annual data on real exchange rates and fundamentals such as real output, money, terms of trade, government spending, domestic investment, openness and International Financial Integration for a sample of 10 countries of South and South East Asia such as Bangladesh, China, India, Indonesia, Korea Rep, Malaysia, Pakistan, Philippines, Sri Lanka and Thailand. We use annual observations over the 1975-2004 period.

The variables are defined as follows (Note 2):

Dependent Variable:

Real exchange rate volatility is calculated as standard deviation of the effective real exchange rate over a five-year period.

We define at the beginning, the RER as: $\frac{P}{EP^*}$, where

P= Domestic price index, expressed by the consumer price index (as it has an important weight of non-exchangeable goods)

$P^*$ = Foreign price index, expressed by the consumer price index of the U.S. (as it has an important weight of exchangeable goods).

E= Nominal exchange rate, defined a proxy as the average price of dollar in local currency. An increase (decrease) of the RER means a real appreciation (depreciation) of the relevant currency.

We use annual data to construct the real effective exchange rate index for country i at period t, $TCREF_{it}$, as the nominal exchange rate index multiplied by the relative price of the rest of the world (in U.S. dollars) to the domestic price index,

$$TCREF_{it} = \frac{\frac{P_{it}}{P_{i0}}}{\left(\frac{E_{it}}{E_{i0}}\right)\prod_{k=1}^{n}\left[\frac{P_{kt}^*}{P_{k0}^*}\frac{E_{k0}}{E_{kt}}\right]^{w_k}}$$ , where,

(1) $E_{it}$ and $P_{it}$ are nominal exchange rate and consumer price index respectively of the country i, in period t,

(2) $E_{kt}$ and $P_{kt}$ are nominal exchange rate and consumer price index respectively of k-commercial partners, in period t. Price level at time 0 represents the base period of our index numbers, and

(3) $W_k$, the weights, are computed as the ratio of the bilateral trade flows of country i to the trade-flows of its main commercial partners.

Explanatory Variables:

(1) The volatility of growth rate as the standard deviation of the GDP growth rate.

(2) The volatility of government consumption as the standard deviation of the change of the government expenditures. The data are from WDI CDROM (2006).

(3) The volatility of domestic investment (ID), as the standard deviation of the change of the ID. The data are from WDI (2006).

(4) The volatility of money is the standard deviation of the growth rate of the monetary base. The data are from the base of the IMF CDROM (2006).

(5) The volatility of the terms of trade (TT) as the standard deviation of the TT changes. The data are from WDI (2006).

(6) The trade openness as the ratio of total imports and exports on the total domestic expenditure.

(7) International Financial Integration (IFI), (from Lane and Milesi-Ferretti (2006) database). We consider three indicators to measure IFI. The ratio of total engagements and asset on GDP (IFI), the net foreign credit position is considered as an alternate indicator of the IFI (measured by the difference between the total of the assets and engagement (in absolute value)) and finally a political measurement (measured by capital account liberalization (CC) using the Aguirre and Caldéron (2005) data source).

(8) Exchange rate regimes are from Levi-Yeyati and Sturzenegger (2005).

We regress the RER volatility on the primary determinants (output growth, inflation, deficit) and openness (trade and financial).

*3.2 The Model*

Our baseline regression equation is:

$$Y_{it}=\mu_{it}+X_{it}\beta+F_{it}\gamma+Z_{it}\delta+\varepsilon_{it} \quad (1)$$

where, Y*it* represents the RER volatility, *Xit* is the vector of fundamental volatility —which comprises the standard deviation of shocks to real output, domestic investment, government consumption, money, and terms of trade—*Fit* is the measures of financial integration, while *Zit* represents the matrix of control variables such as trade openness and dummies for the fixed and intermediate exchange rate regimes.

*3.3 Estimation Technique* (Note 3)

The proposed panel data regression poses some challenges for estimation. The first is the presence of unobserved period and country specific effects. While the inclusion of period specific dummy variables can account for the time effects, the common methods to deal with country- specific effects ("within" or "difference" estimators) are inappropriate given the dynamic nature of the regression. The second challenge is that most explanatory variables are likely to be jointly endogenous with economic growth, and, thus, we need to control for the biases resulting from simultaneous or reverse causation. In the following paragraphs, we outline the econometric methodology that we use to control for country specific effects and joint endogeneity in a dynamic model of panel data.

We use the Generalized Method of Moments (GMM) Estimator developed for dynamic models of panel data that were introduced by Holtz- Eakin, Newey and Rosen (1988), Arellano and Bond (1991), and Arellano and Bover (1995). Taking advantage of the data's panel nature, these estimators are based on, first, differencing regressions and/ or instruments to control unobserved effects, and, second, using previous observations of explanatory and lagged dependent variables as instruments, called "internal" instruments.

After accounting for time specific effects and including the output gap in the set of explanatory variables *X*, We rewrite the equation (1) as follows,

$$Y_{it}=\alpha Y_{i,t-1}+\beta' X_{it}+\eta_i+\varepsilon_{it} \quad (2)$$

In order to eliminate the country- specific effect, we take first- differences of equation (2),

$$(Y_{it}-Y_{i,t-1})=\alpha(Y_{i,t-1}-Y_{i,t-2})+\beta(X_{it}-X_{i,t-1})+(\varepsilon_{it}-\varepsilon_{i,t-1}) \quad (3)$$

The use of instruments is required to deal with the likely endogeneity of the explanatory variables and the problem that, by construction, the new error term, $(e_{it}-e_{it-1})$, is correlated with the lagged dependent variable,

$(y_{i,t-1}-y_{i,t-2})$.

Taking advantage of the panel nature of the data set, the instruments consist of previous observations of the explanatory and lagged dependent variables. As it relies on past values as instruments, this method only allows current and future values of the explanatory variables to be affected by the error term. Therefore, while relaxing the common assumption of strict exogeneity, our instrumental- variable method does not allow the *X variables* to be fully endogenous.

Under the assumptions that (a) the error term, ε, is not serially correlated, and (b) the explanatory variables, *X*, are

weakly exogenous ( i. e., the explanatory variables are assumed to be uncorrelated with future realizations of the error term), the GMM Dynamic panel estimator uses the following moment conditions.

$$E\left[Y_{i,t-s} \quad . \quad (\varepsilon_{i,t} - \varepsilon_{i,t-1})\right] = 0 \qquad \text{for} \quad s \geq 2 \;; t = s.....t \tag{4}$$

$$E\left[X_{i,t-s} \quad . \quad (\varepsilon_{i,t} - \varepsilon_{i,t-1})\right] = 0 \qquad \text{for } s \geq 2 \;; t = s.....t \tag{5}$$

The GMM estimator based on these conditions is known as the *difference* estimator. Notwithstanding its advantages with respect to simpler panel data estimators, there are important statistical shortcomings with the difference estimator. Alonso- Borrego and Arellano (1999) and Blundell and Bond (1998) show that when the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences. Instrument weakness influences the asymptotic and small sample performance of the difference estimator. Asymptotically, the variance of the coefficients rises in small samples. In addition, the Monte Carlo experiments show that the weakness of the instruments can produce biased coefficients.

To reduce the potential biases and imprecision associated with the usual difference estimator, we use a new estimator that combines in a system the regression in differences with the regression in levels (developed in Arellano and Bover (1995) and Blundell and Bond (1998). The instruments for the regression in differences are the same as above. The instruments for the regression in levels are the lagged differences of the corresponding variables. These are appropriate instruments under the following additional assumptions: although there may be correlation between the levels of the right- hand side variables and the country- specific effect in equation (3), there is no correlation between the differences of these variables and the country specific effects. This assumption results from the following stationarity property,

$$E\left[Y_{i,t+p} \quad . \quad \eta_i\right] = E\left[Y_{i,t+q} \quad . \quad \eta_i\right] \tag{6}$$

$$E\left[X_{i,t+p} \quad . \quad \eta_i\right] = E\left[X_{i,t+q} \quad . \quad \eta_i\right]$$

The additional moment conditions for the second part of the system (the regression in levels) are (Note 4):

$$E\left[(Y_{i,t-1} - Y_{i,t-2}).(\eta_i + \varepsilon_{i,t})\right] = 0 \tag{7}$$

$$E\left[(X_{i,t-1} - X_{i,t-2}).(\eta_i + \varepsilon_{i,t})\right] = 0 \tag{8}$$

Thus, we use the moment conditions presented in equations (4), (5), (7), and (8) and employ a GMM procedure to generate consistent and efficient parameter estimates.

We employ a Generalized Method of Moments (GMM) procedure to generate consistent estimates of the parameters of interest and their asymptotic variance- covariance (Arellano and Bond, 1991; Arellano and Bover, 1995). These are given by the following formulas:

$$\hat{\delta} = (\bar{X}' Z \hat{\Omega}^{-1} Z' \bar{X})^{-1} \bar{X}' Z \hat{\Omega}^{-1} Z' \bar{Y} \tag{9}$$

$$AVAR(\hat{\delta}) = (\bar{X}' Z \hat{\Omega}^{-1} Z' \bar{X})^{-1} \tag{10}$$

where, θ is the vector of parameters of interest (α, β), *y* is the dependent variable stacked first in differences and then in levels, *X i*s the explanatory variable matrix including the lagged dependent variable (yt- *1, X*) stacked first in differences and then in levels, *Z i*s the matrix of instruments derived from the moment conditions, and Ω^ is a consistent estimate of the variance covariance matrix of the moment conditions.

The consistency of the GMM Estimator depends on whether lagged values of the explanatory variables are valid instruments in the growth regression. We address this issue by considering two specification tests suggested by Arellano and Bond (1991) and Arellano and Bover (1995). The first is a Sargan Test of over-identifying restrictions. It tests the overall validity of the instruments by analyzing the sample analogue of the moment conditions used in the estimation process. Failure to reject the null hypothesis gives support to the model.

The second test examines the null hypothesis that the error term εi, *t* is not serially correlated. As in the case of the Sargan test, the model specification is supported when the null hypothesis is not rejected. In the system specification, we test whether the differenced error term (that is, the residual of the regression in differences) is second order serially correlated. First order serial correlation of the differenced error term is expected even if the original error term (in levels) is uncorrelated, unless the latter follows a random walk. Second-order serial correlation of the differenced residual indicates that the original error term is serially correlated and follows a moving average process at least of order one. This would reject the appropriateness of the proposed instruments (and would call for higher-

order lags to be used as instruments).

## 4. Empirical Result

We provide the results of our panel data regression analysis on the determinants of real exchange rate volatility and the effect of financial integration. We begin by analyzing the stylized fact and correlation analysis. Then, we present our econometric result and its interpretation.

### *4.1 Descriptive and Correlation Analysis*

In figure 1, we observe the importance of exchange rate volatility in the majority of the region. This volatility seems to be smaller in some cases, like in Bangladesh, China, and India. But the volatility trend over time indicates a small decline for most countries, like Korea, Malaysia, Pakistan, Philippine, Sri Lanka and Thailand.

Our figure 2 shows the importance of financial integration evolution in the entire region, notably during the last decade. The trend over time seems to be positive for all countries. At this level the question which arises: which correlation exists between the real exchange rate (RER) volatility and IFI?

In table 2, we report the results of a panel correlation analysis including probability values for RER volatility and fundamental determinants.

First, we find that RER volatility is positively correlated with the financial integration. This correlation is higher among countries with intermediate and flexible exchange rate regimes. In contrast, with fixed regime, RER volatility is negatively correlated with financial integration (Bangladesh, China, Indonesia, Malaysia and Thailand). Indeed, fixed exchange rate regime can stabilize the RER and reduce its volatility. This implies that the impact of financial openness on exchange rate volatility depends on the exchange rate system in this region.

Second, the correlation between RER volatility and trade openness is negative and stronger among countries with fixed regimes than among countries with flexible regimes. Indeed, the correlation coefficient between the two variables is -0.265, and it is significant at 5%.

Third, the GDP growth volatility is positively and significantly associated with RER volatility for the full sample and in most cases. The result is the same for correlation between RER and domestic investment (ID).

Finally, the correlation between RER volatility and government spending, terms of trade, and money does not seem to be significant. This implies that, volatility of these variables cannot represent the source of RER volatility in the region. However, countries with fixed exchange rate system, we consider that government spending and terms of trade as sources of RER volatility.

### *4.2 Financial integration and fundamental volatility (outcome and policy measures): Panel Regression Analysis*

We present evidence on the determinants of real exchange rate volatility for our sample of 10 selected countries over 1975-2004. As stated in the previous sections, our dependent variable is the volatility of exchange rate measured by the standard deviation of changes in the real effective exchange rate.

In table 3, we present the estimation results of the baseline regression model using the GMM system estimator. Here we regress the ERER (Equilibrium Real Exchange Rate) volatility on the primary determinants (output growth, Investment, Government spending, Money and Term of trade) and openness (trade and financial). Here, we expose two regressions accordingly to the measures of Financial Integration, if there is an outcome measure (IFI) or policy one (CC) (Note 5).

First, we find that the higher the volatilities of the output growth and investment the higher the volatility of real exchange rate. The estimated coefficients are positive and statistically significant. The coefficient of government spending is also positive and is relatively significant. However, the monetary and terms of trade coefficient enter with the wrong sign and are not statistically significant. This implies that exchange rate volatility in the region is explained by volatility of real factors and not monetary and external shocks.

Second, trade openness has a negative relationship with the volatility of real exchange rates. According to our estimates in Table 3, an increase in the volume of exports and imports as a percentage of real GDP induces a decrease in the RER volatility. On the other hand, if trade openness increases by 1%, RER volatility may decline by almost 0.08% and 0.11%, in each equation.

Third, the coefficient of financial openness is positive and significant regardless of the measure of financial integration used. The coefficient is significant at the 5% level for each outcome and policy measure. This means that, if the country is more integrated to the international financial market, the RER will be more volatile. According to our estimates, if financial integration increases by 1%, RER fluctuations would increase by 0.08% and 0.09% respectively, in output (here, we use the IFI measure) and policy measure.

Finally, we also find that fixed and intermediate exchange regimes can decrease real exchange rate volatility in the region. Some countries like Bangladesh, Indonesia, Malaysia, Sri Lanka and Thailand adopt fixed exchange rate system.

**Conclusion**

What is the importance of financial liberalization in real exchange rate fluctuations in South and South East Asian countries? It is this question that we have tackled in this paper in order to underline the relative importance of the different sources of impulsion. Our results suggest that openness help to reduce real exchange rate fluctuations but financial integration increases RER volatility. However, this later finding is less prominent in countries with a fixed exchange rate regime. This finding is supported by the new financial architecture accompanied by more flexible exchange rates (Leiderman and Bufman (1996), Bayoumi and Eichengreen (1998), Eichengreen (2000 b), and recently Obstfeld, Shambaugh and Taylor (2004)) that can lead to an increase in real exchange rate volatility.

We conclude that real exchange rate (RER) is well in the centre of economic dynamics and its fluctuation depends on economic specificities of every region in particular its degree of insertion in the international markets. In particular, financial integration context plays against the stability of the RER in South and South East Asian countries.

These countries need to revise their efforts of financial integration by adopting sequential and gradual reform in their liberalization policy. This way they can realize more stability of their RER. Consequently, they have to revise their exchange rate policies to raise the challenge of the new financial architecture. Although the exchange rate policy is one of the several considerations in the area of international financial integration the RER flexibility is a valuable factor. We encourage the countries of South and South East Asia to improve the flexibility of their exchange rate system for their desired economic growth.

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Statistics: CDROM of Chelem (2005), IFS (2006) and WDI (2006)

**Notes**

Note 1. Ten countries are Bangladesh, China, India, Indonesia, Korea Rep, Malaysia, Pakistan, Philippines, Sri Lanka and Thailand.

Note 2. For more information, see table 1

Note 3. Cesar Calderon (2004)

Note 4. Given that lagged levels are used as instruments in the differences specification, only the most recent difference is used as instrument in the levels specification. Using other lagged differences would result in redundant moment conditions (see Arellano and Bover, 1995).

Note 5. See table 3.

Table 1. Definitions of Variables and Sources of Data

| Variables | Definitions | Sources |
|---|---|---|
| RER volatility | Standard Deviation (SD) of ERER | CDROM of WDI, 2006 & Chelem base, 2005 ( LibraryUniversity of Tunis El Manar) |
| Growth rate volatility or Output volatility(Voutp) | SD of the GDP growth | WDI, 2006 |
| Government spending volatility( Vgs ) | SD of change of GC | WDI, 2006 |
| Domestic investment volatility (Vdi). | SD of change of DI | WDI, 2006 |
| Money volatility (Vmon ) | SD of the growth rate of monetary base | IMF, 2006 |
| Terms trade volatility (Vtt ) | SD of TT changes | WDI, 2006 |
| Trade openness (Open) | (M +X) /dom. expenditure | WDI, 2006 |
| Financial integration (IFI, NFA and CC) | Net foreign asset, difference between total assets and engagement , capital liberalization | Lane and Milesi-Feretti (2006) |
| Exchange rate regimes | Fixed, intermediate, flexible | Levy-Yeyati and Sturzenegger (2005) |

Table 2. Real Exchange Rate Volatility and Financial Integration: Panel Correlation Analysis Correlation between Real Exchange Rate Volatility and its Determinants
(Five-year period observation for a sample of 10 countries for 1975-2004)

| | Full Panel | | Sample of countries according to Exchange Rate Regimes | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Fixed | | Intermediate | | Flexible | |
| | P. Corr | P-value | P. Corr | P-value | P. Corr | P-value | P. Corr | P-value |
| Voutp | 0.616 | (0.00) | 0.645 | (0.00) | 0.704 | (0.00) | 0.491 | (0.05) |
| Vdi | 0.459 | (0.00) | 0.476 | (0.07) | 0.524 | (0.02) | 0.332 | (0.16) |
| Vgc | 0.000 | (0.99) | 0.416 | (0.12) | 0.243 | (0.33) | 0.360 | (0.15) |
| Vmon | -0.010 | (0.94) | 0.031 | (0.89) | 0.146 | (0.56) | 0.097 | (0.71) |
| Vtt | 0.010 | (0.94) | 0.493 | (0.06) | 0.212 | (0.39) | 0.106 | (0.68) |
| Open | **-0.265** | **(0.06)** | -0.344 | (0.17) | -0.293 | (0.19) | -0.271 | (0.24) |
| IFI | **0.193** | **(0.15)** | **-0.455** | **(0.08)** | **0.369** | **(0.13)** | **0.364** | **(0.15)** |
| NFA | **0.231** | **(0.10)** | **-0.425** | **(0.10)** | **0.580** | **(0.01)** | 0.322 | (0.16) |
| CC | **0.341** | **(0.01)** | 0.108 | (0.70) | **0.375** | **(0.12)** | **0.503** | **(0.03)** |

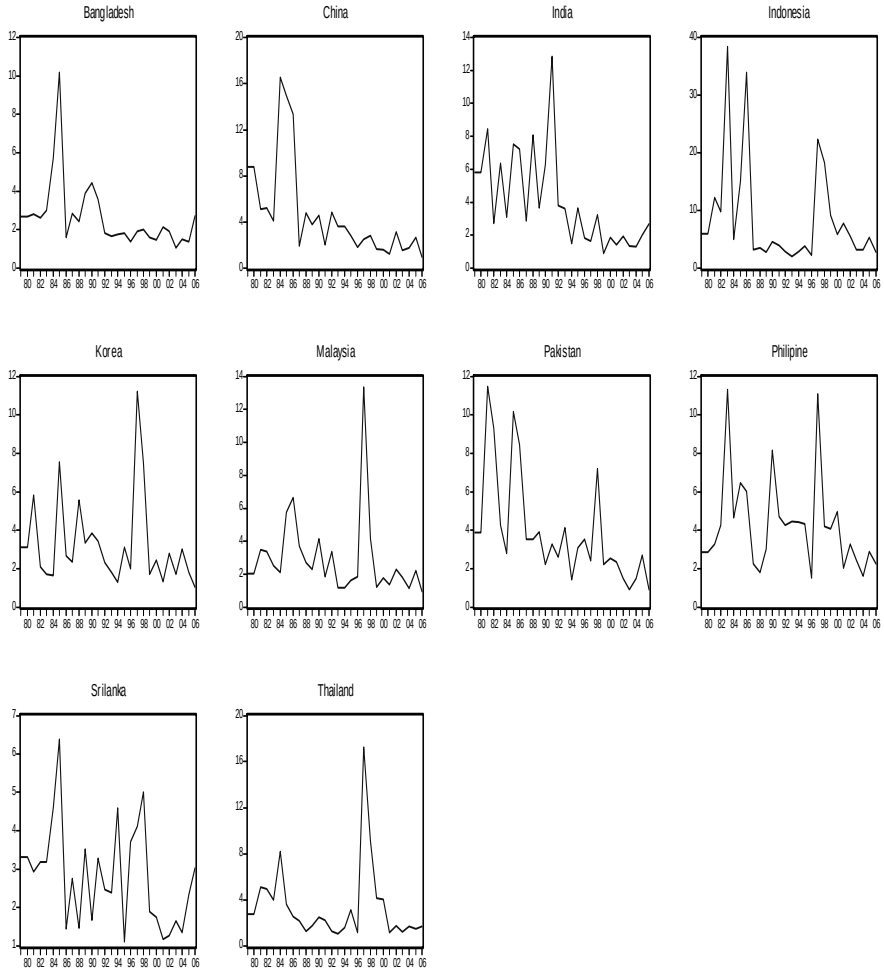
Table 3. Real Exchange Rate Volatility and Financial Integration: Basic Regression Model Sample of 10 countries, 1975-2004 (Five-year period observation)
Estimation Method: GMM system Estimator (Arellano and Bover, 1995)

| | **Outcome Measures** [a] | **Policy Measures** [b] |
|---|---|---|
| Constant | 1.968*** | 0.091 |
| | (0.00) | (0.08) |
| RER volatility (t-1) | 2.739** | 2.413** |
| | (0.00) | (0.00) |
| Output volatility | 2.546*** | 2.118*** |
| | (0.00) | (0.00) |
| Investment volatility | 0.206* | 0.151 |
| | (0.14) | (0.16) |
| Government Spending Volatility | 0.273 | 0.153 |
| | (0.17) | (0.17) |
| Money volatility | -0.174 | - 0.814 |
| | (0.83) | (0.44) |
| Terms of trade Volatility | -0.221 | - 0.655 |
| | (0.51) | (0.31) |
| Trade Openness | -0.089** | -0.113* |
| | (0.03) | (0.12) |
| Financial Integration | 0.081** | 0.096** |
| | (0.03) | (0.05) |
| Fixed exchange rates | -0.094* | -0.112* |
| | (0.06) | (0.11) |
| Intermediate Exchange rates | -0.127* | -0.138* |
| | (0.11) | (0.14) |
| Number of groups | 10 | 10 |
| Number of obs. | 50 | 50 |
| $R^2$ | 0.35 | 0.31 |
| Specification Tests (p-values) | | |
| - Sargan Test | 0.33 | 0.25 |
| - 2nd.Order Correlation | 0.35 | 0.29 |

*, **, and *** imply respectively statistical significance at the 10%, 5% and 1% levels.

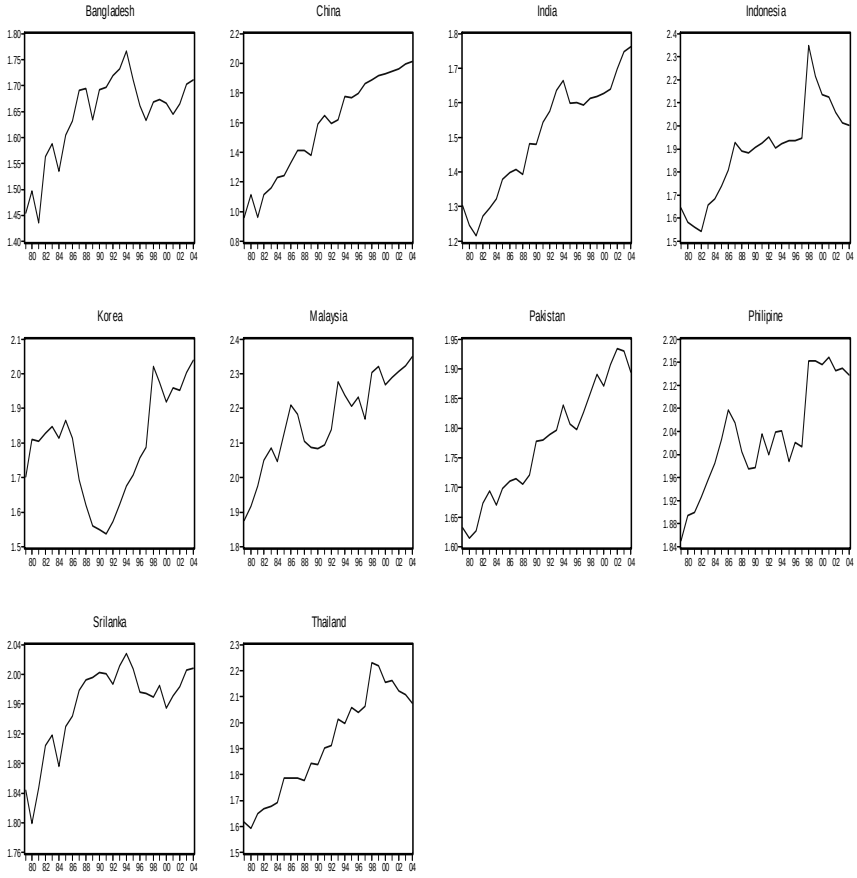
a, b: Two equations are classified according to the measure of the financial integration. We take IFI and CC respectively for outcome and policy measures.

Figure 1: Evolution of RER Volatility in South and South East Asia (1979-2006)




Sources: WDI 2006 and calculation of authors

Figure 2: Evolution of International Finanacial Integration in South and South East Asia (1979-2004)




Sources: Calculation of authors and CDROM Chelem (2005), IFS (2006), WDI (2006) & Lane & Milesi-Feretti (2006).