MEASURING MONETARY INTERDEPENDENCE IN EAST ASIA: EVIDENCE AFTER 1990

BY

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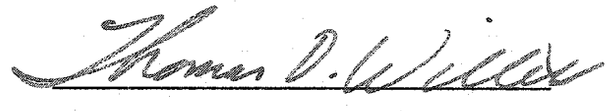

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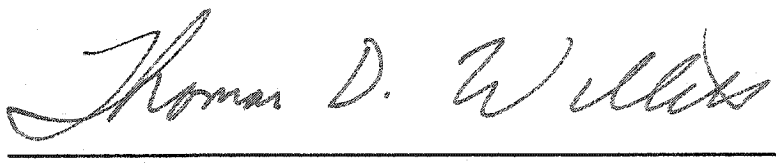

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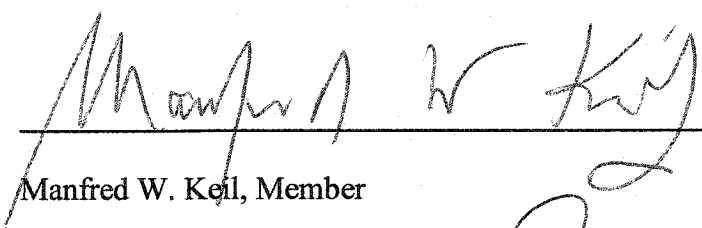

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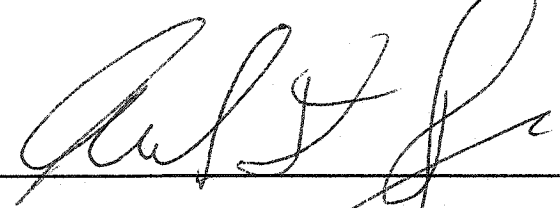

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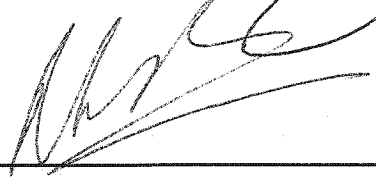

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ABSTRACT OF THE DISSERTATION

Measuring Monetary Interdependence in East Asia: Evidence After 1990

By

Amnat Phalapleewan

This dissertation investigates the extent to which financial markets in East Asia after 1990 have become more interconnected to the US, as well as to each other, by examining the sensitivity of foreign influences on domestic interest rates. Since there have been many conflicts in the empirical findings on the degree of financial integration because of different methodology and time period, I have employed the estimates both in levels and in differences with several choices of control variables and dynamic specifications. The results are mixed. First, the results show that the sensitivity of local to foreign interest rates for most countries has changed substantially between the pre-crisis and post-crisis periods because of switching in the exchange rate regime after the crisis. Moreover, the results can be sensitive to the starting date of the post-crisis period, especially when assessing intra regional integration. Second, the estimation in levels tends to find more cases of high correlations between the local and foreign interest rates. With an unresolved issue of stationary property of the time series, however, it is not clear how much weight should be given to each empirical estimate. Third, despite a rapid growth in international capital movements in the 1990s, there are more financial connections between East Asian countries and the US, rather than to each other in the pre-crisis period. In the post-crisis, however, the evidence indicates that there is lesser interest rate connections to the US, while intra regional interest rate interdependence among Korea,

Malaysia, the Philippines, and Thailand is more apparent. Yet, it is difficult to distinguish whether such findings reflect the true causal relationships between these countries or just spurious correlations caused by lower inflation rate regimes.

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INTRODUCTION

The financial crisis of 1997 devastated the economic and financial markets in East Asia. As a result, several proposals and initiatives emerged to facilitate monetary cooperation in the region, including the establishment of the Asian Monetary Fund, as well as the ASEAN drafting of the Chiang Mai Initiative (further discussion in Montiel, 2004; Rajan and Siregar, 2004). Monetary integration in East Asia, it was hoped, would vitiate any further potential economic and financial crises in the region.

A growing interest in monetary integration in East Asia also arises from the launch of the euro. The European model of the common currency creates monetary stability among members, yet each country retains most of its political sovereignty and some of its fiscal policies. Such conditions offer the crisis-inflicted countries a sense of security in joining a monetary union without considering the costs and benefits suggested by the theory of Optimum Currency Areas (OCA).

The OCA postulates, for example, it is more attractive to form a currency union when the participant countries face similar shocks because the costs of adopting a common currency are lower. The OCA can be utilized to determine how much weight should be given to developments in the foreign exchange market in setting domestic monetary policy (Willett, 2003). While the weight within a currency union should be a hundred percent, the weight that should be given in a general bilateral exchange rate in a multi national world would depend on both economic and financial integration with the corresponding countries. Unfortunately, little discussion has taken place about the requirements for a smooth and successful transition to a single currency.

East Asian officials arguing for the creation of a common currency implicitly assume high or almost perfect capital mobility will materialize in the region. Empirical studies examining the degree of capital openness and financial integration, however, have produced mixed results. Many empirical studies find high or perfect capital mobility in most East Asian countries; however, some of these studies tend to suffer from an upward bias resulting from excluding sterilization into account (Willett et al.2000).

Studies that do not appear to experience such upward bias problems (i.e. Frankel et al., 2000; Chinn and Frankel, 1994) consistently find a high degree of financial integration; therefore, it is not clear how much weight should be put on such findings (see Appendix 1 for irregularities in the empirical findings). The capital control indexes from several sources (i.e. IMF indexes; Quinn, 1995; and Appendix 2) suggest considerable high barriers to capital flows exist in most East Asian countries. Although these indexes are not perfect due to different classifications and criteria, they do indicate capital markets in most of these countries, contrary to many empirical findings, are nowhere near perfect.

Another germane issue is the degree of capital openness and the exchange rate regime. A fixed exchange rate regime relies on the stability of the exchange rate, which in turn reduces transaction costs associated specifically to an individual country and its associated exchange rate risks. Another advantage of the pegged regime is to serve as a nominal anchor for monetary policy. On the other hand, the floating exchange rate regime allows monetary authorities to wield monetary independence. The argument is that most countries have liberalized--or are in the process of liberalizing--capital markets, and an increase in capital mobility in the financial world will narrow a country's option to

maintain either an exchange rate stability (peg) or an independent monetary policy (float). Some might go further by arguing that the capital markets are so tightly integrated that no currency regime can truly maintain monetary autonomy. Pegged and nonpegged countries, therefore, should react similarly to the changes in the base country.

Strong disagreement, however, exists on these issues. Recent empirical findings by Frankel et al. (2000, 2002) and Hausman et al. (1999) support the argument that no single currency regime can truly have an independent monetary policy in a tightly integrated financial market, especially during the 1990s. On the other hand, Shambaugh (2004) argues that on average the impossible trinity holds: a country cannot simultaneously maintain perfect capital mobility, a pegged exchange rate, and retain monetary independence. Shambaugh concludes a pegged country follows the base country's interest rates more closely than a nonpegged country.

Very few studies examine the East Asian financial markets. Most financial integration literature either focuses on monetary integration in industrialized nations or on relationships between the nations of East Asia and the U.S. and Japanese global financial markets. Although there might be a high, but less than perfect, degree of financial correlation between the countries of East Asia and the United States, it is feasible to find intra regional interdependence. The interest rate movement in the United States, for example, can result in substantial interest rate movements in both Korea and the Philippines, yet an adjustment of monetary policy in Korea can have a modest impact on the Philippines, and vice versa. As long as the Asian countries can maintain some degree of financial autonomy, intra regional interdependence will remain the most relevant model for monetary policy cooperation within the region.

This dissertation will investigate the degree of monetary integration in East Asia by focusing primarily on interest rate relationships.[1] Since interest rate movements reflect, in part, monetary policy actions, it is natural to use interest rate relationships to test monetary interdependence between two economies. The fundamental issue is, then, to what degree does the world financial market influence the Asian economies and to what extent do monetary policy actions initiated in the individual East Asian countries affect each other?

My analysis first examines the Uncovered Interest Rate Parity (UIP) model, where an increase in the domestic interest rate relative to foreign interest rates, given that both interest rates have a similar maturity, will cause the future expected exchange rate to increase (depreciate) relative to the spot exchange rate. Both financial markets are well integrated if the UIP condition holds. Results from most studies, however, do not show a positive one-to-one relationship; in fact, many tests have found a negative relationship between changes in the interest rate and the exchange rate. Therefore, I will measure to what degree UIP holds by examining the causality conditions between domestic and foreign interest rates. The more domestic interest rates are influenced and explained by foreign interest rates, the greater is the degree of financial integration between the two economies.

In addition, my analysis examines the monetary integration progress among the East Asian countries, and their relationship with the United States. The time frame under examination, from 1990 to mid 2003, covers the time period when most financial markets have already liberalized and have experienced the financial crisis of 1997. After the 1997

[1] This study focuses primarily on short-term interest rate relations which may best describe monetary integration rather than financial integration as a whole.

financial crisis, most East Asian nations abandoned the pegged exchange rate regime for the more flexible exchange rate regime, hoping to insulate their economies from foreign development. This paper proceeds to investigate whether a country's monetary autonomy is a relevant issue in an increasingly interconnected world, given that each country should display a similar progress of liberalization in the financial realm.

The dissertation is organized in the following manner. Chapter 2 reviews an arbitrage measure of financial integration derived from an interest rate parity condition. In addition, a model based on a derivation of the Edwards-Khan approach is examined. Chapter 3 provides a brief summary of the extensive literature dealing with the fundamental issues examined in Chapter 2. This section stresses empirical irregularities on interest rate interdependence from different methodologies, period samples, and control variables. Methodological issues and data are discussed in Chapter 4. Countries examined in my study include the 5-core ASEAN (Indonesia, Malaysia, the Philippines, Singapore, and Thailand), Hong Kong, and Korea. Empirical results are provided in Chapter 5. The final chapter will conclude my study and offer suggestions for further research.

CHAPTER 2

THEORY OF INTEREST RATE DETERMINATION

The degree of a nation's openness to the world financial market greatly determines its domestic interest rate. In a closed economy, the interest rate is exclusively dependent upon domestic variables, whereas in an open economy, the interest rate will be entirely influenced by foreign interest rates. Most nations, however, share attributes of both closed and open economies. This study will examine both internal and external variables as the determination factors of the domestic interest rate depending on the degree of capital openness.

This chapter examines interest rate determination in both a closed and open economy, followed by a general case study in which the financial market is semi-open.

2.1 A CLOSED ECONOMY

The classical theory of interest rates stresses the equilibrium of the demand for loanable funds, and the amount of funds that a bank desires to loan, determines interest rate levels. The Keynesian approach, on the other hand, argues the supply of, and demand for, money determines interest rate levels. As the opportunity costs of holding money increases, individuals will attempt to invest in other resources. Money holding greatly influences the interest rate one must forgo on other assets that one could hold instead of money minus the interest rate from holding money.[2] Other things being equal, the higher the opportunity costs of holding money, the demand for money will decrease. An

[2] In general one might just assume that money holding bears no interest rate. However, historically the nominal interest rate on money has varied much less than the nominal interest rate on nonmonetary assets and therefore, has been omitted in most studies.

increase in the interest rates on non-monetary assets reduces the amount of money demanded. In addition, an increase in real income raises the demand for liquidity and thus increases money demand.

The demand for money, m^d, can be expressed as a function of nominal interest rate, i, price, P, and real income, y:

$$M_t^d = P_t L(y_t, i_t) \tag{2.1}$$

Furthermore, the domestic interest rate can be expressed like the Fisher equation where the nominal rate is a combination of real rate of interest, rr, and the expected rate of inflation, π^e:

$$i_t = rr_t + \pi_t^e \tag{2.2}$$

The demand of money balance as a log linear combination of price, income, and interest rate can be written as:

$$\log m_t^d = \alpha_0 + \alpha_1 \log y_t - \alpha_2 (rr + \pi_t^e) - \alpha_3 \pi_t^e] \tag{2.3}$$

The quantity of money supplied, on the other hand, is determined by the actions of the banking system and the central bank. Its quantity is exogenously determined and fixed on a given day. It is quite reasonable to assume that the stock of real money balance, m, influenced by the central bank would adjust according to

$$\Delta \log m_t = \beta [\log m_t^d - \log m_{t-1}] . \tag{2.4}$$

The change in real money stock in the current period is equal to the difference between money demand in the current period and the stock of money from the previous period.

Money market equilibrium occurs when the interest rate has adjusted to make the quantity of money supplied equal to the quantity of money demanded. Equilibrium in the money market is achieved by changes in the interest rate. If the interest rate is too high,

people demand less quantity of money than the quantity supplied, and will be influenced to buy bonds. As a result, the price of bonds rises and the interest rate falls to the equilibrium rate.

2.2 AN OPEN ECONOMY

In a perfectly open economy, the arbitrage conditions should equalize the returns of identical assets across markets. Uncovered interest parity (UIP), as opposed to covered interest parity (CIP), is a more effective method in order to examine the degree of financial openness (Willett et al., 2002). Real interest parity (RIP) is considered a long-run interest parity condition because for RIP to hold, UIP, purchasing power parity (PPP), and the Fisher hypothesis must all hold simultaneously.

CIP utilizes forward markets in foreign exchange to cover foreign exchange risks involved in the transaction. CIP holds when the difference between rates of return on assets that are identical in maturity except for their currency denomination equals the forward discount on the domestic currency,

$$1+i_t = \frac{F_t(1+i_t^*)}{S_t} \tag{2.6}$$

where i and i^* represent the domestic and foreign interest rates; S is the spot exchange rate; and F is the forward exchange rate (both exchange rates are expressed as the units of

the local currency price of a unit of foreign currency, unless otherwise stated). The above equation can be rewritten as:[3]

$$i_t = i_t^* + \frac{F_t - S_t}{S_t} \tag{2.7}$$

Equation (7) can also be expressed in the natural log as:[4]

$$i_t = i_t^* + (f_t - s_t). \tag{2.8}$$

If $i < i^*$, the forward exchange rate of foreign currency will go to a discount and the covered interest parity condition holds continuously. The mechanism is as follows: there will be capital outflows from the home country to the spot market in the foreign market – in order to buy foreign treasury bills denominated assets – and this will raise the price of the foreign currency in the spot market. At the same time, people will bring the funds home by selling foreign currency and in turn strengthen the forward rate of the local currency. With s rising while f is falling, the forward premium rate should be negative.

If $i > i_t^* + (f_t - s_t)$, capital inflows will follow as the return in the foreign country including the cost of covering is less than the return in the home country. On the other hand, if $i < i_t^* + (f_t - s_t)$, there will be capital outflows because the return in the domestic market is less than the return in the foreign market.

When CIP holds, UIP will also hold if an investor is risk neutral and the forward rate equals the expected future spot rate. It implies that the forward rate is an unbiased

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[3] Let $\frac{F_t - S_t}{S_t} = a$ and I have $\frac{F_t}{S_t} = 1 + a$. Substitute the latter part in the equation (2.6) to yield $1 + i_t = (1 + i_t^*) * (1 + a)$. Solving the equation in term of i gives $i_t = i_t^* + a + ai_t^*$. I ignore the last term because it is usually very small, which gives us the equation (2.7).

[4] Log of the interest rate is approximately itself because its value is small

estimator of the expected future spot exchange rate.[5] By utilizing the equality of the forward rate and the expected future return, the equation (2.7) is now transformed as:

$$i_t = i_t^* + E_t[(S_{t+k} - S_t)/S_t] \tag{2.9}$$

where s^e is the spot exchange rate expected to prevail in period t+k. In log form, the equation can be expressed as:

$$i_t = i_t^* + E_t(s_{t+k} - s_t)$$

or

$$i_t = i_t^* + E_t \Delta s_{t+k}. \tag{2.10}$$

Note the term $i_t = i_t^* + E_t \Delta s_{t+k}$ (also the term in parenthesis) is the expected change in the domestic exchange rate. If it is the expected proportionate depreciation (appreciation) of the local currency, it will be positive (negative).

UIP theory, expressed by equation (2.10), postulates that the return on domestic assets must equal the return on foreign assets, adjusted by the expected change in the exchange rate over the period to maturity of the assets, given perfect substitution between domestic and foreign assets of a similar maturity. If $i_t > i_t^* + E_t \Delta s_{t+k}$, the home country will experience capital inflows because of the expected rate of return on home assets is higher than on foreign assets. On the other hand, if $i_t < i_t^* + E_t \Delta s_{t+k}$, the home country will experience capital outflows as the expected return on foreign assets is higher than on home assets. The capital market is in equilibrium only when $i_t = i_t^* + E_t \Delta s_{t+k}$.

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[5] Frankel (1991) shows the relationship between the UIP and the CIP can be expressed as followed:
$i_t - i_t^* - E_t(s_{t+k} - s_t) = [i_t - i_t^* - (f_{t+k} - s_t)] + (f_{t+k} - E_t s_{t+k})$
the first term on the right hand side is the regular CIP or referred to as country or political risk premium and the second term is the currency risk premium. If the CIP holds but the UIP does not, this would imply that forward rates are bias predictors of future exchange rate. See Engle ( ) for literature review on biasness of forward rates.

Both interest rate parity conditions predict that a country will experience capital movements if there is a change in the interest rate influenced by either domestic or foreign factors. The capital will flow in (out) the home country if the local interest rate rises (falls) or the foreign interest rate falls (rises).

2.3 A SEMI-OPEN ECONOMY (OR GENERAL CASE)

International finance theory dictates that if a country establishes an open, free-market economy, domestic interest rate variation can be best explained and understood by international factors, particularly foreign interest rates. In a closed economy, by contrast, domestic factors, i.e. the money supply, inflation, and national income, are more likely to have an overwhelming impact on the domestic interest rate. Most nations, however, fall between these two camps; as a result, both internal and external factors influence the domestic interest rate, depending upon a nation's openness in the global economy.

Following the Edwards - Khan approach, I incorporate the effect of capital mobility to which the degree of the domestic interest rate can be expressed as a weighted average of domestic market-clearing interest rates and foreign interest rates from UIP.[6]

From equation (2.2), I assume that the real rate of interest, on the other hand, can be specified as:

$$rr_t = \rho - \lambda EMS_t + \omega_t, \tag{2.11}$$

[6] Haque and Montiel (1991) and Dooley and Mathieson (1994) extend the model by distinguishing between the organized and the informal financial markets. Since market-determined interest rates are difficult to obtain in most developing countries, they use the demand for real money balances to model for the interest rate. Willett et al. (2002) point out that such an assumption of no sterilization is likely to yield an upward result.

where ρ is a constant long-run equilibrium real interest rate. EMS represents the excess supply of money, and ω is a white noise. Furthermore, the excess supply of money is defined as

$$EMS_t = \log m_t - \log m_t^d, \tag{2.12}$$

where m and m^d are the actual stock of, and the equilibrium demand for, real money balances. The demand for real balances increases as the level of real income rises and decreases as the nominal interest rate level rises; in fact, there is a trade off between the benefits of holding more money versus the interest costs of doing so. The demand for real balance and its adjustment are given by equations (2.3) and (2.4), respectively. I can rearrange equation (2.4) as

$$\log m_t = \phi \log m_t^d + (1-\phi)\log m_{t-1}, \tag{2.4a}$$

Combining equations (2.3) and (2.4a), the excess supply of money equation can be represented as:

$$EMS_t = (1-\phi)[\log m_{t-1} - \log m_t^d] \tag{2.13}$$

On the other hand, in a completely open economy, the domestic interest rate is determined by foreign interest rates (or the base country) given by equation (2.10). As regional trade in goods and services and finance increasingly deepen, the interest rate determination provided by equation (2.10) might not be sufficient in capturing the external forces that influence the domestic nominal interest rate. Although interest rates in the base country have a high influence on local interest rates, local interest rates can be connected with other regional interest rates as long as there is no perfect correlation in the

first case. In other words, if a country retains some degree of its monetary independence, this might affect monetary coordination within the region.

In such a scenario, the local interest rate can be expressed as a function of both world and regional interest rates:

$$i_t = \delta(i_t^{regional} + \Delta s_t^{regional^e}) + (1-\delta)(i_t^{world} + \Delta s_t^{world^e}) \qquad (2.14)$$

where $i^{regional}$ is the other potential regional interest rate (neighbor), i^{world} is the world interest rate, and $s^{regional^e}$ and s^{world^e} are the change in exchange rates relative to its neighbor and the world, respectively. The coefficient δ can be any value between zero to unity, $0 \le \delta \le 1$, depending on whether the world interest rate or the regional interest rate is the dominant force in determining the local rate. If a country is closely integrated within the world economy more than it integrates within other regional economies, δ tends to be large closer to unity.

Furthermore, the domestic interest rates may respond with delay due to frictions (from transaction costs, delay information) within that country:

$$\Delta i_t = \theta[\delta(i_t^{regional}) + (1-\delta)(i_t^{world}) + i_{t-1}]. \qquad (2.15)^7$$

Solving equation (2.15) in terms of the domestic interest rate yields:

$$i_t = \theta[\delta(i_t^{regional}) + (1-\delta)(i_t^{world})] + (1-\theta)i_{t-1}. \qquad (2.16)$$

In general, the interest rate determination allowing imperfect capital mobility and domestic and foreign variables to influence the domestic rate is:

$$i_t = \psi(i_t^*) + (1-\psi)(i_t^{'}), \qquad (2.17)$$

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[7] From now on, I will express the interest rate from UIP in form $i_t = i_t^{world}$ and omitted the expected change in exchange rate for brevity.

where i^* is the foreign interest rate from UIP, i' is the interest rate from a closed economy, and the parameter ψ is considered an index measuring the degree of financial openness with $0 \leq \psi \leq 1$. If ψ =1, a country is highly open. Equation (2.17) reduces to just the UIP expression in which the domestic interest rate is solely explained by the foreign interest rate. If ψ = 0, the nominal interest rate only depends on the domestic variables in a closed economy.

Substituting the right hand side of equation (2.16) for i^*, assuming slow adjustment to interest rate parity, and equation (2.2) for i' in equation (2.17), the new equation may be expressed as:

$$\begin{aligned} i_t = {} & \psi[\delta(i_t^{regional} + e_t^{regional^e}) + (1-\delta)(i_t^{world} + e_t^{world^e})] + \\ & \psi(1-\theta)i_{t-1} + (1-\psi)(rr_t - \pi_t^e) \end{aligned} \tag{2.18}$$

Furthermore, assuming that the money demand and the excess money supply are substantiated by equation (2.3) and (2.13), substitute these equations into (2.18) in order to express the nominal interest rate as a function of both internal and external variables:

$$\begin{aligned} i_t = {} & \psi[\theta\delta(i_t^{regional}) + \theta(1-\delta)(i_t^{world}) + (1-\theta)i_{t-1}] + \\ & (1-\psi)[\rho + \lambda(1-\phi)(\alpha_0 - \alpha_2\rho) - \lambda(1-\phi)\log m_{t-1} + . \\ & \lambda(1-\phi)\log y_t + (1-\lambda(1-\phi)(\alpha_2 + \alpha_3))\pi_t^e + \omega_t] \end{aligned} \tag{2.19}$$

The model can be rewritten as[8]:

$$i_t = c_0 + \beta_1 i_t^{world} + \beta_2 i_t^{regional} + \gamma_1 \log y_t + \gamma_2 \log m_{t-1} + \gamma_3 \pi_t^e + \varphi i_{t-1} + \varepsilon_t, \tag{2.20}$$

where the reduced-form parameters are

[8]By grouping terms in equation (2.19), the model is

$$\begin{aligned} i_t = {} & (1-\psi)(\rho + \lambda(1-\phi)(\alpha_0 - \alpha_2\rho)) + \psi\theta\delta(i_t^n) + \psi\theta(1-\delta)(i_t^w) + (1-\psi)\lambda(1-\phi)\alpha_1 \log y_t \\ & -(1-\psi)\lambda(1-\phi)\log m_{t-1} + (1-\psi)[1-\lambda(1-\phi)(\alpha_2 + \alpha_3)]\pi_t^e + \psi(1-\theta)i_{t-1} + (1-\psi)\omega_t \end{aligned}$$

$$c = (1-\psi)(\rho + \lambda(1-\phi)(\alpha_0 - \alpha_2\rho))$$
$$\beta_1 = \psi\theta(1-\delta)$$
$$\beta_2 = \psi\theta\delta$$
$$\gamma_1 = (1-\psi)\lambda(1-\phi)\alpha_1$$
$$\gamma_2 = -(1-\psi)\lambda(1-\phi)$$
$$\gamma_3 = (1-\psi)[1-\lambda(1-\phi)(\alpha_2+\alpha_3)]$$
$$\varphi = \psi(1-\theta)$$
$$\varepsilon = \text{white noise}$$

From the reduced equation (2.20), the degree of openness can be expressed as $\psi = \beta_1 + \beta_2 + \beta_1\varphi$. If the model can adjust quickly, no lag of the local interest rate within the equation should arise. The degree of openness, furthermore, is reduced to just a sum of the estimated coefficient of the world and regional interest rates, $\psi = \beta_1 + \beta_2$.

The expected relationship between independent variables and the domestic interest rates may be described as follows: the world interest rate is positively related with domestic interest rates because higher rates of return in foreign assets lead to capital outflows. The demand for domestic bonds falls and the local interest rate rises until it equalizes to the world market without any expected change in the currency rate. Similarly, higher real income is also associated with a higher domestic interest rate because it raises the demand for money.

On the other hand, a higher supply of money raises bond prices and reduces interest rates. Thus, the money supply can have a negative impact on the rate of interest. In regard to the Fisher relationship, the higher expected rate of inflation would have a negative impact on the demand for money because investors prefer a higher rate of return on alternative assets. The net effect is ambiguous because a change in the demand for money can lead to a decrease in the money supply. Generally speaking, an increase in the expected inflation rate would have a positive impact on the nominal interest rate.

In summary, the degree of financial openness, ψ, runs from zero to one. It rises when a country strengthens its financial integration with the world financial markets. When $\psi = 0$, the external factors play no role in determining the domestic interest rate. If $\psi = 1$, the domestic interest rate equals the interest parity rate which implicitly implies perfect capital mobility. Therefore, if the capital controls have been effectively implemented, the domestic interest rate is more likely to be determined by domestic monetary conditions. On the contrary, if capital controls are not effective and perfect capital prevails, the local interest rate should be determined by the world capital market. Hence, reducing capital controls and restrictions will leave a small space for the monetary authorities to influence the local interest rate. In other words, monetary policy becomes ineffective, unless the exchange rate is purely floating.

Chapter 3

Literature review

The vast majority of literature on international financial integration focuses on the industrialized countries. Very few studies focus on the issue in developing countries, mainly due to the fact that historically, capital flows have been tightly controlled and financial sectors have been heavily repressed in most developing nations. Under such restrictive conditions, the local monetary conditions in each country are likely to be the main factors in determining local interest rates.

Both an increase in capital mobility and a complexity of the monetary transmission mechanism in the past decade heavily impact interest rate relationships. The progress of financial liberalization raises important questions; namely, how much are domestic interest rates influenced by the world interest rate, and to what extent do the various interest rates among the individual East Asia nations affect each other's economy. These questions are crucial as they help monetary authorities determine a country's monetary policy.

Rajan (2003) groups several empirical estimations of financial integration into three broad categories: (1) price-base measurement involving debt and equity flows, and non-debt flows in the stock market; (2) quantity based measurement such as savings-investment and consumption correlations; (3) regulatory- and institutional-base measurements. My main focus is on interest rate covariations among different economies under price-base estimations. The first section focuses on international financial integration, especially monetary integration, grouped into two main approaches. The first approach is the extent of correlation and co-movement of interest rates in levels. The

most common measure of co-movements when variables show symptoms of unit roots is the cointegration method. The interest rates are cointegrated if they move together in the long run. Another common method is to apply the ordinary least squares (OLS) estimates on the interest rate parity conditions and its extension along the Edwards-Khan style. The second approach is by differencing. This method has been widely debated due to complications of measures in levels of financial time series data. The second part of this chapter provides an overview on intra regional integration.

3.1 INTERNATIONAL LINKAGES

3.1.1 MEASUREMENT IN LEVELS

- **UNCOVERED INTEREST ARBITRAGE**

Although the UIP framework is a workhorse model in empirical studies in international finance, most studies reject the UIP hypothesis. UIP postulates the interest differential should be equal to the excepted change in the exchange rate. Many empirical studies often find a perverse relationship of the interest and exchange rates, particularly common among highly developed and open financial markets.[9] Results from developing countries, on the other hand, sometimes exhibit a positive sign. De Brouwer (1999) found a negative relationship between the interest rate differential and the ex-post expected change in exchange rates, focusing on Australia, Hong Kong, Japan, Malaysia, and Singapore, from January 1980 to September 1994.

[9] However, in the most recent paper using long term maturity up to 3 years of interest rate by Chinn and Meredith (2002) finds a better result in the sense that the coefficients response of the UIP in most industrial countries are positive, yet small and far from unity.

On the other hand, de Brouwer found a small and positive relationship of the expected change in the exchange rate and the interest rate differential in Indonesia, the Philippines, Korea, and Thailand. UIP holds better in a country that is less open, while a highly open economy tends to be the one that fails to hold most of the time. De Brouwer explains that managed exchange rates are easier to predict than floating rates because the expected depreciations are easier to measure.

Flood and Rose (2001) demonstrate that the UIP result in the 1990s works better in the sense that the estimated coefficients of the relationship between the interest rate differential and the change in the exchange rates are, in most cases, positive. The estimated result of each country varies quite substantially, however, depending on the frequency of the data used in the measurement. Out of 21 countries under a monthly horizon, 12 are negative, but statistically insignificant from zero; two are zero, and seven are positive. Nevertheless, different data frequency produces a wide range of the estimated coefficients of UIP; in fact the sign is often switching across the horizon. At the conventional significant level, most of the estimated results tend to have large standard errors, resulting in a non-rejection of the null hypothesis of zero coefficients. On the other hand, pooled data depicts UIP coefficients close to unity for the daily and weekly data. Given heterogeneous of the estimated coefficients under different time horizons, the pooling estimation is a rather precarious method.

Moosa and Bhatti (1997) apply the UIP framework[10] to the Phillips-Ouliaris tests by utilizing the residuals of the cointegration regression, using quarterly data of six Asian countries from 1980 to 1994. The results indicate cointegration exists among the nominal

[10] They regress $s_{t+1} = \beta_0 + \beta_1 \overline{f}_t + \omega_{t+1}$ where s_{t+1} is the log of the future spot rate and $\overline{f}_t$ is the log of the interest parity forward rate.

exchange rate, the interest rates ratio, and the expected real exchange rate between Japan and the East Asian nations. Moreover, the restrictions implied by UIP, a one-for-one relationship between the interest rate differential and the expected depreciation rate, cannot be rejected. Thus, the authors conclude that UIP works fairly well in the long-run for every country, except for the Philippines.

In general, an empirical estimation of UIP does not perform well due to risk premium, endogeneity problems, unanticipated changes in the exchange change rate, and the validity of rational expectations assumptions.[11] The alternative approach: estimate uncovered interest differentials (UID) and its stationary property. Tanner (1998) argues that UIP 'works' in the sense that the mean of UID is not statistically different from zero and remains stationary. In his study, de Brouwer (1999) reports near zero of the UID in Hong Kong and Singapore, while other Asian countries tend to have significant deviations from the parity condition.

- **MODIFIED INTEREST ARBITRAGE**

Because of the low power and perverse result from UIP estimates[12], Edwards and Khan (1985) developed a model for a semi-open economy in which interest rates depend upon both domestic macroeconomic conditions as well as on foreign interest rates. The Edwards-Khan model incorporates the effect of capital mobility in which the degree of the domestic interest rate can be expressed as a weighted average of the domestic market-

[11] Engel (1995) has a through review on such issue.

[12] Chinn and Meredith (2002) argue that most studies on uncovered interest parity depend on short-term interest rates that do not have prediction power in exchange rate models. As a result, they use quarterly returns on 5-year bonds for Germany, the U.K., Canada, and the US over 1980 to 2000. The slope coefficients of β in all cases (using US dollar as a base) are positive; particularly the estimated β for Germany is close to unity at 0.87. Furthermore, they expand the sample to 1977 to 2000 for a sensitivity test and still find positive coefficients, but somewhat lower, for all cases.

clearing interest rate and the foreign interest rate from UIP.[13] As the degree of openness of a country increases, so does the influence of foreign interest rates on the domestic interest rate. Edward and Khan test the applicability of the model for Singapore, a highly open country, from 1976 to 1983, and Colombia, a partially open economy, from 1968 to 1982. The authors report Singapore's interest rate is determined almost solely by the foreign interest rate, whereas the interest rate in Colombia is much more sensitive to both domestic and foreign influences.

The replication of the Edwards-Khan methodology by Ahn (1994), applied to Korea (1980:2-1993:4) and Singapore (1979:2-1993:4), demonstrates the interest rate in Korea is determined by the domestic money stock and lag of its own interest rate. The foreign interest rate, however, has no influence on the local interest rate. In Singapore, however, foreign interest rates have only a moderate influence (around 25 percent) on local rates while lag of the local rates itself plays a dominant role in interest rate determination. Even when the author uses the same timeframe as the original Edwards-Khan model (1979:3 – 1983:4), the finding is still consistent with his previous report that the domestic rate is determined both by foreign interest rates and by lag of the local interest rate itself. The replication coefficient of foreign interest rates is only one-forth of what Edwards and Khan produced.[14]

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[13] Hence, the domestic interest rate is determined by:

$i = \psi i^{f} + (1-\psi) i'$ where $i^{f} = i^{*}+e'$ and i' is the domestic market clearing condition.

[14] I also try to replicate Edwards-Khan results and find much smaller (for SIBOR) or insignificant (for interbank rate) coefficients of foreign interest rates. However, I find a similar result as Ahn that the lag of the dependent variables is highly significant. The differences of my results and the original results may cause by several factors including different interpolation technique of generating quarterly GDP and a different set of the expected changes in exchange rate. I suspect the major differences in foreign coefficient are caused by the use of perfect foresight expectations instead of the forward premium.

Haque and Montiel (1991) and later, Dooley and Mathieson (1994), modify the Edwards-Khan approach to most developing countries in which market-determined interest rates are not available. Haque and Montiel express market-clearing interest rates as a function of observable variables, such as real income, real money balance, and ex-post expected inflation rate. The authors also report a high degree of foreign influences on the domestic interest rates of most countries under their study. Haque and Montiel (1991) find perfect capital mobility for Indonesia, Malaysia, and the Philippines during the period from 1969 to 1987. Using annual data from 1963 to 1990, Dooley and Mathieson (1994) report perfect capital mobility in Malaysia, the Philippines, and Thailand, but less than perfect for Indonesia.

In a country study, Hataiseree and Phipps (1996) model their nominal interest rate determination according to the Edwards-Khan approach for Thailand, but allow a money innovation index, represented by the log of the ratio of M2 to M1, to capture the rapid financial liberalization, from 1987 to 1992. By cointegration techniques, they conclude that in the long-run, domestic interest rates have been influenced significantly, yet not completely, by the foreign interest rates, possibly around 85 percent after the local interest rate is normalized to one.

Since the Hague-Montiel approach is based upon a no sterilization assumption, Willett, Keil, and Ahn (2002) assert most developing countries engage in some form of sterilization of capital flows, and thus the results from the Hague-Montiel methodology are likely to have an upward bias. On the other hand, an estimation of capital mobility in a high-inflation country tends to overestimate the coefficients in the Edwards-Khan model because inflation is feeding back into nominal interest rates and the expected

currency depreciation. Considering the possibility of sterilization intervention in Indonesia, Rooskareni (1998), using monthly data from April 1986 to February 1994, accounting for sterilization in the study, estimates Indonesian deposit interest rates and finds that the coefficient estimate of foreign interest rates is only 0.3 for Indonesia. Capital mobility here is much less than perfect than that implied by Hague and Montiel (1991) and Dooley and Mathieson (1994).[15]

- **INTEREST RATE COMOVEMENT AND CONVERGENCE**

An alternative test of international financial integration is to determine the relative importance of US and Japanese interest rates on domestic interest rates in East Asia. The most common empirical method examining interest rates relationships is to employ the cointegration technique to determine whether these interest rates move together over the long-run.

Chinn and Frankel (1995) employ the cointegration method on real interest rates[16] to nine countries around the Pacific Rim (including Hong Kong, Indonesia, Korea, Malaysia, Singapore, Taiwan, and Thailand) with respect to the US and Japan. Evidence from bivariate tests demonstrates that during the third quarter of 1982 to the first quarter of 1992, Hong Kong, Malaysia, and Taiwan are linked with the USA and Japan, while Singapore and Korea are only linked with the US and Japan, respectively. Yet, the Japanese interest rate does not appear to cointegrate with the US interest rate. When

[15] Hague and Montiel (1991) estimate annual data from 1969 to 1987 of 15 developing countries. Dooley and Mathieson (1994) include 7 countries in Asia from 1970s to 1980s in the study (Indonesia is from 1971 to 1989).

[16] The estimated equation is $r_{t,k}^{US} - r_{t,k}^{local} = \Delta q_{t,k} + \varepsilon_{t+k}$, where r is real interest rate and q is the log real exchange rate. Their rational in using cointegration method is that as long as the expected real depreciation is stationary, then the two real interest rate series should move together.

integration is defined as the presence of common stochastic trends in real interest rates, there seems to be a high degree of economic integration in East Asia. When testing the trivariate cointegration of US, Japan, and the local rates, however, real interest parity only holds for Singapore with respect to the US and for Taiwan with respect to both the US and Japan.

Similarly, Phylaktis (1995) tests the degree of real interest rate integration using cointegration technique for Hong Kong, Japan, Korea, Malaysia, Singapore, and Taiwan with monthly interest rate data dating from 1970s to 1993. Evidence from the bivariate system indicates Korea and Taiwan are integrated with Japan and Hong Kong, Korea and Singapore (possibly Taiwan and Malaysia) are integrated with the US. In addition, the speed of adjustment also confirms the dominant role of the U.S. in financial markets in East Asia after 1980.

Chinn and Frankel (1994) regress interest rates of 11 Pacific Rim countries, including Hong Kong, Indonesia, Japan, Korea, Malaysia, Singapore, Taiwan, and Thailand —from September 1982 to March 1992— on US interest rates and a time trend. The authors impose conditions such that there is not only nonexistence of capital controls, but also no change in expectations of exchange rate depreciations. They discover that the coefficient of international interest rates of every country in East Asia, except for Korea and Malaysia, is positive but only Hong Kong and Thailand are statistically significant and close to one. There are a few cases, such as Indonesia, of a shift of influence from US interest rates to the Japanese rates which implies a weaker role of Japan in the region.

While most studies find the US a major external influence on the financial markets in Asia, the studies conducted by Phylaktis (1999) found contrary findings. By reexamining the role of the US and Japanese financial markets on six countries in East Asia (the same set of countries and the same timeframe as in the previous study (Phylaktis (1995)), and using monthly interest rates from the early 1970s to September 1993, the author based his analytical framework on cointegration and multivariate Granger causality[17] tests rather than utilizing the bivariate methodology. The results indicate the financial markets in East Asia integrate more with Japan than with the US, especially after 1980.[18] When integration is defined as the speed adjustment from shock, Malaysia is the most integrated country with Japan, followed by Taiwan and Singapore. The comovement of real interest rates by multivariate Granger causality tests indicate that both the US and Japanese interest rates influence the rates in Singapore, Hong Kong, Malaysia, and Korea, but only Japan exhibits strong influences in Taiwan. Moreover, causality exists both ways between Japan and Malaysia and between Japan and Hong Kong.

The most recent papers by Frankel, Schmukler, and Serven (2000, 2002) investigate the market's local interest rate responsiveness to international rates using monthly data from the 1970s to 1999 (the beginning and ending of each series may be different depending on data availability). The two papers are similar in most respects except for an individual country study where the first paper has employed a standard

[17] The author claims that the method is superior to a general bivariate method because the multivariate approach takes into account the interaction of interest rates between the US and Japan in examining capital market interaction between these two major markets and the markets in East Asia.

[18] Zhou (1998) examines the role of exchange rate system and linkages of the currencies in Asia-Pacific countries from 1980s to 1993 by cointegration tests and finds that the Japanese yen is gaining momentum in East Asia, especially on the exchange rate of the Asian newly industrialized economies (NIEs). However, the US dollar is still a dominant currency in other East Asian countries.

estimates in level. The authors, on the other hand, avoid the time series issues in their second paper by applying the unrestricted autoregressive distributed lag (ADL).

Since every single country in the study has experienced at least one or two types of shocks or unusually high volatility in the financial markets, the authors have created three dummy variables, represented by crisis, hyperinflation, and regime transition, especially exiting from pegs to other exchange rate regime periods.[19] When using the entire sample period from 1979 to 1999, the pooled estimates by fixed effects suggest that interest rates in a fixed currency regime (at 0.62) tend to exhibit higher sensitivity to international rates than flexible regimes (both intermediate and floating equal to 0.53). These results concur with the conventional wisdom that under fixed exchange rate regime and high capital mobility, the authorities have less monetary independence. Nevertheless, the sensitivity of the coefficients is due in part to the exchange regime classification that remains an ongoing debate (see Willett and Kim, 2004).

On the contrary, the insulation property under flexible exchange rates disappears when the sample period is limited to only the 1990s and only developing countries are considered. All the exchange rate regimes tend to show high sensitivity of local interest rates to international rates. A closer examination of an individual country, both by standard OLS estimates and by ADL, indicates that in the long run the interest rates in Hong Kong, Indonesia, the Philippines, Singapore, and Thailand can fully adjust to the international interest rate movement regardless of the exchange rate regime – they cannot reject the null hypothesis that the coefficient of the US rate equals one. The upward trend

[19] A crisis dummy takes a value of one when the cumulative depreciation of the nominal exchange rate over a three-month period is equal or greater than 15 percent. A hyperinflation dummy takes a value of one when monthly inflation rate is above 50 percent. And a transition dummy takes a value of one in the month of the transition as well as those immediately preceding and following it.

in the degree of international transmission in the 1990s is consistent with the timeframe of financial liberalization in these countries. This study, however, fails to recognize the possibility of structural breaks as a result of changes in the currency regime following the 1997 financial crisis. The result might be biased as the regression tries to fit a line in between the two different slopes.

3.1.2 MEASUREMENT IN DIFFERENCES

Since the estimate in level is influenced by the behavior of time series data, spurious correlations can be a problem if the two independent series have unit roots and are not cointegrated. The general recommended remedy is differencing the data and proceeding with standard techniques. The recent paper by Shambaugh (2004) applies the differencing technique with the pooled samples to investigate the effect of exchange rate regimes on monetary policy. The author pays particular attention to the classification of the exchange rate regime by using *de facto* instead of *de jure* classification from the IMF. The exchange rate regime specification is quite important because some countries behave differently from their official announcements.

As theory predicted, Shambaugh reports that the changes in interest rates of pegged countries follow the changes in the base country more closely than the nonpegs. In the 1990s the coefficient of fixed countries is 0.56 compared to that of 0.35 for nonpegs, but the later value is not significant from zero. As predicted, the pegged sample has higher R^2 than the nonpegs (0.12 for pegs compared to 0.006 for nonpegs). However, the foreign coefficient and R^2 of the pegged countries are not even close to one which indicates an imperfection of capital mobility.

The author then considers the impact of capital controls on the estimated foreign coefficient in pegged and nonpegged countries. The results consistently yield a similar conclusion that capital controls do not alter the previous results because the pegs with capital controls show stronger correlation with the foreign interest rates and have higher R^2 than the nonpegs. The overall estimated outcomes indicate that the pegged countries have less monetary autonomy than the nonpegged ones, even in the 1990s. This conclusion, however, sharply contrasts with the results reported by Frankel et al. (2000, 2002) that during the 1990s, most countries in the world, regardless of the currency regime (except only Japan and Germany that are big and independent enough pursue their own monetary policies), have no ability to exercise an independent monetary policy.

The conclusions of Kim and Lee (2004) also sharply contrast with the results reported by Frankel, Schmukler, and Serven (2000, 2002). Kim and Lee first estimate differences of interest rate relationships between the local rate and the US treasury bill rate, allowing for regime switching at an unknown date and correcting for a possibility the endogeneity problem. While the authors find structural changes in Korea and Malaysia in September and October of 1997 respectively, they do not find a break in data for Thailand until much later on, in September 1998. Surprisingly, the authors do not find a country severely effected by the crisis, like Indonesia, to suffer from a structural break problem.

Once the structural breaks in exchange rate regimes are taken into account, the coefficients of foreign interest rates in Korea and Thailand have been dramatically reduced from statistically equal to one (the coefficients of foreign interest rates are 2.95 for Korea and 3.51 for Thailand) in a pre-crisis period to insignificant from zero in post-

crisis periods. Kim and Lee contribute their findings as a result of the regime switching its exchange rate from peg to floating after the crisis. This result indicates a sharp contrast from Frankel et al. (2000, 2002) who find domestic interest rates can fully adjust to the foreign interest rates regardless of the exchange rate regime.

For Malaysia, Kim and Lee contribute a small and insignificant coefficient of US interest rates in both periods to capital controls that have been imposed on and off in the early 1990s and again in 1998. In addition, the structural break in Malaysia appears to exist in the intercept term rather than in the slope of foreign coefficients like Korea and Thailand. On the other hand, the coefficients of foreign interest rates in other countries vary greatly depending on their exchange rate regime. The estimated parameter for Hong Kong is very responsive (coefficient is 1.64) to the changes in US interest rates, given that it pegs currency to the US dollar. The responsiveness to the changes in foreign interest rates for countries in intermediate regimes varies from one for the Philippines to not significantly from zero for Indonesia and Singapore.

The results presented here in part concur with Shambaugh's findings in more explicit cases like Korea and Thailand, but their coefficients are far from the pooling estimates. Nonetheless, various degrees of sensitivity of the local interest rates to the changes in the base country under the intermediate regime are a reminder of how volatile the middle regime is.

3.2 INTRA REGIONAL LINKAGES

To date, most empirical studies on financial integration have focused either on movement of international and local equity markets or the influence of international interest rates on

local interest rates. Regional integration in financial markets, however, has been left unexplored until recently.

Cheung, Chinn, and Fujii (2002) explore the possibility of financial integration for the greater China area which comprises China, Hong Kong, and Taiwan. The later study includes Korea, Japan, Singapore, and the US. The results, based on empirical validity of price-based assessments (real interest parity, UIP, and PPP), show that only China and Hong Kong (possibly China and Taiwan) appear to experience high integration. A possibility of financial integration between China and other East Asian countries, however, is not supported by the empirical study.

On a larger scale, Zhou (1996) estimates the degree of interest rate linkages among ASEAN, Japan, and the US from the 1970s to 1994 by employing the cointegration test on quarterly data of short-term market determined rates. The results reveal close interest rate relationships between Singapore and Malaysia, and those of Singapore and Thailand. The evidence does not support any cointegration of Indonesia and the Philippines with other ASEAN nations. From vector of error correction model (VECM), the causality runs from the variables of Singapore to Malaysia and to Thailand, but not the reverse. This verifies the strong exogeneity of the Singapore interest rates linkages with Malaysia and Thailand.

Once US and Japanese interest rates have been inserted into the analysis, Zhou finds US and Japanese influence affecting the rate in Singapore. Nevertheless, the Granger causality only runs from the US interest rate to the Singapore rate, but not the reverse. Thus, the driven force of interest rates from the US and Japan are likely to engineer the interest rate connections among Singapore, Malaysia, and Thailand. In

addition, empirical tests indicate the movements of Philippines interest rates are Granger caused by both the US and Japanese rates, whereas Indonesian interest rates are affected only by the US rate. The overall results indicate US interest rates, not Japanese interest rates, greatly influence ASEAN interest rates.

Anoruo, Ramchander, and Thiewes (2002) employ monthly short-term interest rate data from 1980 to 1999, including Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore, and Thailand. The results indicate in the 1990s, East Asian countries have higher cointegration relationships with the US. Furthermore, they apply a VECM to address whether there is a bi-directional causal relationship among the East Asians. The results demonstrate a high connection among countries in East Asia during the 1990s, notably the growing role Hong Kong in sharing feedback to Indonesia, Singapore, and Thailand. While the interest rate movements in Malaysia and Korea causally influence Thailand's interest rates, the Malaysian rates, in turn, are driven by Indonesian rates. The results support a possible interlocking of monetary policy in the short-run among countries in East Asia, but with one reservation for the Philippines. There is no analytical evidence to indicate any significant role of the Philippines in short-run dynamics of interest rates within East Asia.

Further analytical inferences about interest rate relationships reveal that Japan played a dominant role in East Asia during the1980s, but that role has been replaced by the US in the 1990s. Since Hong Kong and Singapore interest rates appear to have close ties with the US rate, this implicitly indicates the strong influence of the US in this region.

On the other hand, the empirical studies on regional financial integration that distinguish the different phases of the financial crisis have trouble finding an agreement upon the degree of financial integration after the crisis. The empirical estimates of UID for commercial deposit rates among East Asian countries by Cavoli, Rajan, and Siregar (2003) show that there are arbitrage opportunities in all three periods (January 1995 to December 1996; January 1998 to December 1999; January 2000 to June 2002). Absolute UIDs, however, become significantly widened during the crisis period. Yet, in the aftermath of the crisis, these countries have strengthened the degree of financial integration among themselves, which reflect across-the-board reduction in absolute UIDs, except for Thailand.

Chung and Rhee (2002) estimate the linkages between the financial markets of Korea and those of eight other countries (Hong Kong, Indonesia, Japan, Malaysia, Singapore, Taiwan, Thailand, and the US) based on assessing the time-varying correlation coefficients estimates from a multivariate generalized autoregressive conditional heteroskedastic (GARCH) model. They analyze 23 financial variables comprised of foreign exchange rates, stock indexes, and interest rates from bond markets. The evidence suggests that the interest rates in these countries are moving independently of one another, implying that the bond markets in these countries are not interdependent.

Table 1 summarizes the literature on financial integration previously reviewed in this chapter. It describes the approaches and findings to the principal contributors to the field. A broad conclusion that emerges from the above is that interest rates in East Asia are found to be integrated with the world financial market, this case the US interest rate, and maybe among themselves as they undertake financial liberalization and continue

opening up their capital markets in the early 1990s. There are several disagreements about the degree of financial integration emerged, depending upon the time period, methodology, and data set chosen.

TABLE 1
Survey of Empirical Studies on Financial integration

Study	Main Question(s)	Country Sample	Variables	Methodology	Note	Main Finding(s)
Edwards and Khan (1985)	Determining foreign factors and domestic monetary conditions that affect interest rate in developing countries	Columbia 1968-82, Singapore 1976-83. Quarterly data		OLS regressions of domestic interest rate on foreign interest rate and other domestic variables	With the domestic macroeconomic variables as control variables.	The local interest rate will be determined mostly by the foreign rate as a country open more to the financial world.
Ahn (1994)	Determining effect of foreign interest rate on domestic interest rate	Korea and Singapore: Quarterly data 1980:2-1993:4 for Korea; and 1979:2-1993:4 for Singapore.	3-year corporate bond for Korea; 3-month interbank rate.	OLS and cointegration	With the domestic macroeconomic variables as control variables.	Korea: The interest rate is determined by the domestic money stock and lag of the local rate, no influence from the external rate. Singapore interest rate is determined mostly by its own lag of interest rate, and money supply plays a minor role determining. Foreign interest rate, however, has only moderate impact on the local rate, only 0.249.
Haque and Montiel (1991)	Degree of financial openness that does not depend on domestic interest rate measurement	15 countries (including Indonesia, Malaysia, and the Philippines); annual data from 1969-87		Generalized nonlinear instrumental variable	With the domestic macroeconomic variables as control variables. Avoid using the local interest rate	Degree of financial openness is quite large across most of the countries. There is full capital openness (prefect capital mobility) for Indonesia, Malaysia, and the Philippines.
Dooley and Mathieson (1994)	Measuring degree of capital mobility (similar to Hague and Montiel) without using the local interest rate measurement.	Indonesia, Korea, Malaysia, Myanmar, the Philippines, Sri Lanka, and Thailand annual data from 1963 - 90		Nonlinear OLS and instrumental variables (IV), (IV with Kalman filter for Thailand and the Philippines)	With only macro variable and i* (avoid using local rate) CUSUM and CUSUMSQ to test stability of the data over time	High capital mobility for most countries. Perfect capital mobility for Korea, Malaysia, the Philippines, and Thailand. Indonesia is less than perfect.

Hataiseree and Phipps (1996)	Degree of international capital mobility	Thailand 1980:Q1 - 92:Q4		Cointegration and error correction (EC) model; Included seasonal dummy in EC	With the domestic macroeconomic variables as control variables.	Domestic interest rate is greatly influences by the external rate (degree of openness 0.85) yet domestic variables still have some influence.
Chinn and Frankel (1994)	How well do the financial markets in Pacific Asia linked to the world? Who has the most influence over other Asian, Japan or the US?	11 Pacific Asia countries 1982:9 - 92:3 Note: US interest rate is 3-month Eurodollar rate.	3-month interbank deposit rate for Hong Kong, Indonesia, Malaysia; Monetary stabilization bond for Korea; 3-m banker's acceptances and 3-m commercial bill; Call money for Thailand.	OLS; local rate on foreign interest rate and foreign rate interacted with time trend	OLS on UIP and CIP	Hong Kong and Singapore results are close to full capital mobility. But UIP for Korea, Singapore, and Japan are positive but small (far from unity). There is some evidence of growing yen influence in the financial markets and on the exchange rate policies in East Asia.
Chinn and Frankel (1995)	Influence of US and Japan on real interest rates in the Pacific counties	11 Pacific Asia countries monthly data from 1982:3 - 1992:1	US - 3-month Eurodollar rate; Hong Kong and Malaysia - 3-month interbank deposit rate; Indonesia- 1-m interbank deposit rate; Korea-3-m bond rate; Singapore - 3-m banker's acceptance; Thailand- call money rate.	Cointegration (bi and trivariates of the interest rate pairs) and error correction model		High economic integration in the region, when integration is defined as the presence of common stochastic trends in real interest rate. But real interest parity only holds with a few cases like Singapore and Taiwan.
Chung and Rhee (2002)	Estimate the linkages between the financial markets of Korea and the US, Japan, and other 6 East Asian countries	Hong Kong, Indonesia, Japan, Korea, Malaysia, Singapore, Taiwan, Thailand 1995-2001	Note: interest rates are from bond market.	GARCH-interpreting the time varying correlation coefficients estimated of 23 financial variables (which are interest rate, exchange rate, and stock price)		Interest rates of these countries are moving independently of one another. On the other hand, stock prices of these countries are moving more closely with the stock market of Japan.

Cheung, Chinn, and Fujii (2002)	Real and financial integration of greater China area	China, Hong Kong, and Taiwan, 1996:12 - 2002:06		ADF-GLS to test the stationary of series differentials (RID, UID, deviations from PPP)		These parity conditions tend to hold over longer periods. China and Hong Kong appear to experience high integration.
Cavoli, Rajan, and Siregar (2003)	Degree of financial integration	Monthly (also daily) data of Indonesia, Malaysia, the Philippines, Singapore, Thailand, Korea, China, and Hong Kong from 1995 - 2002	3-month commercial deposit rates	UID (other method is to investigate the equity markets within the region by testing correlation and Granger-causality).	To avoid the "peso problem" the authors excluding 1997 from the sample.	Absolute UIDs become significantly widening during the crisis period. Yet in the aftermath of the crisis these countries have strengthened the degree of financial integration among themselves which reflect across-the-board reduction in absolute UIDs, except Thailand
Anoruo, Ramchander, and Thiewe (2000)	Investigate the interest rate influence of the US and Japan in East Asia	Monthly data 1980-99 of Hong Kong, Indonesia, Malaysia, Philippines, Singapore, Korea, Thailand. From IFS	3-m treasury bill for Philippines, the US; 3-m Gensaki for Japan; 3-m interbank rate for HK and Singapore; money market rate for the rest	Multilateral cointegration and VECM. Separate countries into two groups: i only among 7 Asian countries, ii 7 countries + Japan, and US for each test.	Avoiding pre and post liberalization problem, they divide the sample 80-89 and 90-99	More cross-country interest rate linkages in 90s where Hong Kong and Singapore play an important, but not dominant, role in region. They serve as intermediaries between regional and the world.
Moosa and Bhatti (1997))	Are Asian market integrated with Japan? Examine UIP and PPP.	Hong Kong, Korea, Malaysia, Philippines, Singapore, and Taiwan: Quarterly 1980:1 - 1994:4	3-month deposit rate for Hong Kong and Malaysia; 3-month treasury bill rate for Taiwan, the Philippines, and Korea; 3-month deposit rate and 3-month Gensaki rate for Japan	Cointegration		Highly cointegrate in most country, except the Philippines, in the sense that long-run UIP exists.

Frankel, Schmukler, and Serven (2000, 2002)	Do exchange rate regime and foreign interest rate have effect on the local rate?	48 countries (developed and developing), including Hong Kong, Indonesia, Korea, Philippines, and Thailand	90-day money market rate when available or 30-day market rate.	Fixed effects, OLS, and ECM (for the later paper)		Fixed regimes exhibits higher transmission than flexible; but on a country specific level, especially in 1990s) reveals high (close to or equal one) transmission of international interest rate to domestic rate regardless of currency regime in 1990's.
Phylaktis (1995)	Investigate the real financial integration of the Pacific region following financial liberalization by looking at the speed of adjustment after shock US or Japan plays dominant role in financial market in Asia	Hong Kong, Korea, Malaysia, Singapore, Taiwan. Monthly data from 1970's - 1993:12.	90-day t-bill for US; 3-month Gensaki for Japan; 3-month regulated deposit rate for Hong Kong; and 3-month interbank rate for Singapore and Malaysia.	Cointegration of real interest rate. Divided sample size into two period 1970's - 1980 and 1981-1993.		Increasing in capital market integration with both US and Japan in 1980's. Japan has not, however, surpassed the US in dominating the market in the region (except in Malaysia). High degree of financial integration is found in Hong Kong, Singapore, and Taiwan.
de Brouwer (1999)	Testing relationship between international interest rates and the interest rates in Asia Pacific countries	3-month HIBOR rate for Hong Kong; 1-month interbank rate for Indonesia and Thailand; average daily rate on call rate for Korea; 3-month interbank rate for Malaysia and Singapore; 91-day treasury bill rate for the Philippines;		OLS for UIP; cointegration to look at the long-run relationships		Full sample, Hong Kong, Indonesia, Singapore, and Thailand are cointegrated with the US. In 1990's every country, except Korea and Indonesia, the local rate is cointegrated with the US rate with positive sign (except for Malaysia).

Zhou (1996)	Interest rate linkages among ASEAN The influence of Japan and the US on the interest rate linkages of Singapore, Malaysia, and Thailand	Quarterly data from 1970s-1994: short-term t-bill for the Philippines, short-term interbank rate for Indonesia, Malaysia, Singapore, and Thailand,		Cointegration tests on interest rates (bivariate and multivariate)	Assuming that the expected change in exchange rate is stationary; therefore, it has no effect on the existence of long run equilibrium relationship between the two non-stationary variables.	Find close interest rate linkages between Singapore - Malaysia, and Singapore-Thailand. Further results confirm that Singapore interest rate is exogenously of the interest rate of Singapore in both countries (the reverse does not hold).
Flood and Rose (2001)	Testing UIP	Using high frequency data: daily (weekly, monthly, and quarterly) of 23 countries (including Hong Kong, Indonesia, Korea, and Thailand) in 1990's	1-month bid rate from the euro market from Bloomberg.	OLS		UIP works better in the sense that it has correct sign (but far from unity as the theory implied). The heterogeneity across country does not show any specific relationships between exchange rate regime or country income.
Kim and Lee (2004)	Investigate whether choice of exchange rate regimes influences the sensitivity of domestic interest rate to US interest rate in East Asian countries.	Hong Kong, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, and Thailand (monthly data from 1987:1 – 2002:4)	90-day money market rate and 90-day US t-bill (IFS)	First difference equation that allows for regime-switching	Plus using lags of the first difference of local and foreign interest rates as instruments to deal with any possible endogenous explanatory variables.	The sensitivity to the US rate of Korea and Thailand has declined after they adopted floating exchange rate regime post crisis period (from 2.95 to – 0.29 for Korea and from 3.51 to 0.39 for Thailand). Malaysia results, however, do not yield any significant result which may cause by capital control. Conclusion, floating exchange rate regime gives greater independence in monetary policy than a pegged exchange rate. The coefficient responses to the base country of middle exchange rate regime, however, vary greatly form around zero for Singapore to 1 for the Philippines.

Shambaugh (2004)	How a fixed exchange rate affects by the interest rate movement in the base country.	Using 103 countries. Classification of exchange rate regime is by using actual behavior, not declared status.	Money market rate and treasury bill rate (annul data for pooled estimates and monthly data for individual country samples).	Several methods on the first differencing of local interest rates and foreign interest rates.	Methods: -Pooled OLS -Autoregressive distributed lags - cointegration	The pegged exchange rate regime follows the base country interest rate more than nonpegs.

CHAPTER 4

METHODOLOGY AND DATA

4.1 METHODOLOGY

The major goal of this study is to establish the empirical regularities concerning the links between the East Asian local interest rates and foreign interest rates, as well as intra regional integration in East Asia. A major factor in this study is the coefficients of foreign interest rates, which indicate the degree of integration. Previous studies found a vast array of degrees of capital openness depending on the data set, methodology, and timeframe used in the empirical analyses. On average, the estimates of foreign influences on the local interest rates by standard regressions in level (Frankel, 1999; Chinn and Frankel, 1994; Hausman et al., 1999; Frankel, 1999; and Frankel et al., 2000) are very high regardless of the exchange rate regime. There are mixed results, however, on the degree of capital openness when measuring the first difference. There are no "correct" techniques or methods in determining the effect of foreign interest rates on the local rate. As a result, I employ both approaches in the analysis with a series of robustness checks for the sensitivity and stability of the coefficients of foreign interest rates.

I base my methodology upon the UIP framework similar to the Edwards-Khan approach where both capital openness and domestic macroeconomic variables, through money demand function, are taken into consideration. I first discuss the time series issue that might validate or invalidate each method. The next section focuses on international integration and the last section concentrates on intra regional integration.

TIME SERIES ISSUES

The measurement in level of capital mobility has been widely used in empirical studies on financial integration even in the most recent papers (see Chinn and Frankel, 1994; Hausman et al., 1999; and Frankel et al., 2000). The major setback of this type of estimation is its accuracy when the issues of time series arise. Most financial time series data tend to be nonstationary most of the time. Running regressions of pairs of independent unit root processes can lead to a spurious problem that mislead us to interpret that a meaningful relationship among variables exists when in fact all that is obtained is just contemporaneous correlations rather than meaningful casual relationships. Moreover, t- and F-statistics do not have standard normal distributions in this case; therefore, the usual statistical inference is invalid. Granger and Newbold (1974) demonstrate that the OLS estimates of two independent integrated series yield high R^2 and low Durbin-Watson statistics.[20] Yet, the regression in level of the two nonstationary variables can yield meaningful long run relationships if these two variables are cointegrated and, thus, the regression residuals are stationary.

The most recent trend in measuring capital openness tends to move away from the level estimate because of complications from the nonstationary in most macroeconomic variables. A typical recommended remedy for such a problem is by differencing the data to make it stationary. Then, the standard OLS regression is now a consistent estimate. Nevertheless, differencing is not a panacea for unit root problems because the valuable long-run relationship given by the levels might be lost if the two nonstationary series are in fact cointegrated.

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[20] A good rule of thumb that flags a possibility of spurious regression problem is when R^2 is much greater than the Durbin-Watson statistic.

Another approach that has become increasingly popular is to apply the Autoregressive-Distributed Lag (ADL) model and manipulate it as the error-correction form. This method allows a long-run equilibrium relationship among variables regardless of whether they are integrated of the same order or not.[21] This type of an analysis is beyond the scope of this dissertation.

It would be less problematic if the level and the difference estimates produce the same conclusion, but most of the time different methods yield different answers. Therefore, I keep the advantages and disadvantages of different methodologies in mind and proceed to the main analysis by employing the two approaches in order to make comparable estimates with the previous empirical results on the degree of capital openness.

Before examining the linkages of interest rate relationships, I employ unit root tests and the cointegration tests on the interest rate series of the core ASEAN (Indonesia, Malaysia, the Philippines, Singapore, and Thailand), Hong Kong, Korea, and the US. The unit root tests applied are the Augmented Dickey-Fuller (ADF) and the Philips-Peron (PP) tests. It is not constructive to perform the tests to the whole sample period because the data corresponds to both fixed and flexible exchange rate regimes. Switching in the exchange rate regimes is likely to cause a structural break in the series. As a result, the unit root tests tend to reject the non-stationarity hypothesis. I will apply the Johansen tests (traces statistics and maximum-eigenvalue) for the cointegration relationship between the non-stationary pair. If such a stationary linear combination exists, the non-stationary time series are said to be cointegrated and may be interpreted as a long-run equilibrium relationship among the variables. The standard theory suggests that it is more

[21] See Pesaran, Shin, and Smith (2001) for further specification.

likely for a fixed exchange rate country to be cointegrated with the base interest rate than for nonpegs.

4.1.1 INTERNATIONAL INTEGRATION

I) ESTIMATE IN LEVELS

A starting point is a standard UIP framework derived from equation (2.11); however, I allow the risk premium to differ from zero:

$$i_t^{local} = c + \beta[i_t^{world} + E_t(s_{t,t+k} - s_t)] + \gamma' D_t + \varepsilon_t, \qquad (4.1)$$

where i_t^{local} represents the domestic nominal interest rate at time t; i_t^{world} is the international interest rate; $s_{t,t+k}^e$ and s_t are the expected future spot exchange rates at time $t+k$ and spot exchange rate at time t; c is a risk premium or country specific effect; and D_t is a set of dummy variables representing the financial crises, covering the period from July 1997 to December 1998.

To measure equation (4.1), I implicitly imply that the local interest rate is small enough that it can take the world interest rate as exogenous. As Borensztien, Zettelmeyer, and Philippon (2001) argue, it is not likely for a small country to exhibit a reverse causality effect on a much larger base country like the United States. There may be common shocks, however, that affect both the local and the base country, leading to potential endogeneity problems. On a broader issue, most economies in East Asia are closely linked with the US by trade connections. As a result, these countries and the US tend to have synchronized business cycles. What appears to be a high correlation between the local and the base country interest rates may be due to monetary responses

(via monetary response functions) to the shocks - indeed such correlation does not reflect the genuine response of the local interest rate reaction to the shocks in the base country.

By recognizing the possibility of such potential problems, I proceed with the analysis. Nevertheless, there is a possibility of heteroskedastic and serial correlations, and my coefficients from OLS are still consistent estimates, but with incorrect statistical inference.[22] With such potential problems, I use the Newey-West consistent estimate of standard errors for all of my measures.

The difficulty to estimate equation (4.1) empirically is that the expectation of future spot exchange rate is not observable; therefore, I apply three assumptions to proxy the expectation of the future exchange rate behavior:

a) static expectations $E(s_{t+k} - s_t) = s_t - s_t$;

b) perfect foresight $E(s_{t+k} - s_t) = s_{t+k} - s_t$;

c) extrapolative expectations $E(s_{t+k} - s_t) = s_t - s_{t-1}$.

The estimated equations after applying different expectation assumptions are

$$i_t^{local} = c + \beta i_t^{world} + \gamma' D_t + \varepsilon_t . \tag{4.1.1}$$

$$i_t^{local} = c + \beta[i_t^{world} + (s_{t+k} - s_t)] + \gamma' D_t + \varepsilon_t . \tag{4.1.2}$$

$$i_t^{local} = c + \beta[i_t^{world} + (s_t - s_{t-1})] + \gamma' D_t + \varepsilon_t . \tag{4.1.3}$$

Besides these expectation assumptions, forward exchange rates and survey data have also been used as proxies for the expected future spot exchange rate, notably in highly developed financial markets. These two data sets, however, are difficult to obtain or unavailable for most developing countries. These two data sets have weak spots of

[22] Both heteroskedasticity and autocorrelation problems result in misleading statistical inferences, even when utilizing a large sample size.

their own. For example, the MAS (1999) uses currency survey data from the Economist Intelligence Unit (EIU) to replicate market expectations of the changes in exchange rates in Indonesia, Malaysia, the Philippines, and Thailand during the financial crisis. It finds that the participants tend to commit systematic forecast errors.

Similar to Frankel et al. (2000, 2002), I have included the crisis dummy variables; however, my dummies cover a longer period, from July 1997 to December 1998, in order to avoid the "peso problem." I suspect, however, that most financial data have experienced structural breaks after the crises. Most of these countries have changed or adjusted their exchange rate regimes from pegged to floating or to a more flexible exchange rate (see Appendix 3), except Malaysia and Hong Kong, in the post-crisis period. Even now there are ongoing debates about how to categorize the exchange rate regime classification either by an official statement, *de jure*, like the IMF version or by replicating the actual behavior of the exchange rate regime, *de facto*, like the Reinhart-Rogoff approach.[23]

Therefore, I should not expect macroeconomic variables, as well as other country specific risk factors, to remain constant after changes in the exchange rate regime. In addition, changes in the rigidity of capital controls (see Appendix 2. for a measure of capital controls coded at Claremont Graduate University using the methodology developed by Quinn) should be expected to influence the degree of interest rate interdependence. It would be ideal to model the interaction of capital controls index with the base rate similar to Shambaugh's methodology. However, the index is only available at the annul frequency.

[23] See Willett and Kim (2004) for criticism of the Reinhart – Rogoff type of classification.

It makes more sense to separate the whole data sample into two sub-periods and reestimate the equations (4.1.1) – (4.1.3) without the dummy variables. The pre-crisis period begins January 1990 and ends one month before the July 1997 financial crisis in Thailand. The post-crisis period starts only after the volatility in these economies has been subsided after January 1999.[24] It will now be possible to distinguish the effects of foreign influences on the local interest rates between the two periods.[25]

The preliminary findings indicate that the results from both perfect foresight and extrapolative expectation assumptions experience too much noise for the changes in the exchange rate. Hence, from now on my main focus remains on the estimated equation under static expectation assumptions. Further discussion on this issue will be explored more closely in the next chapter.

In equation (4.1.1), I am imposing a long-run relationship of the interest rate in the system. What would the interest rate relationship be if I allowed short-term adjustments to the system? As a robustness check, I allow partial adjustment of the dependent variable on the right hand side of the equation. Although it may be difficult for a country to insulate the fluctuation of world interest rates in the long-run, it is possible to do so in the short-run. Thus, the measurement in the short-run should be able to capture the policy reactions of my interest.

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[24] Note that Kim and Lee (2004) estimate time varying for structural breaks in interest rate data and find that only Malaysia, Korea, and Thailand have had a break in the data.

[25] Alternatively, I can use dummy variable to indicate pre and post-crisis period and re-estimate the following equation: $i_t^{local} = c + \gamma d_t + \beta i_t^{world} + \mu(d_t \times i_t^{world}) + \varepsilon_t$

where d_t =1 for observations in 1997:07-2003:06

= 0, otherwise (i.e., for observations in 1990:01-1997:06).

γ is the differential intercept and β_2 is the differential slope coefficient, indicating by how much the slope coefficient of the world interest rates post-crisis period differs from that of the pre-crisis period.

$$i_t^{local} = c + \beta i_t^{world} + \varphi i_{t-1}^{local} + \varepsilon_t, \tag{4.2}$$

So, in the long-run the relationship between domestic and foreign interest rates is $\beta/1-\varphi$.

Besides allowing a partial adjustment of the dependent variable, it is more realistic to put no restrictions on the number of lag dependent variables to allow a full dynamic adjustment process. The number of lags should be sufficiently long enough to allow short-term dynamic movements because too few lags can reduce forecast accuracy. Too many lags, however, pose constrains on the degree of freedom, as well as reduce the power of the test.[26] The specific number of lag for each country will be determined by Akaike information criterion (AIC) and Bayes information criterion (BIC).

$$i_t^{local} = c + \sum_{j=0}^{k} \beta_j i_{t-j}^{world} + \sum_{j=1}^{q} \varphi_j i_{t-j}^{local} + \varepsilon_t, \tag{4.2.1}$$

One caveat, however, is the dynamic adjustment is not a problem free solution because there may be a high correlation between current and lags values of a variable.[27]

INTERNATIONAL INTEGRATION WITH DOMESTIC CONTROL VARIABLES

Since most of the East Asian countries are neither totally open nor totally closed economies, it is likely that both foreign interest rates and domestic macroeconomic variables may influence the domestic rate of interest. Therefore, I employ the Edwards – Khan approach in combining the two notions of perfect capital mobility under UIP with a closed economy model where capital mobility is strictly prohibited. The domestic

[26] Adding additional lags will reduce the sum of squares of the estimated residuals. Ideally, the AIC and BIC should be as small as possible. Of the two criteria, the BIC has superior large sample properties. See Stock and Watson (2003) for further discussion on lag length selection.

[27] This is multicollinearity problem (high R^2, but imprecise coefficient estimates and low t- values, even thought the model is correctly specified).

control variables enter the model via the money demand function, as discussed in Chapter 2 (equation (2.3)). The new estimated equation of my interest is equation (2.20) where the local interest rate is a function of both foreign interest rates and domestic variables:

$$i_t^{local} = c + \beta i_t^{world} + \gamma_1 y_t + \gamma_2 m_{t-1} + \gamma_3 \pi_t^e + \varphi i_{t-1} + \varepsilon_t. \qquad (4.3)$$

where y represents the log of real income; m represents the log of real money balances; π^e represents the expected rate of inflation.

There is a possibility of multicolinearlity problems between the right-hand side variables, especially between real income and real money supply. For the sensitivity check, I will drop the real income variable. I choose to drop the real income variable instead of the money supply because the money supply series contains a more complete set of data than the real income series.

For the sensitivity check, I allow dynamic adjustment of domestic macroeconomic variables and the dependent variable in the short-run. As in the previous case, the number of lags length will be determined by AIC – BIC criteria.

$$i_t^{local} = c + \sum_{j=0}^{k} \beta_j i_{t-j}^{world} + \sum_{j=0}^{m} \gamma_{1j} y_j + \sum_{j=1}^{n} \gamma_{2j} m_{t-j} + \sum_{j=0}^{p} \gamma_{3j} \pi_{t-j}^e + \sum_{j=1}^{q} \varphi_j i_{t-j}^{local} + \varepsilon_t. \qquad (4.3.1)$$

II) ESTIMATION IN DIFFERENCES

From the UIP framework, I can manipulate and express equation (4.1) in difference notation as:

$$\Delta i_t^{local} = c + \beta \Delta i_t^{world} + \varepsilon_t \qquad (4.4)$$

Equation (4.7) demonstrates that the changes in local interest rates should equal the changes in the base rates if a country has a credible fixed currency. Similarly the

constant term can be considered as a difference in risk premium. Shambaugh (2004) demonstrates several possibilities of β to deviate from one. The expected foreign coefficient in differences is similar to the analysis in the levels where the coefficients of foreign interest rates reflect how fast the domestic interest rates respond to the changes in foreign interest rates.

Equation (4.8) imposes long-run restrictions between the local and foreign interest rates. I am utilizing monthly frequency, however, that may not factor in dynamic adjustment, which can vary across countries. The new estimated equation is

$$\Delta i_t^{local} = c + \sum_{j=0}^{k} \beta_{1j} \Delta i_{t-j}^{world} + \sum_{j=1}^{n} \varphi_j \Delta i_{t-j}^{local} + \varepsilon_t \qquad (4.4.1)$$

INTERNATIONAL INTEGRATION WITH DOMESTIC CONTROL VARIABLES

The next sensitivity check is to determine whether the domestic control variables have any influences on the domestic interest rate determination. Analogous to equations (4.3) and (4.3.1), the estimates in difference with domestic variables are

$$\Delta i_t^{local} = c + \beta \Delta i_t^{world} + \gamma_1 \Delta y_t + \gamma_2 \Delta m_{t\text{-}1} + \gamma_3 \Delta \pi_t^e + \varepsilon_t . \qquad (4.5)$$

$$\Delta i_t^{local} = c + \sum_{j=0}^{k} \beta_{1j} \Delta i_{t-j}^{world} + \sum_{j=0}^{m} \gamma_{1j} \Delta y_{t-j} + \sum_{j=1}^{n} \gamma_{2j} \Delta m_{t\text{-j}} + \sum_{j=0}^{p} \gamma_{3j} \Delta \pi_{t-j}^e + \sum_{j=1}^{q} \varphi_j \Delta i_{t\text{-j}}^{local} + \varepsilon_t . \qquad (4.5.1)$$

4.1.1 INTRA REGIONAL INTEGRATION

I) ESTIMATION IN LEVELS

A productive way to measure interest rate linkages among the non-financial centers in Asia is to introduce other regional interest rates to the model (4.1.1).

$$i_t^{local} = c + \beta_1 i_t^{world} + \beta_2 i_t^{regional} + \varepsilon_t \quad (4.6)$$

To capture any possibility of common shocks between the local and the regional interest rates by the third economy, the world interest rate is left in the model. Since both the regional and the local economies are relatively small, this may lead to an endogeneity problem where the classical OLS is an inconsistent estimate. Therefore, extra caution is required when interpreting the regressions results from equation (4.6). On the other hand, Hong Kong and Singapore interest rates are highly correlated with the US rates, by including either one of these countries as a regional reference will likely introduce the multicolinearlity problem. My main concern at this time, therefore, will focus exclusively on the interest rates from other non-financial center countries in East Asia.

Each subsection in this part follows the same pattern as in the previous section. Next, I allow any lag dependent to enter the equation.

$$i_t^{local} = c + \beta_1 i_t^{world} + \beta_2 i_t^{regional} + \varphi i_{t-1} + \varepsilon_t \quad (4.7)$$

$$i_t^{local} = c + \sum_{j=0}^{k} \beta_{1j} i_{t-j}^{world} + \sum_{j=0}^{l} \beta_{2j} i_{t-j}^{regional} + \sum_{j=1}^{n} \varphi_j i_{t-j}^{local} + \varepsilon_t \quad (4.7.1)$$

INTRA REGIONAL INTEGRATION WITH DOMESTIC CONTROLS VARIABLE

The next step is to apply the Edwards-Khan approach according to equation (2.20) in chapter 2 where the domestic interest rate determination depends on both foreign interest rates and the domestic variables.

$$i_t^{local} = c + \beta_1 i_t^{world} + \beta_2 i_t^{regional} + \gamma_1 y_t + \gamma_2 m_{t-1} + \gamma_3 \pi_t^e + \varphi i_{t-1} + \varepsilon_t \quad (4.8)$$

The main difference between equation (4.3) and the equation (4.8) is the additional interaction of the local interest rates with the regional interest rates. Following

the same pattern, I check for the sensitivity of estimated coefficients of foreign interest rates by allowing for dynamic adjustment of the model.

$$i_t^{local} = c + \sum_{j=0}^{k} \beta_{1j} i_{t-j}^{world} + \sum_{j=0}^{l} \beta_{2j} i_{t-j}^{regional} + \sum_{j=0}^{m} \gamma_{1j} y_{t-j} + \sum_{j=1}^{n} \gamma_{2j} m_{t-j} + \sum_{j=0}^{p} \gamma_{3j} \pi_{t-j}^{e} + \sum_{j=1}^{q} \varphi_j i_{t-j}^{local} + \varepsilon_t. \quad (4.8.1)$$

II) ESTIMATION IN DIFFERENCES

This section follows the same pattern as in the first section by examining the various relations between changes in the local interest rates and the changes in foreign interest rates.

$$\Delta i_t^{local} = c + \beta_1 \Delta i_t^{world} + \beta_2 \Delta i_t^{regional} + \varepsilon_t \quad (4.9)$$

Note that the equation (4.9) does not contain a lag dependent variable in the system. The next equation is the dynamic process of the equation (4.9)

$$\Delta i_t^{local} = c + \sum_{j=0}^{k} \beta_{1j} \Delta i_{t-j}^{world} + \sum_{j=0}^{l} \beta_{2j} \Delta i_{t-j}^{regional} + \sum_{j=1}^{n} \varphi_j \Delta i_{t-j}^{local} + \varepsilon_t \quad (4.9.1)$$

The last part is the regression when domestic variables enter the models.

$$\Delta i_t^{local} = c + \beta_1 \Delta i_t^{world} + \beta_2 \Delta i_t^{regional} + \gamma_1 \Delta y_t + \gamma_2 \Delta m_{t-1} + \gamma_3 \Delta \pi_t^{e} + \varphi \Delta i_{t-1}^{local} + \varepsilon_t \quad (4.10)$$

$$\Delta i_t^{local} = c + \sum_{j=0}^{k} \beta_{1j} \Delta i_{t-j}^{world} + \sum_{j=0}^{l} \beta_{2j} \Delta i_{t-j}^{regional} + \sum_{j=0}^{m} \gamma_{1j} \Delta y_{t-j} + \sum_{j=1}^{n} \gamma_{2j} \Delta m_{t-j} + \sum_{j=0}^{p} \gamma_{3j} \Delta \pi_{t-j}^{e} + \sum_{j=1}^{q} \varphi_j \Delta i_{t-j}^{local} + \varepsilon_t. \quad (4.10.1)$$

4.2 DATA

During the last decade of the twentieth century, economies in East Asia transformed drastically as a result of financial development and trade liberalization; therefore, the characteristics of these financial markets might behave differently after 1990. Therefore, the study—examining monthly data from January 1990 to June 2003—focuses on five members of the Association of South East Asian Nations (ASEAN)[28]: Indonesia, Malaysia, the Philippines, Singapore, and Thailand, as Well as Hong Kong and Korea. The main criteria in selecting a group of countries depend not only upon their similarity in financial progress, though some might be more advanced than others, but also on their geographical proximity. For a proxy of world interest rates, I use interest rates of similar maturity in the US and Japan since both countries' economies are intertwined in both trade and finance with the East Asian nations. The regression makes sense only under the assumption that the international interest rate is exogenously determined to the local rate - the local interest rate has no influence on the world rate. It is a reasonable assumption for a large economy like the US or Japan; however, I should approach the analyses with caution for smaller countries like Hong Kong and Singapore.[29]

My main source of interest rates and macroeconomic variables are derived from the *International Financial Statistic* (IFS) of the International Monetary Fund (IMF), otherwise indicated. Since I am interested in monetary integration, interest rates should

[28] In addition to the core 5 countries in ASEAN, there are 4 more countries in the association, which are Brunei, Cambodia, Myanmar, People Republic of Laos, and Vietnam. Financial development in other members of ASEAN is still in the early stage of development. Thus, it is not constructive to include these countries in my analysis.

[29] Results by Anoruo, Ramchander, and Thiels (2002) and Zhou (1996) indicate that there is one way causal relation from either Hong Kong or Singapore to other non-financial center in East Asian.

be market determined with the same maturity and definition of assets. Most of the financial markets in East Asia have been heavily dominated by bank-based systems where commercial banks are the prime lenders and distributors of financial assets. It is natural to think that the bank-lending rate is an ideal interest rate that should capture financial characteristics in these countries. However, the lending rate has been heavily regulated by the central bank, thus making the market determined lending rate unobservable (see Chinn and Dooley, 1995). Therefore, I employ 1-month interbank rates or call rates, whichever are available, as the best alternative for market determined interest rates. There are several missing values of Hong Kong interest rates; therefore, 3-month Hong Kong interbank offered rate (HIBOR) obtained from the Hong Kong Monetary Authority (HKMA) is employed. In addition, I use a 3-month Singapore interbank offered rate (SIBOR) from Monetary Authority of Singapore (MAS).

Figure 1 contains time-series of monthly interest rates of all countries in my study. Here the currency crisis is represented as spikes in the interest rate. The spikes of interest rates appear particularly obvious during the Asian crisis of 1997 for every country except Japan, Singapore, and the US. The drastic increases in interest rates indicate that these countries indeed utilized interest rates more aggressively to defend their exchange rates. There is a clear indication of a breaking in trend of interest rate series in Korea, Malaysia, and Thailand, where the rates of interests during the post-crisis period are low and relatively calm. Moreover, interest rates in Hong Kong, Singapore, and the US exhibit a sharp drop after 2000.

Table 2
Interest rate correlations

a) Whole period from 1990:1 – 2003:6

	HKG	IDO	KOR	MAL	PHI	SGP	THA	USA
HKG	1							
IDO	0.47	1						
KOR	0.4	0.22	1					
MAL	0.37	0.36	0.83	1				
PHI	0.35	0.15	0.49	0.52	1			
SGP	0.81	0.15	0.41	0.25	0.27	1		
THA	0.56	0.38	0.79	0.73	0.43	0.49	1	
USA	0.8	0.13	0.42	0.26	0.27	0.99	0.5	1

b) Pre-crisis: 1990:01-1997:06

	HKG	IDO	KOR	MAL	PHI	SGP	THA	USA
HKG	1							
IDO	0.48	1						
KOR	0.19	0.18	1					
MAL	-0.28	0.13	0.25	1				
PHI	-0.09	-0.04	0.23	0.17	1			
SGP	0.95	0.52	0.19	-0.34	-0.12	1		
THA	0.66	0.53	0.21	-0.04	-0.09	0.66	1	
USA	0.95	0.52	0.21	-0.34	-0.12	0.99	0.65	1

c) Post-Crisis: 1999:01-2003:06

	HKG	IDO	KOR	MAL	PHI	SGP	THA	USA
HKG	1							
IDO	0.20	1						
KOR	0.84	0.32	1					
MAL	0.18	0.87	0.44	1				
PHI	0.70	0.41	0.82	0.46	1			
SGP	0.98	0.09	0.81	0.06	0.71	1		
THA	0.10	0.38	0.30	0.51	0.33	0.08	1	
USA	0.97	0.09	0.82	0.07	0.74	0.99	0.12	1

Table 2 represents a simple correlation of interest rate relationships from the whole sample size among these countries. The most notable relationship is that the US interest rate seems to have a high correlation with both interest rates of Hong Kong and Singapore while such close relationships are not present between the US and any other countries in the region. The interest rate relationships among the East Asians, however, appear to confine within Korea, Malaysia, and Thailand.

The correlations of interest rates of the whole sample period from table above might give a misleading interpretation in several ways. For example, by analyzing the correlations during the pre-crisis and post-crisis periods, the correlations among Korea, Malaysia, and Thailand are much less than the numbers suggested by the panel (a). This indicates that such high correlations found among these three countries under the whole period may be caused by similar responses by these countries to the crisis. Yet, Malaysia shows much better connections with other countries in the regional, especially with Indonesia, during the post-crisis period. Similarly, the interest rates in Korea and the Philippines seem to correlate more with other countries after the crisis, especially since the correlation between these two countries has increased roughly four times.

Interestingly, the countries that have relatively high correlations with the US interest rates in the pre-crisis period become less correlated while the countries that have less connection with the US interest rates during the same period seem to have a much closer linkage with the US in the post-crisis period, excluding Malaysia. This phenomenon cannot be explained by their exchange rate regime since Indonesia, Korea, the Philippines, and Thailand adopted the floating exchange rate after the crisis.

The money supply is represented by a narrow definition of the money base, M1, which includes only the currency in circulation and checking deposits. On the other hand, there is no monthly data for the gross domestic product (GDP), thus I use industrial production index as a proxy for domestic output, y. In addition, the expected inflation rate and expected rate of currency depreciation are not observable. I invoke rational expectations perfect foresight assumptions, the expected rate equals to the actual rate in the next period, and employ in the empirical estimations. The expected rate of inflation is taken as the one-period-ahead rate of inflation where the rate of inflation is measured by the consumer price index (CPI).

The plots of real income, inflation rate, and real money base are presented in Figure 2. There are similarities in the plots of real income and real money supply across countries because of a sudden break in the series during the crisis. The plot of Indonesia's real income, however, does not show a clear pattern of the break in the series. One possible explanation is that it is an oil exporting country. On the other hand, Indonesia is the only country that experienced a sharp spike in the inflation rate during the currency crisis followed by political turmoil in 1998. Yet, the Philippines is the only country that suffers the most substantial losses in its income as a result of the crisis.

The exchange rate, represented as the end of period series, is expressed as units of national currency per US dollar. Note that scales vary across different plots, as they do in all figures. The exchange rates of every country, except Hong Kong and Singapore, have noticeable breaks in their characteristics in each period. From Figure 3, while there are much greater exchange rate volatilities in Indonesia, Korea, and Thailand after they adopted the floating regime, the Malaysian ringgit does not fluctuate as it is pegged with

respect to the US dollar. For countries that are least effected by the crises like Hong Kong and Singapore, their exchange rates appear to adjust within a much smaller range.

Figure 4 combines the changes in the exchange rate, using perfect foresight assumptions, with the US interest rates, or the so-called foreign interest rates from UIP, and plots against the US interest rates itself. Figure 4 shows that the US interest rates adjusted to the expected changes in the exchange rate have much higher volatility than the US interest rates alone. It will not come as a surprise if the regressions with this kind of expectations assumption yield less sensible results because of the noises from the expected changes in the exchange rate. However, the visual plots of data are unclear and difficult to interpret; now I should proceed to more rigorous statistical analyses.

FIGURE 1
Interest Rate Data
(Percent per annual)

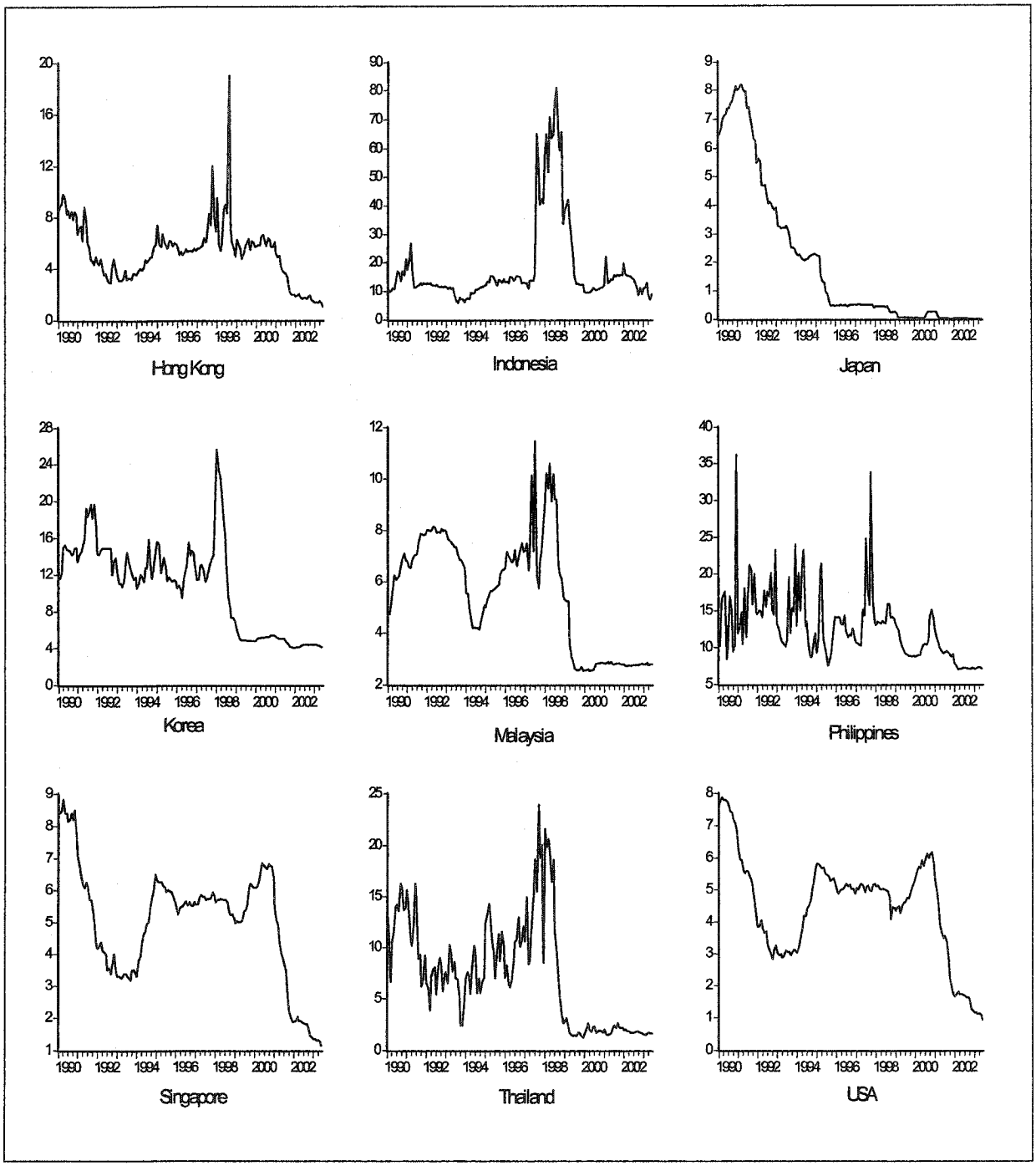
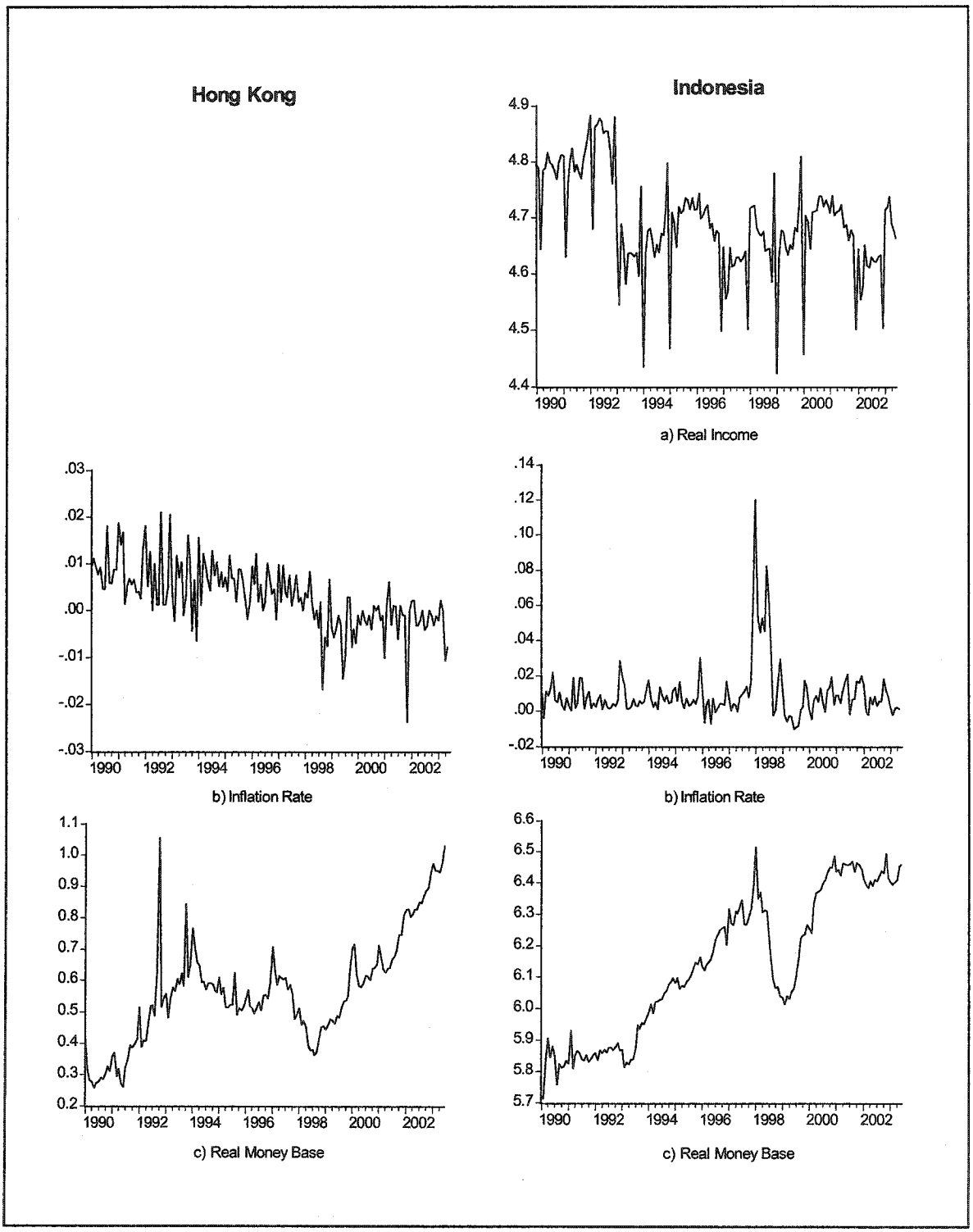
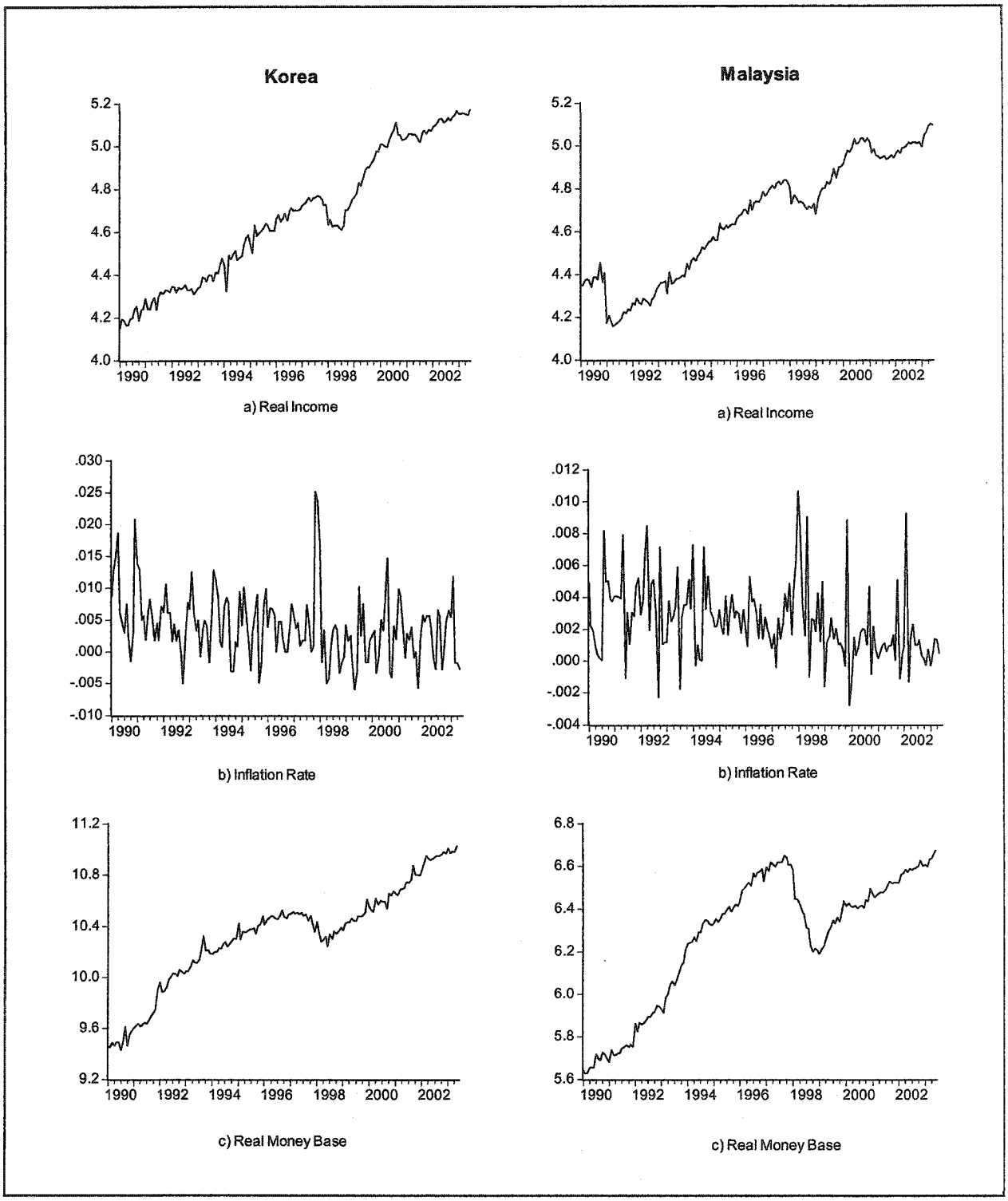
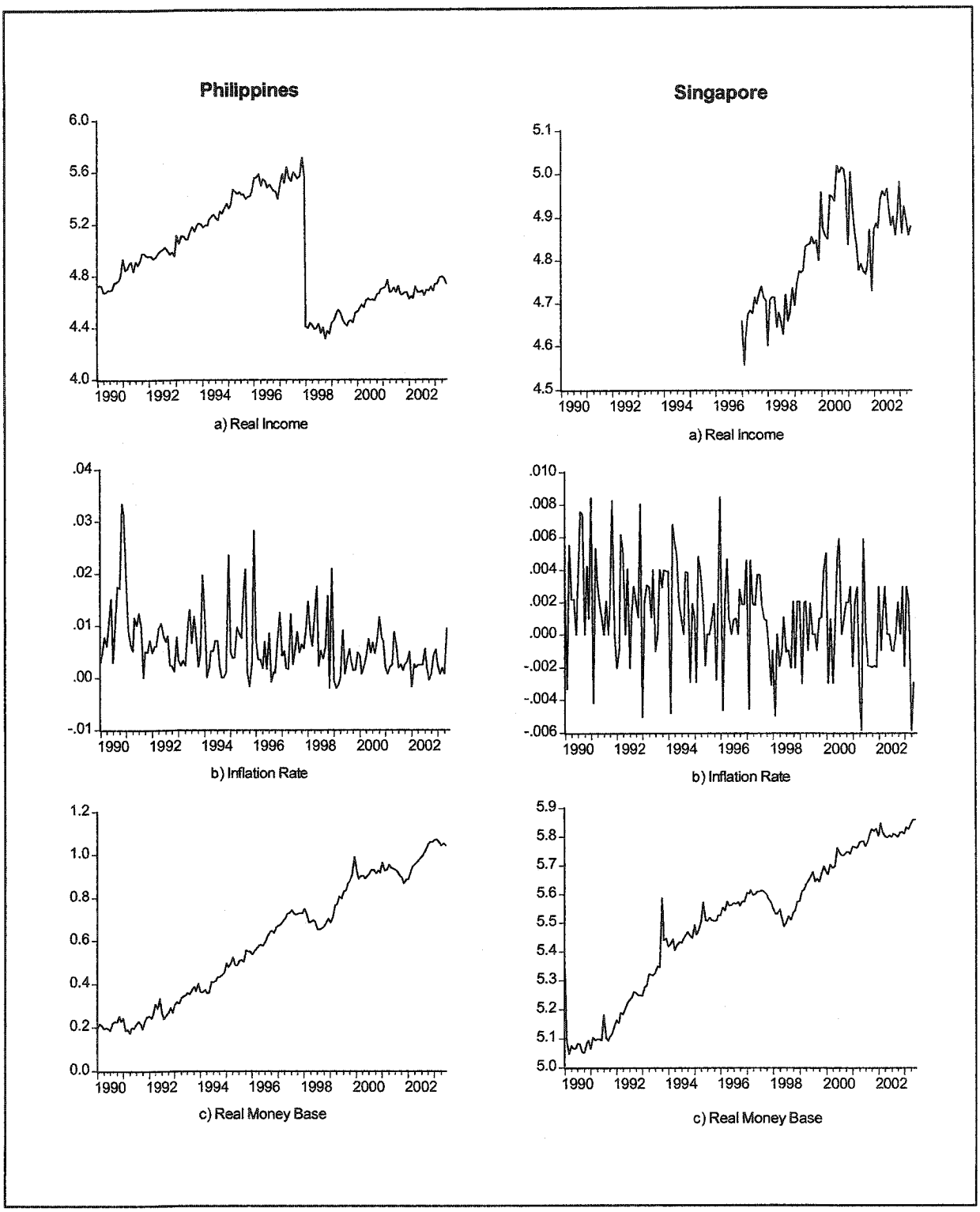


Figure 2
PLOTS OF DOMESTIC MACROECONOMIC VARIABLES
(In log term)







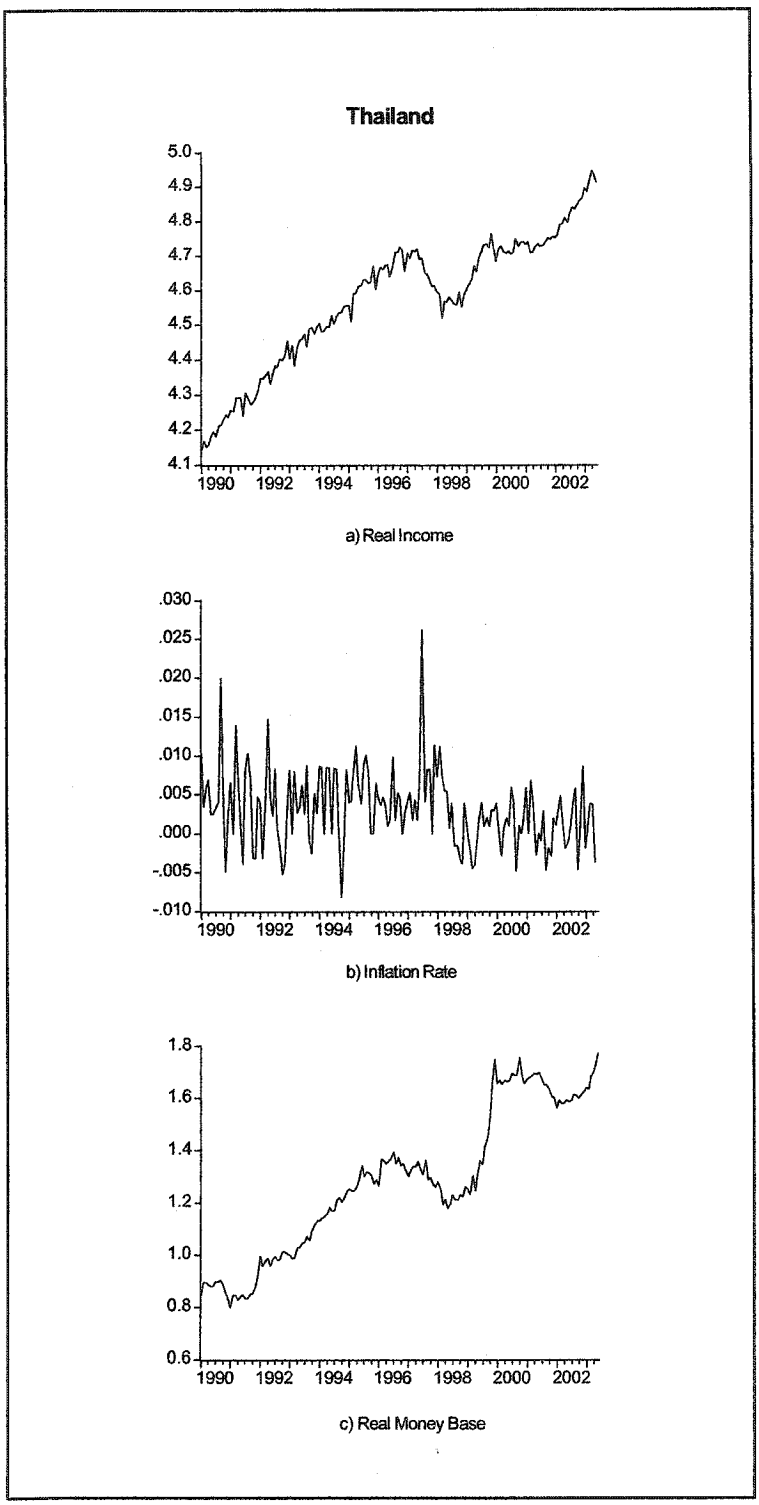


Figure 3
Exchange rate Data
(Units of local currency/ US dollar)

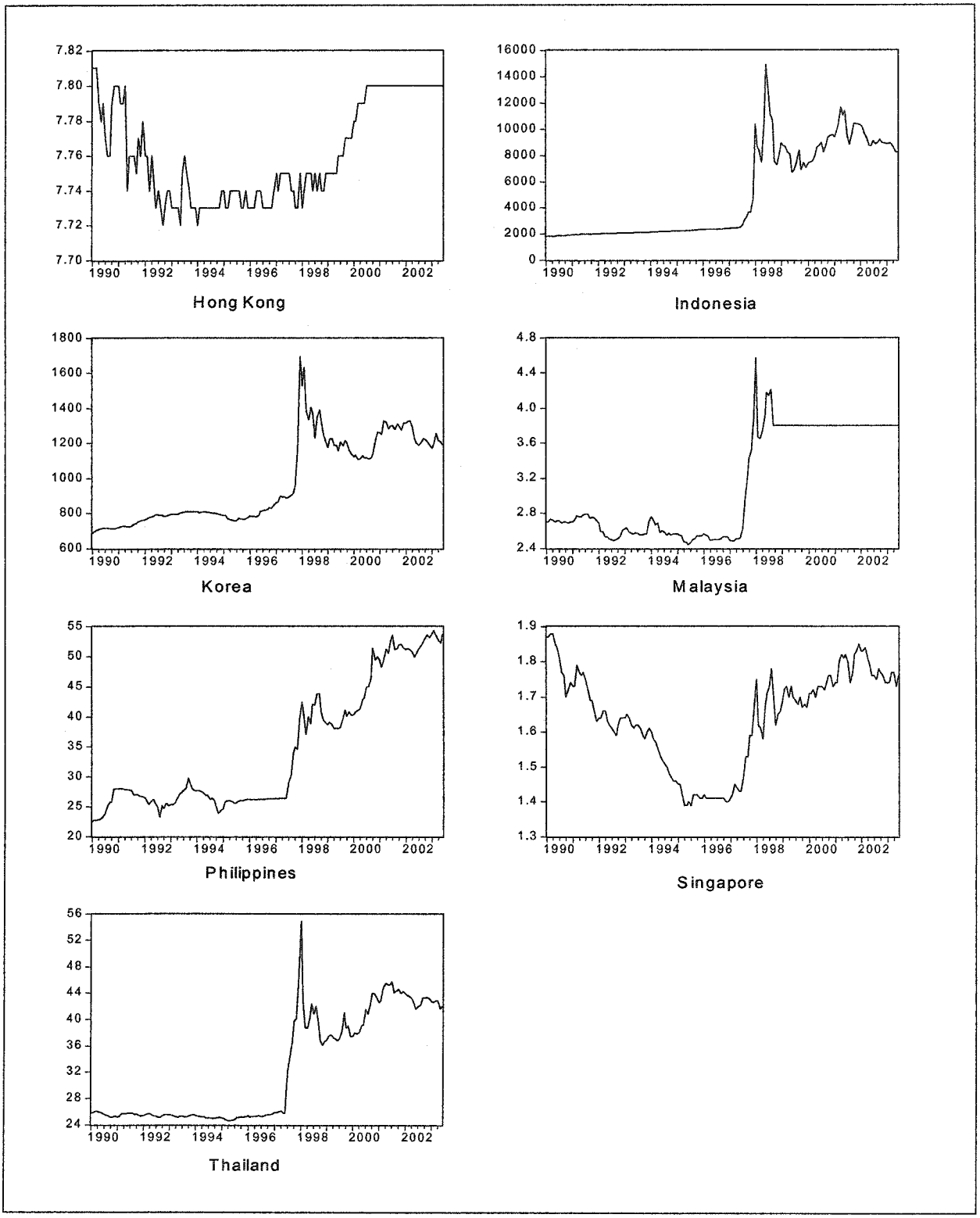
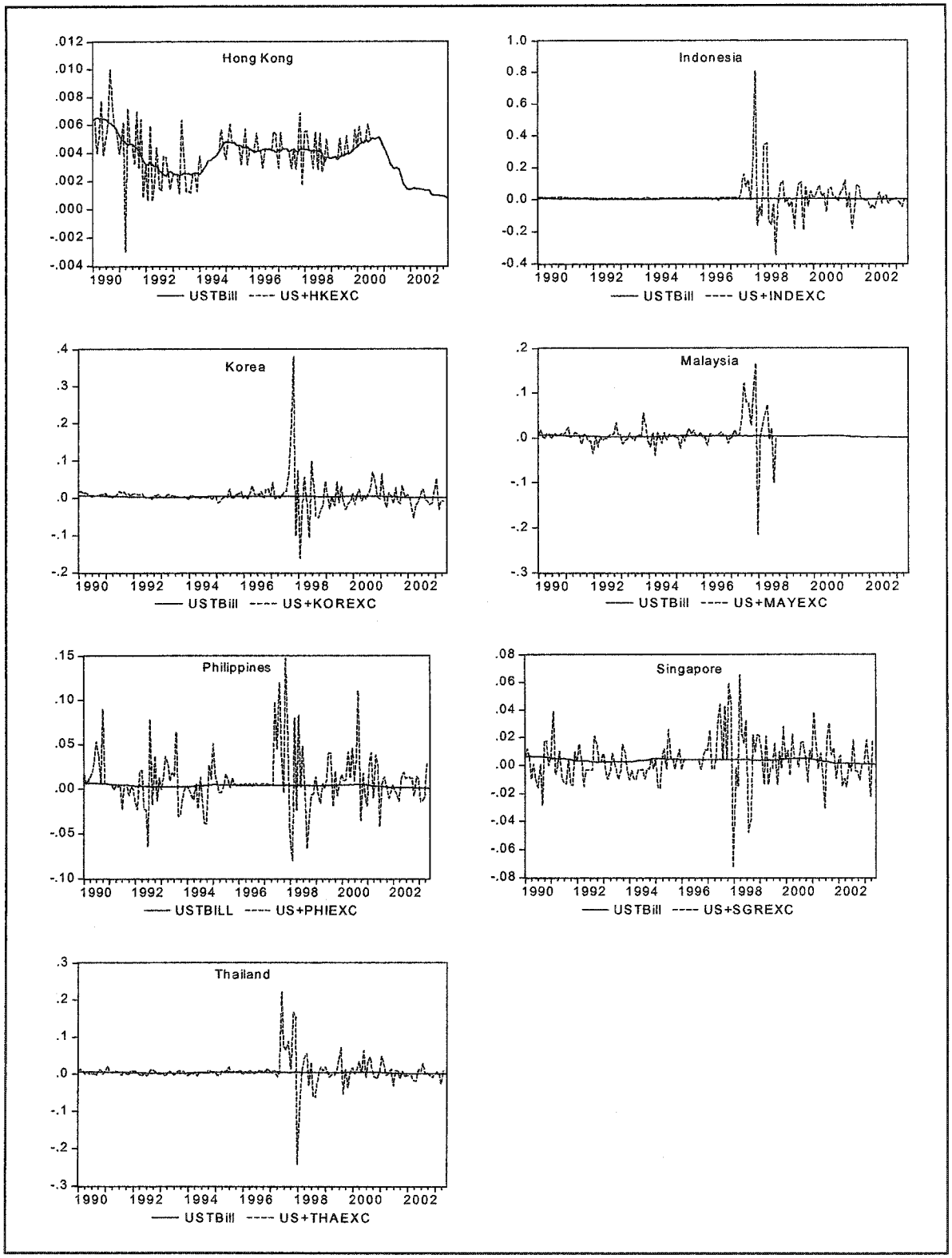


Figure 4
US T-Bill Rate Adjusted to Changes in Exchange Rate vs. US T-Bill Rate
(Percent per annual)



CHAPTER 5

EMPIRICAL RESULTS

Before a further examination of the regression specifications, it is useful to take a preliminary look at the descriptive statistics of the nominal interest rates, as provided in Table 3. Only miniscule changes can be observed in the mean and standard deviations for Hong Kong, Singapore, the United States, and Indonesia between the pre-crisis and post-crisis periods. The interest rates of Korea, Malaysia, Thailand, and the Philippines after the crisis, however, are much lower and less volatile; in fact the interest rates of Korea, Malaysia, and Thailand are so stable that they rarely change in the post-crisis

Table 3
Descriptive Statistics of the Nominal Interest Rates

Pre-Crisis: 1990:01-1997:06

	HKG	IND	KOR	MAY	PHI	SGR	THA	USA
Mean	5.449	12.438	13.464	6.630	14.072	5.432	9.436	4.899
Median	5.375	12.180	13.020	6.840	13.195	5.560	8.985	5.025
Maximum	9.812	26.900	19.700	10.100	36.210	8.810	16.260	7.870
Minimum	2.875	5.680	9.500	4.120	7.430	3.190	2.370	2.840
Std. Dev.	1.734	3.235	2.204	1.180	4.494	1.547	3.226	1.409
Jarque-Bera	5.944	73.652	12.913	1.668	141.587	3.281	2.331	3.061
Probability	0.051	0.000	0.002	0.434	0.000	0.194	0.312	0.216

Post-Crisis: 1999:01-2003:06 (*The post-crisis period in Indonesia is from 1999:07-2003:06.)

	HKG	IND*	KOR	MAY	PHI	SGR	THA	USA
Mean	3.922	12.543	4.705	2.877	9.211	4.017	1.833	3.581
Median	4.500	12.300	4.760	2.760	8.910	4.610	1.730	4.095
Maximum	6.625	22.060	6.350	5.290	15.060	6.840	3.090	6.180
Minimum	1.031	6.810	3.990	2.510	6.900	1.130	1.230	0.940
Std. Dev.	2.012	2.952	0.509	0.601	2.076	2.081	0.382	1.817
Jarque-Bera	6.927	7.160	2.657	385.378	9.201	6.081	13.697	5.626
Probability	0.031	0.028	0.265	0.000	0.010	0.048	0.001	0.060

period. Moreover, lower nominal interest rates of Malaysia and Thailand, in comparison with the US interest rates in the post-crisis period, implies that the monetary authorities in the two countries can pursue independent monetary policies. With the exception of Indonesia and the Philippines, the statistics indicate rapid convergence of nominal interest rates of the East Asian countries to the US interest rates in the post-crisis period. The next question is whether the convergence of interest rates in the post-crisis period indicates closer interest rate interconnections.

TIME SERIES ISSUES

The unit root tests are applied to the level of interest rate series of all countries in the study under the null hypothesis of a unit root against the alternative of stationary. The results are reported in Appendix 4. The ADF and PP tests fail to reject the null hypothesis of a unit root in the US, Hong Kong, and Singapore. While the null hypothesis can be rejected at the five percent significant level for Thailand in both periods, the tests suggest the presence of unit roots in the post-crisis period for Indonesia, Korea (the PP test finds the opposite result), and the Philippines, and in the pre-crisis period for Malaysia. The last column of Appendix 4 shows that the ADF tests on the first differences of the interest rate series are stationary in both periods for every country.

Appendix 5 presents the results of the Johansen cointegration tests and shows that only Singapore and the US interest rates are cointegrated in both periods. Hong Kong interest rates, however, are cointegrated with the US rates only in the pre-crisis period. With Korea as an exception, the test statistics suggest that there is no cointegration

relationship between US interest rates and the interest rates of Indonesia, Malaysia, the Philippines, and Thailand in the post-crisis period.

The results from these preliminary tests on the interest rates should be considered as a warning sign of potential problems that may arise from different methodologies due to the presence or absence of a unit root. If both variables are nonstationary and integrated with the same order, the cointegration test is an appropriate measure of the long-run relationships between the two variables. If there exists a unit root in one of the regression variables, the standard OLS estimate is more likely to yield spurious results. A general recommendation is to take first differences of the data and proceed with the OLS estimate. On the other hand, some remain skeptical about the conclusion drawn from the unit root tests because these tests generally suffer from downward bias results when the root of the series is close to, but less than, one.[30] The ADF and PP tests tend to accept the nonstationary hypothesis in favor of near stationary alternative.

5.1 INTERNATIONAL INTEGRATION

I. ESTIMATION IN LEVELS

1. EFFECT OF US ON LOCAL INTEREST RATE

The overall statistics of the previous section provide little evidence on interest rate correlations between the East Asian countries and the United States. Therefore, I will first estimate the sensitivity of the local interest rates to US interest rates with respect to different exchange rate expectation assumptions using the entire sample, as well as considering two sub-periods: January 1990 to June 1997 and January 1999 to June 2003.

[30] See Peron and Ng (1996) and DeJong et al. (1992) for further discussion on the weakness of the unit root tests.

Table 4

The effects of US interest rates on local interest rates with respect to different exchange rate expectation assumptions (in level)

a) Static expectations (equation 4.1.1)

		Hong Kong	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand
C	*Whole*	-7.41E-05 (0.0001)	0.010*** (0.002)	0.004*** (0.001)	0.002*** (0.0006)	0.008*** (0.001)	1.35E-5 (4.80E-5)	7.63E-05 (0.0009)
	Pre	-0.0002 (0.0002)	0.006*** (0.002)	0.010*** (0.001)	0.007*** (0.001)	0.013*** (0.002)	6.99E-5 (8.06E-5)	0.002 (0.001)
	Post	6.23E-05 (0.0001)	0.011*** (0.002)	0.003*** (7.9E-5)	0.002*** 0.000	0.005*** (0.0004)	-4.97E-5 (5.11E-5)	0.001*** (0.0001)
i^{US}	*Whole*	1.127*** (0.032)	0.401 (0.335)	1.187*** (0.344)	0.858*** (0.137)	0.725** (0.317)	1.109*** (0.014)	1.474*** (0.306)
	Pre	1.169*** (0.042)	1.186** (0.457)	0.323* (0.181)	-0.283** (0.113)	-0.379 (0.354)	1.092*** (0.021)	1.484*** (0.301)
	Post	1.074*** (0.051)	0.388 (0.754)	0.230*** (0.025)	0.022 (0.044)	0.846*** (0.187)	1.138*** (0.022)	0.025 (0.031)
Summary Statistics								
Num. Obs.	*Whole*	162	162	162	162	162	162	162
	Pre	90	90	90	90	90	90	90
	Post	54	54	54	54	54	54	54
Adj. R^2	*Whole*	0.950	0.871	0.304	0.632	0.162	0.987	0.516
	Pre	0.901	0.250	0.032	0.104	0.003	0.988	0.414
	Post	0.939	-0.011	0.667	-0.015	0.539	0.987	-0.004

Note: Robust standard errors are in parentheses. *, **, and *** indicate statistically significance at the 1%, 5%, and 10% levels respectively.

b) Perfect foresight (equation 4.1.2)

		Hong Kong	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand
C	*Whole*	0.002*** (0.0005)	0.011*** (0.001)	0.008*** (0.0007)	0.004*** (0.0004)	0.010*** (0.0006)	0.004*** (0.0003)	0.005*** (0.001)
	Pre	0.003*** (0.0004)	0.010*** (0.001)	0.011*** (0.0003)	0.006*** (0.0002)	0.012*** (0.001)	0.005*** (0.0003)	0.008*** (0.0005)
	Post	0.0003** (0.0001)	0.013*** (0.002)	0.004*** (0.00009)	0.002*** (6.51E-5)	0.008*** (0.0005)	0.003*** (0.0005)	0.002*** (6.63E-5)
i^{US}	*Whole*	0.646*** (0.111)	-0.021 (0.017)	0.030 (0.027)	0.007 (0.016)	-0.013 (0.011)	0.010 (0.012)	0.019* (0.014)

	Pre	0.448*** (0.100)	0.075* (0.055)	0.003 (0.0189)	0.001 (0.009)	-0.015 (0.014)	0.004 (0.015)	0.024*** (0.004)
	Post	0.961*** (0.040)	-0.021* (0.014)	0.006*** (0.002)	0.021 (0.044)	0.001 (0.008)	0.025** (0.013)	-0.0004 (0.002)
Summary Statistics								
Num. Obs.	*Whole*	161	161	161	161	161	161	161
	Pre	90	90	90	90	90	90	90
	Post	53	53	53	53	53	53	53
Adj. R^2	*Whole*	0.672	0.874	0.155	0.145	0.100	-0.110	0.309
	Pre	0.337	0.022	-0.011	-0.011	-0.002	-0.010	0.034
	Post	0.903	0.023	0.104	-0.016	-0.019	0.021	-0.019

Note: Robust standard errors are in parentheses. *, **, and *** indicate statistically significance at the 1%, 5%, and 10% levels respectively.

c) Extrapolative Expectations (equation 4.1.3)

		Hong Kong	**Indonesia**	**Korea**	**Malaysia**	**Philippines**	**Singapore**	**Thailand**
C	*Whole*	0.002*** (0.001)	0.011*** (0.001)	0.008*** (0.001)	0.004*** (0.0004)	0.010*** (0.0006)	0.004*** (0.0003)	0.006*** (0.001)
	Pre		0.008*** (0.001)	0.011*** (0.0003)	0.006*** (0.0002)	0.012*** (0.001)	0.004*** (0.0003)	0.008*** (0.001)
	Post	0.0003** (0.0001)	0.013*** (0.002)	0.004*** (0.0001)	0.002*** (6.1E-5)	0.008*** (0.0005)	0.003*** (0.0005)	0.002*** (6.43E-5)
i^{US}	*Whole*	0.610*** (0.136)	-0.007 (0.013)	0.034* (0.027)	0.002 (0.018)	-0.014 (0.012)	0.009 (0.012)	-0.012 (0.023)
	Pre	0.386** (0.138)	0.364** (0.190)	0.032 (0.029)	-0.0003 (0.011)	-0.021 (0.016)	0.005 (0.015)	-0.041 (0.053)
	Post	0.953*** (0.045)	-0.007 (0.012)	0.004** (0.002)	0.022 (0.044)	0.010 (0.011)	0.024** (0.014)	0.002 (0.002)
Statistics Summary								
Num. Obs.	*Whole*	161	161	161	161	161	161	161
	Pre	89	89	89	89	89	89	89
	Post	54	54	54	54	54	54	54
Adj. R^2	*Whole*	0.636	0.870	0.158	0.143	0.099	-0.109	0.306
	Pre	0.255	0.145	0.006	-0.011	0.004	-0.010	-0.005
	Post	0.894	-0.014	0.035	-0.015	-0.0003	0.020	-0.001

Note: Robust standard errors are in parentheses. *, **, and *** indicate statistically significance at the 1%, 5%, and 10% levels respectively.

Table 4 contains the regression results for equation (4.1) in combination with conditions (a) to (c) (or the equation (4.1.1) to (4.1.3) from the previous chapter). The results clearly indicate that the two sub-periods yield substantially different estimates from those by using the whole period regardless of the expectation assumptions on the exchange rate. The exception, however, applies to Hong Kong and Singapore, when utilizing static expectations.

Panel (a) of Table 4 shows the estimated regression coefficients when using static expectations of exchange rates from the entire sample. Except for Indonesia, the estimated coefficients of US interest rates of every country are either very high or not significantly different from one similar to the findings by Frankel et al. (2000, 2002) and Hausman et al. (1999).[31] Note that even the pooled fixed effects estimated by Frankel et al. (2000, 2002) cannot deny the full adjustment of local interest rates to the US rates for developing countries in the 1990s, regardless of the exchange rate regime (coefficients are 1.81 for the fixed; 0.81 for intermediate regime; and 0.91 for the floating rate).[32]

For Hong Kong and Singapore, the regression estimates of correlations between local and US interest rates are not significantly different from one in every sample range. Hong Kong is a classic example demonstrating the impossibility of the trinity principle utilized in practice; that is, a country must give up its monetary independence in order to have fixed exchange rates and perfectly open capital markets; it cannot maintain all three simultaneously. The regression adjusted R^2 in every sample range is close to one as the

[31] I apply the same methodology described in Frankel et al. (2000) to the same set of countries in my dissertation in order to estimate interest rate correlations between local and US interest rates. With exception for Indonesia, the results from Appendix 6 show a full integration of the local interest rates to the US rates.

[32] Frankel et al. (2000, 2002) report Newey-West standard errors, which control for autocorrelation. Therefore, the problem is not likely to generate from incorrect standard errors, but the problem of unit roots or near unit roots in the data may yield spurious results in overall.

theory predicted.[33] Even though Singapore has a more flexible exchange rate regime (managed floating) than a pegged exchange rate regime, utilized in Hong Kong, its capital markets may be so open and tightly integrated to the US that the authorities lack monetary freedom pursuing an independent policy.

A closer examination of panel (a) reveals that interest rates of Indonesia and Thailand in the pre-crisis period follow the international finance theory that a country cannot pursue an independent monetary policy if it chooses the pegged exchange rate regime while the capital market is perfectly mobile. On the other hand, the coefficient estimates of US interest rates of these two countries become statistically insignificant after they adopt the floating exchange rate regime in the post-crisis period. The adjusted R^2's of Indonesia and Thailand are substantially greater in the pegged regimes than in the floating regimes (0.225 and 0.414 in the pre-crisis period and –0.011 and –0.004 in the post-crisis period for Indonesia and Thailand, respectively) because many more factors can propel the local rate in the latter period.

For Korea, Malaysia, and the Philippines, what appears to be the full integration of local interest rates to US rates when covering the whole period is in fact deceiving. The results are misleading because neither coefficient estimates in the two periods are even close to one, except for the Philippines in the post-crisis period. Even though Korea and the Philippines claim to have adopted a floating exchange rate regime after the crisis, the coefficients of US interest rates of these two countries are statistically significant at the 1 percent level, with magnitudes of 0.230 and 0.846, respectively.

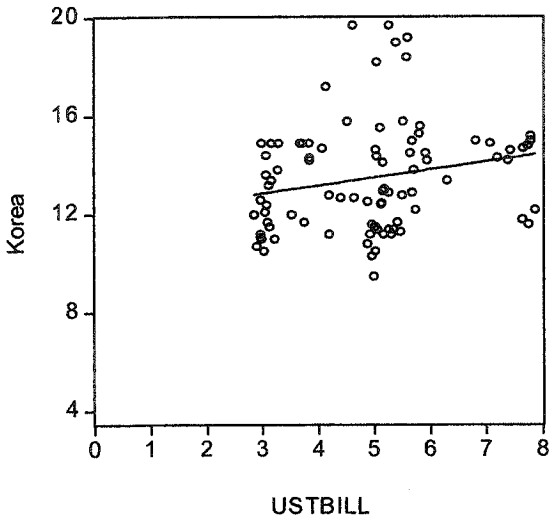
---

[33] The regression adjusted R^2 equals one if it is a credible hard peg, capital markets are open and arbitrage costless, risk premiums constant.

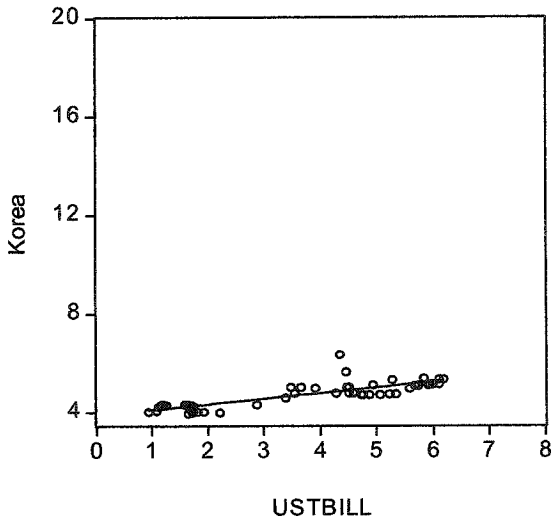
Figure 5

a) Korea Interest Rate vs. US Treasury-Bill Rate

1990:01-1997:06

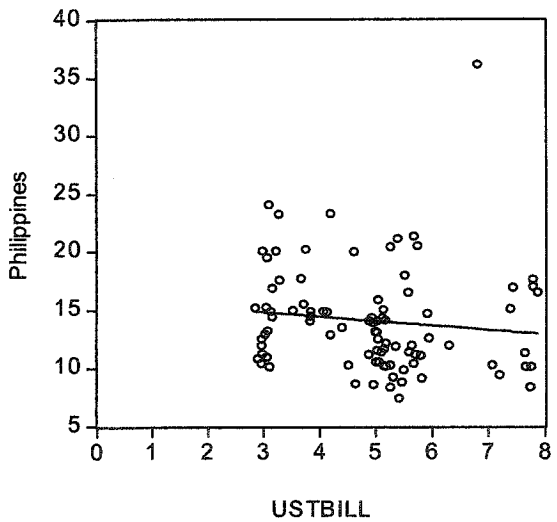


1999:01-2003:06

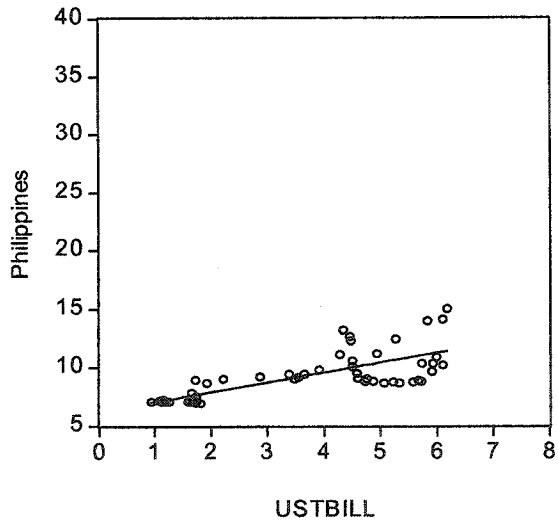


b) Philippines Interest Rate vs. US Treasury-Bill Rate

1990:01-1997:06



1999:01-2003:06



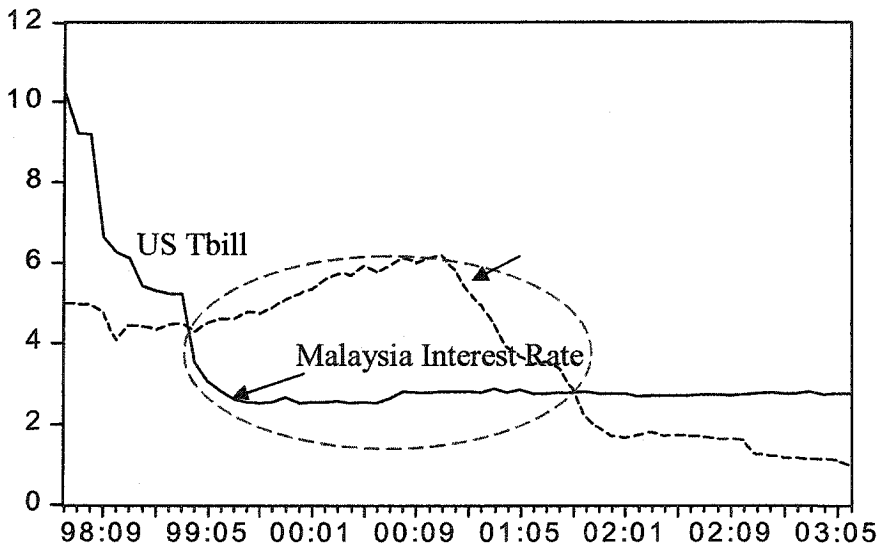
Both Korea and the Philippines, moreover, have low regression adjusted R^2's for the peg (0.032 and 0.003 for Korea and the Philippines, respectively) in comparison with the floating period (0.667 for Korea and 0.539 for the Philippines). Using a simple scatter plot between respective local and US interest rates presented in Figure 5, panels (a) and (b) suggest that the scatter is much tighter for the post crisis period due to smaller variations of interest rates. Notice that the scale for each country is identical in both periods.

One possible explanation of the observed high interest rate correlation coefficients and the adjusted R^2 in nonpegged countries by Shambaugh (2004) is that the local country may attempt to reduce exchange rate volatility by weighing its policy rule on the expectation of currency depreciation. As this weight grows, the interest rates in a floating regime behave more like the ones in a pegged regime by reacting to foreign shocks. On the other hand, interest rates in a floating regime can still be correlated to the foreign rates if the shocks facing the two countries are similar, or the economic cycle in the domestic and in the US happen to synchronize and require similar monetary policies.

For Malaysia, the results show that it has a negative correlation to the US rates in the pre-crisis period and no significant correlation to US interest rates, even after having switched to peg its currency to the US dollar right after the crisis. In addition, the regression adjusted R^2 becomes smaller in the post-crisis period. These contradictory results are in contrast to the conventional theory that interest rates in a pegged exchange rate regime should closely follow interest rate movements of the country it pegged the currency with.

One possible explanation is the Malaysian authorities can effectively impose capital control measures following the crisis. By combining a fixed exchange rate and half-open capital markets, the monetary authorities can engage in a considerably independent monetary policy. The Malaysian authorities, for example, continued to operate an easy monetary policy when the United States began tightening its monetary policy back in 2000 (see Figure 6).

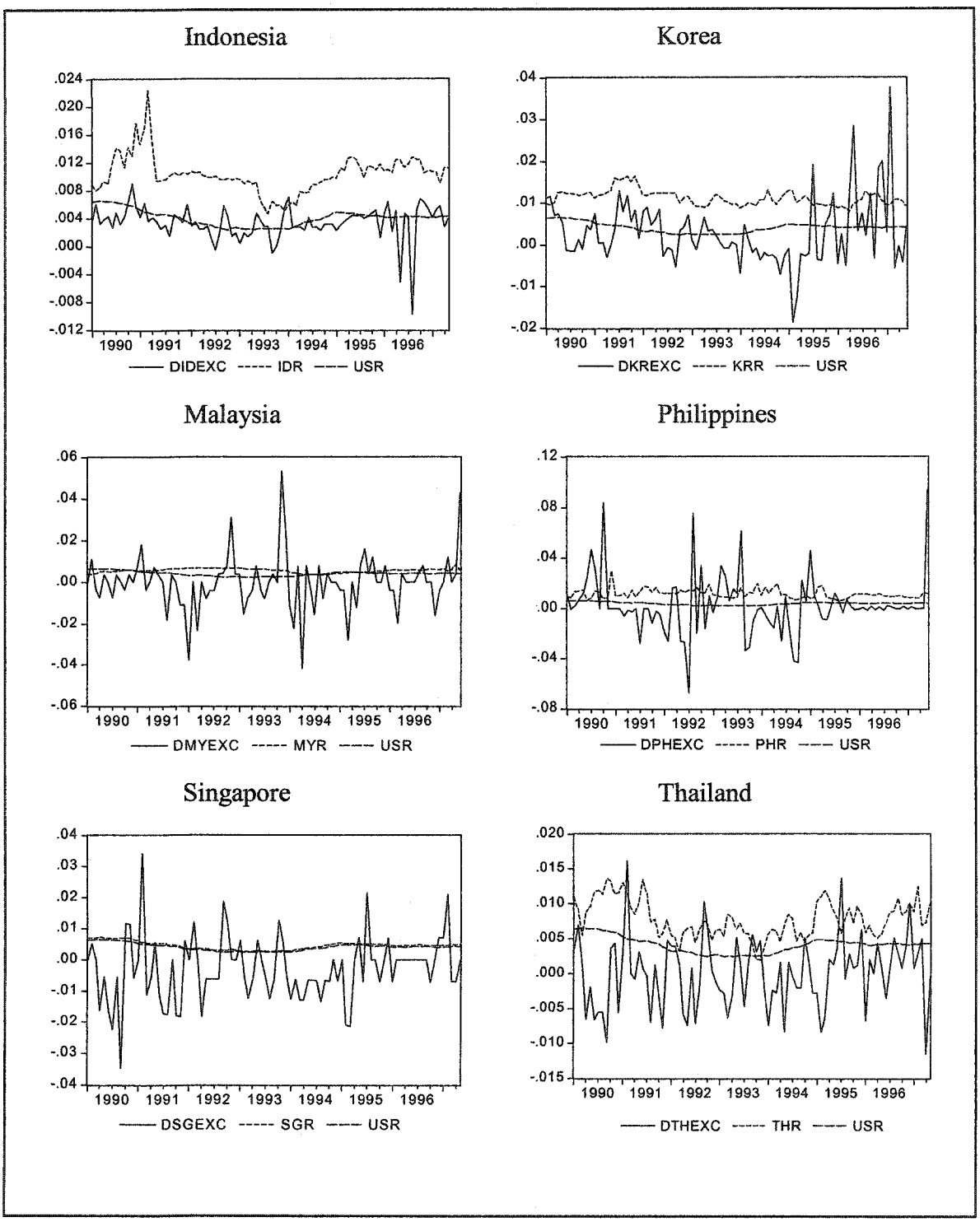
Figure 6
Malaysia short-term interest rate vs. US Treasury bill rate in the post-crisis period



Panels (b) and (c) of Table 4 show the regression results from applying the perfect foresight and extrapolative expectations of exchange rate, respectively. Except for Indonesia, there is a decline in country risk premiums in the post-crisis period for every country, if the regression constant is considered as a risk associated with each specific country and currency. Comparing these two specifications to the static expectations, correlation coefficients of local to US interest rates are not significant from zero for most

Figure 7

Local Interest Rates, US T-bill Rates, and the Percent Changes in the Exchange Rate



countries. Only Hong Kong has consistently significant results from every regression estimate; however, the coefficients in the pre-crisis period are much smaller than one implied in panel (a). For Singapore, where the results were found to be perfectly correlated with the US rates in both periods when applying the static expectations, while the US coefficient in the post-crisis period remained small (around 0.025) and statistically significant, the coefficient was not different from zero in the pre-crisis period.

What becomes clear from examining Figure 7 is large changes in the proxy of the expected changes in exchange rates are associated with relatively small movements in the local interest rate. Moreover, these movements in the exchange rate seem to dominate any change in the US interest rate as demonstrated by the regressions in panels (b) and (c). The static expectations model, therefore, appears to be the most appropriate fit, rather than the other two assumptions previously discussed, due in large part to unexpected movements in the exchange rates in most East Asian countries in the 1990s.

The level regressions analysis implicitly implies that the relationship between the local and the US interest rates are always in equilibrium in the long-run. Since such an assumption may not be appropriate for high frequency data, I allow for a partial adjustment to enter the equation. From now on, I will assume the static expectations of exchange rate in all specifications and report the t-statistics, calculated from consistent standard errors, indicated in italic, below the estimated coefficients.

Table 5 reports the partial (equation (4.2)) and dynamic (equation (4.2.1)) adjustment results, as well as the long run estimates (4.1.1) previously reported for the pre and post-crisis periods. If the maximum lags length determined by the BIC criteria in dynamic adjustment is the same as the lag in partial adjustment, I will leave the dynamic

Table 5

Effects of the US interest rates on the local interest rate (in Level)

Hong Kong					**Indonesia**			
		4.2	4.2.1				4.2	4.2.1
C	*Pre*	-0.0002 *-1.339*	-0.0001 *-0.925*		C	*Pre*	0.005 *3.156*	0.001 *1.280*
	Post	0.0001 *0.601*	-0.005 *-0.834*			*Post*	0.011 *6.437*	0.001 *0.848*
i_t^{US}	*Pre*	1.169 *27.774*	0.767 *7.213*		i_t^{US}	*Pre*	1.186 *2.596*	0.468 *2.491*
	Post	1.074 *20.972*	0.385 *4.331*			*Post*	0.388 *0.515*	0.025 *0.184*
i_{t-1}	*Pre*		0.340 *4.109*		i_{t-1}	*Pre*		0.722 *6.878*
	Post		0.651 *7.834*			*Post*		0.888 *9.160*
Summary Statistics					Summary Statistics			
N	*Pre*	90	89		N	*Pre*	90	89
	Post	54	54			*Post*	54	54
$Adj.R^2$	*Pre*	0.901	0.909		$Adj.R^2$	*Pre*	0.259	0.693
	Post	0.939	0.961			*Post*	-0.011	0.854
p-value H_0: *No Auto.*	*Pre*	-	0.264		*p-value* H_0: *No Auto.*	*Pre*	-	0.561
	Post	-	0.084			*Post*	-	0.793
$p-value$ $H_0: i_t^{US}=0$	*Pre*	0.000	0.000		$p-value$ $H_0: i_t^{US}=0$	*Pre*	0.009	0.013
	Post	0.000	0.000			*Post*	0.607	0.854
$p-value$ $H_0: i_t^{US}=1$	*Pre*	0.0001	0.028		$p-value$ $H_0: i_t^{US}=1$	*Pre*	0.684	0.005
	Post	0.146	0.000			*Post*	0.417	0.000

Note: T-statistics from consistent standard errors are in italic. P-value of no autocorrelation up to lag (q) is from Breusch-Godfrey LM test.

Korea

		4.1.1	4.2	4.2.1
C	*Pre*	0.01 *12.485*	0.001 *1.619*	-
	Post	0.003 *40.941*	0.001 *7.439*	0.001 *9.858*
i_t^{US}	*Pre*	0.323 *1.791*	0.168 *2.567*	-
	Post	0.230 *9.336*	0.078 *6.334*	0.055 *6.999*
i_{t-1}	*Pre*	-	0.825 *11.621*	-
	Post		0.659 *15.653*	1.214 *14.335*
i_{t-2}	*Pre*	-	-	-
	Post			-0.456 *-6.777*
Summary Statistics				
N	*Pre*	90	89	-
	Post	54	54	54
$Adj.R^2$	*Pre*	0.032	0.708	-
	Post	0.667	0.954	0.973
p-value H_0: *No Auto.*	*Pre*	-	0.634	
	Post	-	0.0001	0.956
$p-value$ $H_0: i_t^{US} = 0$	*Pre*	0.073	0.010	-
	Post	0.000	0.000	0.000
$p-value$ $H_0: i_t^{US} = 1$	*Pre*	0.0002	0.000	-
	Post	0.000	0.000	0.000

Malaysia

		4.1.1	4.2	4.2.1
C	*Pre*	0.007 *12.037*	0.0003 *0.430*	-0.001 *-1.532*
	Post	0.002 *38.057*	0.0004 *1.712*	-
i_t^{US}	*Pre*	-0.283 *-2.493*	0.051 *1.234*	0.203 *2.417*
	Post	0.022 *0.497*	-0.003 *-0.529*	-
i_{t-1}	*Pre*	-	0.916 *10.170*	0.543 *3.369*
	Post		0.814 *7.639*	-
i_{t-2}	*Pre*	-	-	-0.207 *-0.423*
	Post			-
i_{t-3}	*Pre*	-	-	0.719 *1.263*
	Post			-
Summary Statistics				
N	*Pre*	90	89	87
	Post	54	54	-
$Adj.R^2$	*Pre*	0.104	0.811	0.853
	Post	-0.015	0.873	-
p-value H_0: *No Auto.*	*Pre*	-	0.0006	0.239
	Post	-	0.456	
$p-value$ $H_0: i_t^{US} = 0$	*Pre*	0.013	0.217	0.016
	Post	0.619	0.597	-
$p-value$ $H_0: i_t^{US} = 1$	*Pre*	0.000	0.000	0.000
	Post	0.000	0.000	-

Philippines

		4.1.1	4.2	4.2.1
C	*Pre*	0.013 *8.684*	0.010 *4.676*	-
	Post	0.005 *14.208*	0.001 *2.903*	0.001 *3.677*
i_t^{US}	*Pre*	-0.379 *-1.069*	-0.244 *-0.801*	-
	Post	0.846 *4.519*	0.204 *2.646*	0.169 *2.399*
i_{t-1}	*Pre*	-	0.208 *1.462*	-
	Post		0.800 *17.234*	1.293 *16.747*
i_{t-2}	*Pre*	-	-	-
	Post			-0.480 *-6.833*
Summary Statistics				
N	*Pre*	90	89	-
	Post	54	54	54
$Adj.R^2$	*Pre*	0.030	0.032	-
	Post	0.540	0.914	0.938
p-value H_0: *No Auto.*	*Pre*	-	0.494	
	Post	-	0.0001	0.332
$p-value$ $H_0: i_t^{US} = 0$	*Pre*	0.285	0.423	-
	Post	0.000	0.008	0.016
$p-value$ $H_0: i_t^{US} = 1$	*Pre*	0.0001	0.000	-
	Post	0.412	0.000	0.000

Singapore

		4.1.1	4.2	4.2.1
C	*Pre*	0.001 *0.867*	0.0001 *0.881*	-
	Post	- 0.0001	-0.0001 *-1.340*	0.000 *0.331*
i_t^{US}	*Pre*	1.092 *52.349*	0.912 *7.518*	-
	Post	1.138 *51.401*	0.655 *2.263*	0.734 *3.891*
i_{t-1}	*Pre*	-	0.162 *1.424*	-
	Post		0.431 *1.596*	0.953 *4.516*
i_{t-2}	*Pre*	-	-	-
	Post			-0.606 *-6.840*
Summary Statistics				
N	*Pre*	90	89	-
	Post	54	54	54
$Adj.R^2$	*Pre*	0.987	0.988	-
	Post	0.987	0.988	993
p-value H_0: *No Auto.*	*Pre*	-	0.0008	
	Post	-	0.000	0.068
$p-value$ $H_0: i_t^{US} = 0$	*Pre*	0.000	0.000	-
	Post	0.000	0.024	0.0001
$p-value$ $H_0: i_t^{US} = 1$	*Pre*	0.000	0.470	-
	Post	0.000	0.233	0.159

Note: Consistent estimated t-statistics are in italic under the coefficient

Thailand

		4.1.1	4.2	4.2.1
C	*Pre*	0.001 *1.530*	0.0007 *1.062*	0.0003 *0.598*
	Post	0.001 *14.097*	0.0004 *3.267*	-
i_t^{US}	*Pre*	1.484 *4.935*	0.652 *3.193*	0.937 *5.572*
	Post	0.025 *0.807*	0.010 *0.738*	-
i_{t-1}	*Pre*	-	0.572 *11.094*	0.599 *6.602*
	Post		0.688 *7.502*	-
i_{t-2}	*Pre*	-	-	-0.090 *-0.778*
	Post			-
i_{t-3}	*Pre*	-	-	-0.025 *-0.272*
	Post			-
Summary Statistics				
N.	*Pre*	90	89	87
	Post	54	54	-
$Adj.R^2$	*Pre*	0.413	0.592	0.633
	Post	-0.004	0.496	-
p-value *H_0: No Auto.*	*Pre*	-	0.350	0.772
	Post	-	0.379	
$p-value$ $H_0: i_t^{US}=0$	*Pre*	0.000	0.001	0.000
	Post	0.420	0.461	-
$p-value$ $H_0: i_t^{US}=1$	*Pre*	0.107	0.088	0.707
	Post	0.000	0.000	-

Note: Consistent estimated t-statistics are in italic under the coefficient

results blank. For example, the BIC is at a minimum at lag one so that no further process can be gained from adding more lags in both periods for Hong Kong and Indonesia.

The estimated coefficients of US interest rates from partial specifications are lower across the countries examined in this study. These results are considered as interest rate relationships between local and the US interest rates in the short-run, which can be different from the long-run equilibrium. Solving foreign coefficients from the partial adjustment for the stationary state equilibrium in the pre-crisis period for Hong Kong, Indonesia, Singapore, and Thailand finds the foreign coefficients are not significantly different from one, the same as the estimated results presented in equation (4.1.1).

On average, the slope coefficients from the dynamic adjustment are not substantially different from those in the partial adjustment. Only the US coefficient for Malaysia in the pre-crisis period has a significant gain from adding more lag dependent variables. The new estimated coefficient is statistically significant of 0.203, quite different from –0.283 found in the long-run specification. The presence of lags suggests that the domestic interest rate takes more time to adjust to the foreign shocks.

Similar to the previous findings in the long-run, the magnitude of the regression R^2 in the peg regime is smaller than the one in the floating exchange rate regime for Indonesia, Korea, and the Philippines, which implies the float has less room to maneuver than the peg. Setting aside the issue of unit root processes, the LM test indicates that most of serial correlation problems have been solved when allowing for further adjustment of the lag dependent variable, except in Singapore.

A) Effect of US on Local Interest Rates With Domestic Control Variables

The next robustness check requires adding the domestic control as the explanatory variables. It is possible that the variation in interest rates might be related to macroeconomic variables, such as domestic inflation and income. Omission of these parameters might lead to an overstatement of the correlation between the local and US rates.

Table 6 depicts a standard model when both US interest rates and domestic parameters act as explanation variables. The sensitivity of the slope coefficients of the US interest rates, when including domestic controls, is almost identical to that obtained when only the US interest rate is represented as the explanatory variable, as observed in equation (4.2) in Table 5. The most significant change occurs in Korea, where the slope of the US rates in the pre-crisis period is not significantly different from zero, in comparison with 0.168, reported in equation (4.2) in Table 5.

With the exceptions of the inflation rates for Indonesia in the post-crisis period (0.114) and for the Philippines in both periods (0.11 and 0.07 for the first and second periods, respectively), the domestic variables are too small to have any sizeable impact on the interest rate determination. Most of the significant coefficients are not larger than 0.2 percent. Moreover, inserting domestic variables does not improve the explanatory power of the regression.

For further sensitivity checks, of possible multicollinearity problems between real income and money supply, I omit the real income from the regression. Appendix 7 equation (4.3a) reports no significant changes in the estimated coefficients, which

Table 6

Effects of US interest rates on local interest rates controlling for domestic variables
(Dependent variable: domestic interest rate)

		HKR	IND	KOR	MAL	PHI	SGR	THA
c	*PRE*	-0.001 *-1.570*	-0.016 *-1.290*	0.011 *2.119*	0.000 *0.309*	0.017 *0.807*	-0.0004 *-0.781*	-0.011 *-0.612*
	Post	0.001 *1.534*	0.001 *0.035*	-0.002 *-1.210*	-0.005 *-2.189*	0.002 *1.188*	0.010 *2.286*	0.008 *2.508*
i^{US}	*Pre*	0.763 *7.478*	0.436 *2.639*	0.126 *0.984*	-0.006 *-0.074*	-0.585 *-1.304*	0.889 *8.068*	0.746 *3.947*
	Post	0.523 *4.709*	-0.002 *-0.013*	0.077 *3.809*	0.058 *1.863*	0.139 *3.110*	0.597 *2.634*	-0.046 *-1.871*
Income	*Pre*	-	0.002 *1.181*	-0.001 *-0.257*	0.001 *0.923*	-0.001 *-0.159*	-	0.003 *0.620*
	Post		0.002 *0.386*	0.001 *1.862*	-0.001 *-0.895*	0.000 *-1.758*	0.001 *2.784*	-0.002 *-2.547*
Inflation	*Pre*	0.003 *0.650*	0.033 *1.310*	-0.028 *-1.155*	-0.008 *-0.587*	0.110 *1.456*	0.003 *0.796*	0.045 *1.051*
	Post	-0.007 *-0.836*	0.114 *2.221*	0.000 *-0.042*	-0.001 *-0.097*	0.073 *1.401*	0.009 *1.260*	-0.009 *-0.799*
M1(-1)	*Pre*	0.001 *1.130*	0.001 *1.209*	-0.001 *-0.512*	-0.001 *-1.056*	-0.004 *-0.523*	0.0001 *0.897*	-0.002 *-0.538*
	Post	-0.002 *-1.661*	-0.002 *-0.342*	0.000 *-0.322*	0.001 *1.697*	-0.001 *-0.391*	-0.003 *-3.010*	0.001 *1.828*
i(-1)	*Pre*	0.385 *3.805*	0.715 *6.647*	0.746 *10.986*	0.887 *7.894*	0.109 *0.721*	0.186 *1.802*	0.549 *7.764*
	Post	0.401 *2.627*	0.924 *10.613*	0.733 *16.494*	0.894 *6.028*	0.832 *12.764*	0.396 *1.908*	0.577 *5.911*
Summary statistics								
N	*Pre*	89	89	89	89	89	89	89
	Post	53	53	53	53	53	53	53
Adj. R2	*Pre*	0.909	0.693	0.715	0.807	0.106	0.987	0.586
	Post	0.964	0.860	0.960	0.870	0.927	0.991	0.514
p-value $H_0: i^{us}=0$	*Pre*	0.000	0.008	0.325	0.941	0.192	0.000	0.000
	Post	0.000	0.980	0.000	0.061	0.002	0.000	0.061
p-value $H_0: i^{us}=1$	*Pre*	0.020	0.006	0.000	0.000	0.0004	0.311	0.180
	Post	0.000	0.000	0.000	0.000	0.000	0.075	0.000

Note: Industrial production indexes are not available in both periods for Hong Kong and in the pre-crisis period for Singapore. T-statistics from consistent error estimates are in italic.

indicates that multicollinearlity problems are not a major concern here. The last column of Appendix 7 depicts the coefficients of the dynamics of the explanatory variables. Once again, the slope of the US interest rate does not change in any significant way in comparison with the results in Table 6, except for Malaysia in the first sub-period, which is statistically significant at 0.182 (about two-thirds of the value found in the regression of equation (4.2.1)).

In summary, including the domestic control variables does not change interest rate correlations between the local interest rates and the US interest rates. With the exception of the inflation rates in Indonesia and the Philippines, the domestic variables do not have a crucial role in determining the local interest rate.

II. Estimation in Differences

A) Effect of US on Local Interest Rate Changes

There is a possibility that the correlations between local and US interest rates in level may be spurious when the common shocks to both countries are similar. In such a scenario, first differencing is a standard recommendation. Table 7 shows the long-run results of changes in US interest rates on local rates.

For the financial centers like Hong Kong and Singapore, the results in Table 7, as well as the first three columns of Appendix 8, represent similar coefficients to those in Table 5 in the sense that these two countries have full integration with US interest rates. Using a Wald test, I find that the p-values are above 0.20 in both periods for the null hypothesis of full integration, except in the dynamic equation (4.4.1a) in Appendix 8 for Hong Kong in the pre-crisis period. In comparison with level estimates in Table 5, the

explanatory power of regression for Singapore and Hong Kong has been reduced to about half and as low as one-tenth, respectively.

Contrary to the results in levels estimate reported in Table 5, the slope coefficient of the changes in US interest rates is statistically insignificant from zero in the pre-crisis period for Indonesia and Thailand. Such drastic drops of the slope coefficients in

Table 7

Effects of Changes in US interest rates on the local Interest rate

(Dependent variable: Changes in domestic money market interest rates)

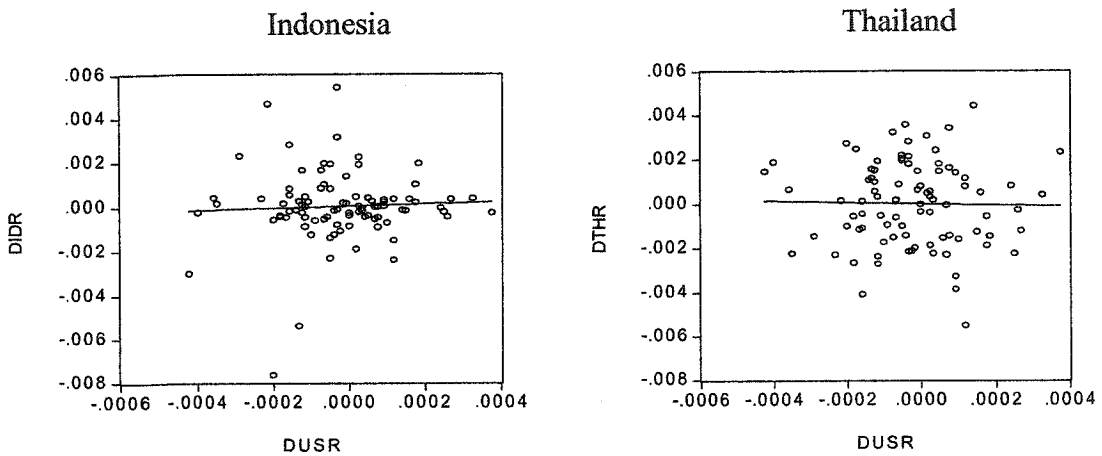
		HKR	IND	KOR	MAL	PHI	SGR	THA
C	*Pre*	0.000 *0.009*	0.000 *0.320*	0.000 *0.414*	0.000 *0.612*	0.000 *0.446*	0.000 *-0.008*	0.000 *0.063*
	Post	0.000 *-0.485*	0.000 *-1.219*	0.000 *-1.062*	0.000 *-1.092*	0.000 *-0.434*	0.000 *-0.875*	0.000 *-0.564*
Δi^{US}	*Pre*	0.909 *3.182*	0.488 *0.502*	1.759 *2.904*	0.042 *0.158*	3.466 *1.172*	0.941 *9.829*	-0.303 *-0.258*
	Post	0.856 *5.118*	-2.181 *-1.470*	0.179 *1.800*	0.050 *0.524*	1.097 *1.972*	0.861 *7.298*	-0.027 *-0.171*
Summary Statistics								
N	*Pre*	89	89	89	89	89	89	89
	Post	54	54	54	54	54	54	54
Adj. R^2	*Pre*	0.059	-0.009	0.055	-0.011	0.001	0.475	-0.011
	Post	0.177	0.005	0.030	-0.017	0.106	0.561	-0.019
Durbin Watson	*Pre*	2.540	2.257	2.115	2.145	2.859	2.507	2.183
	Post	2.089	1.923	0.473	1.472	1.010	1.916	1.995
p-value H_o: $\Delta i^{us} = 0$	*Pre*	0.002	0.616	0. 004	0.875	0.241	0.000	0.796
	Post	0.000	0.142	0.072	0.600	0.049	0.000	0.864
p-value H_o: $\Delta i^{us} = 1$	*Pre*	0.749	0.589	0.210	0.0003	0.404	0.541	0.266
	Post	0.390	0.032	0.000	0.000	0.862	0.239	0.000

Note: Consistent estimated t-statistics are in italic under the coefficient.

Indonesia and Thailand may be due to a loss of information if one believes that the interest rates of these two countries remain stationary. From Figure 8, for a given change in the US interest rates, there are only small responses in the interest rates of both countries. One possible explanation is that the peg can have less correlation to the base rate if it allows the nominal exchange rate to change within bands, which reduces the responsiveness of local interest rates to the base country interest rates.

Figure 8

Changes in US vs. Indonesian and Thai interest rates in the pre-crisis period



Kim and Lee (2004) report a slope coefficient of 3.514 (standard error of 1.633) for Thailand during January 1987 to August 1998. Such finding possibly reflect a high degree of financial volatility, including in the sample period, because the authors have dated a structural break in August 1998, a year after the actual crisis broke out in Thailand. In fact, a similar pattern has been observed in Table 5 in the post-crisis period for Indonesia, where its slope coefficient is –2.181; however, the estimate is less precise (standard error is 1.484). According to the data in Figure 4, Indonesia might have experienced aftershocks of the crisis until mid-1999. As the result, I re-estimate

regression by using the new starting date of the post-crisis period in July 1999 and find the coefficient of –1.746 with statistical significance at the 10 percent level. The new coefficient does not appear to be substantially different from the previous estimate. This is not the case, however, when I revisit this issue in the following section on intra regional integration.

The results are as expected for Korea. The correlation coefficient is substantially higher than for the peg (coefficient of 1.759) compared to the float (0.179).[34] The Wald test confirms that the null of a unit slope in the pre-crisis period and the null of the zero coefficient in the post-crisis period cannot be rejected with p-value of 0.210 and 0.07, respectively. A possible explanation for the coefficient to be higher than one is that "increases in the base rate make investors doubt the peg's stability" (Shambaugh, 2004, p.306). In addition, the adjusted R^2 is marginally higher in the peg than in the float; however, the magnitude is only half of the average size reported by Shambaugh (2004) for the pegs (0.13) in his panel of 103 countries. The lower value in the second period perhaps indicates that the monetary authorities have more latitude when dealing with a floating rate. Yet, when taking the dynamics of interest rates into consideration (equation (4.4.1a) in Appendix 8), the regression power increases to 0.735 while the slope coefficient is slightly lower at 0.151.

In contrasted to Korea, the Philippines exhibits large coefficients of US interest rates in both periods, but only in the post-crisis period is the coefficient statistically significant at the conventional level. The high correlation coefficient and a large adjusted R^2 in the floating regime for the Philippines may indicate the fear of a floating symptom

[34] Kim and Lee (2004) find the coefficient of 2.946 for Korea within the pre-crisis period, from 1987:01-1997:07.

Table 8

Effects of the Changes in US interest rates on local Interest rates with Domestic Variables (Dependent variable: Changes in domestic money market interest rates)

		HKR	IND	KOR	MAL	PHI	SGR	THA
c	*PRE*	0.000 *-0.115*	0.000 *-0.263*	0.000 *0.812*	0.000 *0.544*	0.000 *0.516*	0.000 *0.219*	0.000 *1.159*
	Post	0.000 *0.156*	0.000 *-0.911*	0.000 *-0.390*	0.000 *-0.851*	0.000 *-0.048*	0.000 *-0.367*	0.000 *-0.186*
Δi^{US}	*Pre*	0.939 *3.265*	0.149 *0.199*	1.780 *3.128*	-0.056 *-0.210*	2.746 *1.103*	0.953 *9.852*	-0.135 *-0.112*
	Post	0.888 *5.078*	-2.037 *-1.160*	0.217 *2.673*	0.078 *0.675*	1.146 *2.149*	0.834 *7.735*	0.009 *0.055*
ΔIncome	*Pre*	-	0.001 *0.688*	-0.006 *-1.545*	0.001 *1.013*	-0.004 *-0.309*	-	-0.014 *-1.999*
	Post		0.003 *0.953*	-0.002 *-1.779*	-0.001 *-1.088*	0.000 *-1.279*	0.000 *1.576*	-0.001 *-0.504*
ΔInflation	*Pre*	0.003 *0.622*	0.027 *1.123*	-0.017 *-0.843*	-0.014 *-1.677*	0.118 *2.505*	-0.003 *-0.716*	0.027 *0.923*
	Post	-0.006 *-0.890*	-0.021 *-0.562*	0.004 *1.931*	0.002 *0.506*	0.025 *1.358*	0.008 *2.356*	-0.005 *-0.680*
ΔM1(-1)	*Pre*	0.001 *4.584*	0.013 *1.484*	-0.001 *-0.362*	0.000 *-0.362*	0.003 *0.105*	0.000 *-1.555*	-0.015 *-1.960*
	Post	-0.002 *-1.785*	-0.020 *-1.418*	-0.001 *-2.787*	-0.002 *-1.348*	-0.005 *-2.197*	-0.002 *-1.251*	-0.001 *-1.205*
Summary statistics								
N	*Pre*	88	88	88	88	88	88	88
	Post	53	53	53	53	53	53	53
Adj. R2	*Pre*	0.091	0.063	0.072	-0.031	0.004	0.474	0.051
	Post	0.187	0.034	0.081	-0.046	0.147	0.578	-0.063
Durbin-Watson	*Pre*	2.543	2.150	2.172	2.129	2.868	2.506	2.183
	Post	2.163	1.743	0.483	1.606	1.121	1.889	2.043
p-value H_0: $\Delta i^{us} = 0$	*Pre*	0.001	0.842	0.002	0.833	0.483	0.000	0.911
	Post	0.000	0.246	0.008	0.500	0.032	0.000	0.956
p-value H_0: $\Delta i^{us} = 1$	*Pre*	0.833	0.257	0.171	0.0001	0.270	0.628	0.344
	Post	0.520	0.084	0.008	0.000	0.785	0.112	0.000

Note: Consistent estimated t-statistics are in italic under the coefficient.

that "the floating- regime countries are not able to pursue their independent monetary policy, or rather that they choose not to float." (Frankel et al., 2002, p. 32).

For Malaysia, the results are similar to those obtained in Tables 5 and 6, in that there is no correlation between domestic and US interest rates. The absence of a connection between Malaysian and US interest rates, even if Malaysia has pegged its currency to the US dollar, may contribute to capital controls imposed after the crisis. The coefficients of the US interest rates, when domestic variables are added to the empirical specifications, as represented in Table 8, are virtually identical to those in Table 7.

Similar to the level estimates reported in Table 6, most of the domestic variables in Table 8 do not have any significant impact on the local interest rates. Only the changes in the inflation rate of the Philippines are important in both periods, specifically in the pre-crisis period. Interestingly, the coefficient of the money base in the post-crisis period in every country retains the expected sign and remains statistically significant, even though it is rather small in magnitude. The last two columns (equations (4.5.1) and equation (4.5.1a)) of Appendix 8 represent the static and the dynamic of the domestic variables. The overall results do not change in any dramatic way, other than an improvement in the regression adjusted R^2.

The overall findings in this section can be summarized as followed: first, failing to recognize a structural break of the data is likely to result in serious bias outcomes because there are clearly two distinctive patterns of financial interconnections between the local and US interest rates in the pre-crisis and post-crisis periods. Second, while the estimation in levels tends to produce high correlation between the local and US interest

rates, the regression in differenced forms tend to yield much fewer degrees of interest rate correlations for most countries. Lastly, with the exception of the inflation rate in the Philippines, the domestic control variables do not play any significant role in the interest rate determination, regardless of methodology.

Both Hong Kong and Singapore exhibit a full financial adjustment to US interest rates in both periods, in spite of Singapore's flexible exchange rate regime. A possible reason for an inability of the monetary authorities of Singapore to pursue an independent monetary policy is that the nation operates on an open financial market. Similar to Singapore, both Korea and specially the Philippines appear to follow the interest rate movements in the US, even if Seoul and Manila claim to operate floating exchange rate regimes.

The evidence indicates that only Indonesia and Thailand have the abilities to pursue independent monetary policies after they switched from the pegged to a floating regime in the post-crisis period. On the other hand, by effectively imposing capital controls, the Malaysian authorities can independently pursue monetary policies. Thus, there is no indication of financial correlation between Malaysia and the US, even after the ringgit is pegged to the US dollar.

5.2 INTRA-REGIONAL INTEGRATION

Although U.S. interest rate movements can heavily influence the economies of East Asia nations examined in this study, this does not imply that these countries are fully adjusted to U.S. interest rates. As long as the local authorities have some ability to

manipulate their own monetary policy preferences, it is possible to find interest rate correlations between the local and regional centers.

I. Estimation in Levels

I approach the issue by directly regressing equation (4.6), excluding the US interest rates as control variables, even though doing so might yield a bias estimation due to the omitted variable. Table 9 summarizes the coefficient of regional influences. The rows indicate which local interest rates represent the dependent variable, while the columns depict which regional interest rates represent the explanatory variable in the regression.

When either Hong Kong or Singapore represents the regional center, the estimated coefficients of these two countries are similarly the same with respect to each sub-period for every domestic market. The close proximity of the slope coefficients, I believe, is not a coincidence because Hong Kong and Singapore are highly integrated with the US financial market. When examining the correlation coefficients of the local to US interest rates in the first column of Table 5, and the coefficient of local to either Hong Kong or Singapore interest rates in Table 9, they represent virtually the same values. It is possible that the apparent correlations between local and these two financial centers may simply reflect the correlations of local to US interest rates rather than the direct effect from the two regional centers. Except for the strong correlations between Indonesia and Thailand, Korea and Malaysia, and Korea and the Philippines, there seems to be little evidence of significant correlations of interest rates within the region in the pre-crisis period. There appears to be higher regional correlations after the crisis, especially when the local economies examined are those of Korea and the Philippines.

Table 9

Effects of Regional Interest Rates on Domestic Interest Rates

(No lag of dependent variable)

(Regional center is in columns and the domestic economy is in row. Table 9 should read in the following, the correlation coefficient of Indonesia when Korea as a regional interest rate is 0.272 in the pre-crisis period. The constant terms are not statistically different from zero and are not reported here.)

Local Variables		HKR	IND	KOR	MAL	PHI	SNG	THA
IND	*Pre*	0.894 *2.322*		0.272 *1.423*	0.356 *1.248*	-0.027 *-0.227*	1.084 *2.706*	0.527 *3.896*
	Post[a]	-0.267 *-0.806*		-1.460 *-0.954*	6.737 *1.616*	0.010 *0.036*	-0.262 *-0.845*	1.457 *0.820*
KOR	*Pre*	0.248 *1.522*	0.126 *2.295*		0.463 *1.713*	0.111 *1.510*	0.266 *1.656*	0.145 *1.609*
	Post	0.212 *7.096*	-0.035 *-0.872*		0.376 *3.606*	0.202 *6.623*	0.197 *8.236*	0.403 *1.369*
MAL	*Pre*	-0.191 *-2.028*	0.047 *1.011*	0.133 *2.254*		0.044 *1.161*	-0.261 *-2.497*	-0.015 *-0.304*
	Post	0.054 *0.819*	0.008 *1.337*	0.525 *1.444*		0.132 *1.334*	0.017 *0.440*	0.799 *1.573*
PHI	*Pre*	-0.223 *-0.717*	-0.052 *-0.232*	0.463 *2.064*	0.642 *1.259*		-0.358 *-1.077*	-0.128 *-0.887*
	Post	0.725 *4.224*	0.004 *0.037*	3.352 *5.545*	1.573 *9.580*		0.704 *4.117*	1.782 *2.300*
THA	*Pre*	1.237 *4.759*	0.524 *4.130*	0.310 *1.407*	-0.113 *-0.296*	-0.066 *-0.794*	1.370 *5.242*	
	Post	0.019 *0.510*	0.017 *0.781*	0.227 *1.295*	0.323 *5.007*	0.060 *1.585*	0.015 *0.502*	

Note: [a] Unlike other country, the starting date in the post-crisis period for Indonesia is in July 1999, instead of January 1999. Consistent estimates of t-statistic are in italic under the estimated coefficients.

Next, I regress the equation (4.6) when both US and regional interest rates are included as explanatory variables. Similar to Table 9, the columns indicate which regional interest rates are included in the specification in addition to the US interest rate. Table 10 should read, without the regional interest rate impact, the correlation coefficients of US interest rates, which are 0.237 and 0.224 in the pre-crisis and post-crisis periods, respectively for Korea.

From Table 10, with the exception of a few cases, adding the regional interest rates to the specification does not significantly alter the estimated coefficients of the US interest rates in both periods. There are a few cases, however, in which the addition of the regional interest rates causes a significant change in the US coefficient. For example, the US coefficient becomes negative and highly significant in the post-crisis period for Malaysia when either Korea or the Philippines is a regional center. Another example is the Philippines in the post-crisis period when Korea represents the regional center. The coefficient of US rates, instead of having high degree of integration, is not significant from zero.

In the pre-crisis period, the following results stand out: there is evidence of feedback influences between Indonesia and Malaysia, Korea and Malaysia, Malaysia and Thailand, and Thailand and Indonesia. This leaves the Philippines, which is considered to be the least developed financial market among these countries, playing no role in the short-run interest rate dynamics within the region. These findings are consistent with the results reported by Anoruo, Ramchander, and Thiewes (2002), who find feedback relationships among the East Asian countries, with the exception of the Philippines. The

Table 10
Effects of the U.S. and Selected Regional Interest Rates on Local Interest Rates
(Without lag of dependent variable)

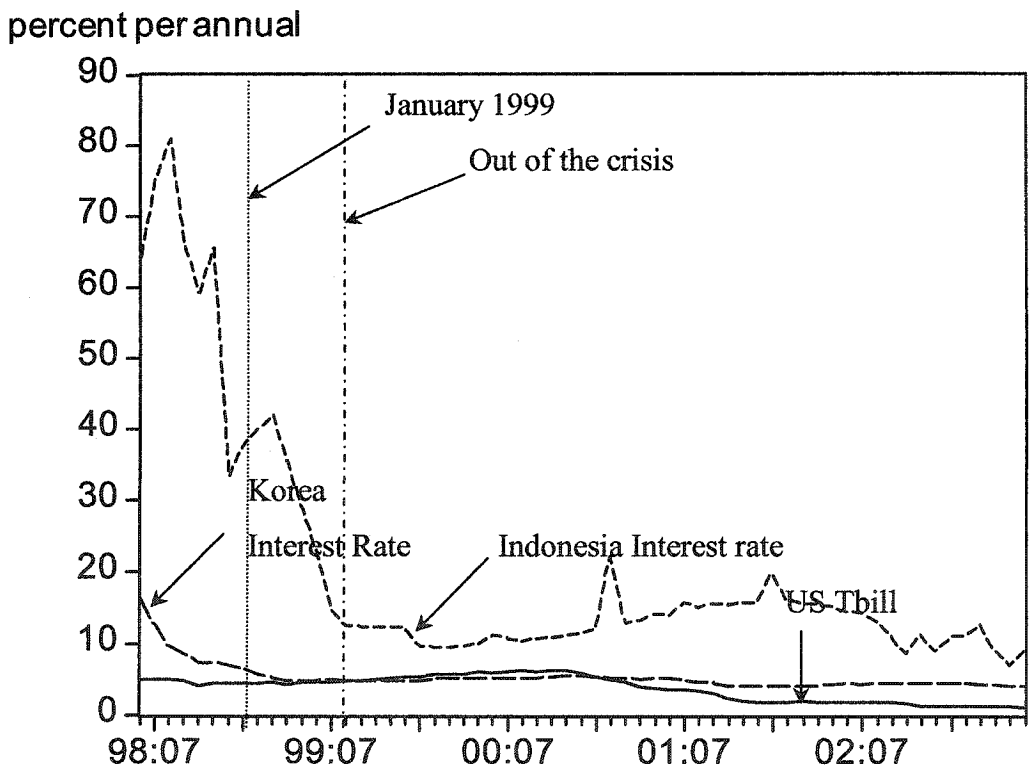
		US	IND	US	KOR	US	MAL	US	PHI	US	THA
IND	*Pre*			1.147 *2.504*	0.120 *0.783*	1.452 *3.548*	0.941 *4.298*	1.193 *2.543*	0.017 *0.195*	0.698 *1.446*	0.329 *2.151*
	Post[a]			0.413 *0.537*	-3.032 *-0.901*	-0.129 *-0.329*	5.773 *1.372*	-0.635 *-1.423*	0.480 *1.256*	-0.282 *-0.793*	1.644 *0.968*
KOR	*Pre*	0.237 *1.074*	0.073 *0.959*			0.512 *2.938*	0.669 *2.074*	0.371 *2.076*	0.125 *1.681*	0.187 *0.736*	0.092 *0.711*
	Post	0.224 *8.736*	0.016 *1.671*			0.223 *11.064*	0.332 *3.611*	0.132 *2.985*	0.116 *2.285*	0.223 *7.985*	0.275 *1.175*
MAL	*Pre*	-0.462 *-4.487*	0.151 *2.428*	-0.340 *-3.599*	0.178 *3.448*			-0.270 *-2.466*	0.034 *0.965*	-0.449 *-4.008*	0.112 *2.131*
	Post	-0.004 *-0.152*	0.067 *4.815*	-0.303 *-4.035*	1.413 *3.706*			-0.199 *-2.166*	0.261 *1.728*	0.002 *0.040*	0.798 *1.580*
PHI	*Pre*	-0.432 *-1.273*	0.045 *0.189*	-0.552 *-1.618*	0.536 *2.658*	-0.223 *-0.507*	0.552 *0.940*			-0.326 *-0.701*	-0.035 *-0.190*
	Post	0.811 *4.259*	0.091 *3.538*	0.230 *1.167*	2.677 *4.204*	0.816 *4.723*	1.411 *5.817*			0.813 *4.268*	1.317 *2.016*
THA	*Pre*	1.177 *4.040*	0.259 *2.284*	1.446 *4.771*	0.119 *0.683*	1.639 *5.908*	0.547 *2.094*	-0.937 *-0.499*	2.217 *1.317*		
	Post	0.018 *0.609*	0.018 *1.832*	-0.082 *-1.247*	0.469 *1.663*	0.018 *0.581*	0.320 *4.929*	0.633 *2.127*	-0.534 *-2.055*		

Note: a) The post-crisis in Indonesia is from 1999:07-2003:06 due to aftershocks of the crisis persisted until mid 1999. T-statistics from consistent standard errors are in italic.

degree of regional correlations is relatively small during the pre-crisis period, with the exception when Malaysia is a regional center.

Note that the statements are sensitive to the starting point of the sample period in some cases. While it seems appropriate to start the post-crisis period in January 1999 for most countries in this study, Indonesia still experiences the aftershocks of the crisis, most likely from political unrest within the country. For example, Figure 9 clearly shows that the volatility of Indonesian interest rates, with respect to the US and Korean interest rates, have persisted until June 1999. Hence, it is more appropriate to redefine the starting date of the post-crisis period for Indonesia to July 1999[35].

Figure 9

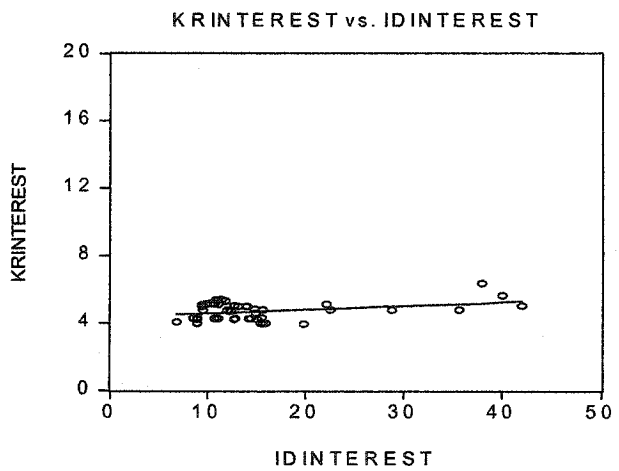


[35] On the other hand, when Indonesia is a regional center, the estimated coefficients of the US and regional interest rates are not too sensitive to the change in the starting point of the post-crisis period.

If the beginning of the post-crisis period has not been adjusted, the estimated coefficients of the US and the regional interest rates become statistically significant and very large in every case. For example, the regional coefficients in Indonesia are well over 11 when the regional interest rates are either derived from Korea or Malaysia. This scenario implies that a small increase in the regional rate will cause a substantial increase in Indonesian interest rates. As in the earlier case, it is informative to examine the scatter plot of interest rates between Indonesia and Korea during the post-crisis period.

Figure 10 shows that while most of the observations are clustered toward the origin, the high volatility of Indonesian interest rates during the first six months of 1999 causes some of the observations to stretch far to the right on the horizontal axis. Note that in addition the estimated coefficient of the U.S. interest rate becomes negative (and statistically significant).

Figure 10



Adjusting the sample period causes most of the abnormalities to disappear. This is an excellent example of just how sensitive the results are to seemingly small changes in the sample period.

On the other hand, there are more cases of intraregional integration among the East Asian countries in the post-crisis period. There are several cases for which I find greater than one-for-one of regional coefficient interest rates on the domestic interest rates. The most notable case is the Philippines in the post-crisis period. During this time, its interest rates were highly correlated not only with US interest rates, but also with the interest rates from Korea, Malaysia, and Thailand.

Korea and Malaysia seem to have large and significant effects on the other countries, with the exception of Indonesia. In addition, neither Indonesia nor the Philippines seem to affect the other countries in a significant manner. While there seems to be an increasing impact of other regional interest rates on Malaysia and the Philippines in the post-crisis period, the results are just the opposite for Indonesia, Korea, and Thailand.

When domestic variables and lag dependent variables are included in the regression specification (see Appendix 10), the coefficients of the regional interest rates in the Philippines have been reduced from more than one to about 0.6. The correlation coefficients with respect to US rates, when including domestic and lag dependent variables, however, are broadly similar to those in the second column in Table 5. These results suggest that as the Philippines adopted the floating exchange rate regime after the crisis, its interest rates followed the interest rates in the US more closely. One possible explanation that deserves further research is that the authorities have been sensitive to exchange rate fluctuations and have adjusted interest rates to reduce them.

I experimented further with the specifications by including the lag dependent variables and domestic control variables. The results, documented in Appendix 10,

appear similar to the previous findings reported in Table 6. There appears to be no significant influence of domestic control variables on the domestic interest rate. The Philippines is the only exception because its inflation rates are consistently large and statistically significant in both periods, even though the coefficients are significant at the 10 percent level. Furthermore, the new specifications do not change the outcomes, suggesting that Korea and Malaysia probably wield the most influence within the region.

II. Estimation in Differences

For symmetry, Table 11 reports the regression results of the first difference model without changes in the US rates. In the pre-crisis period, there is little evidence of regional integration among these countries, with the exception of the Philippines, when Malaysia represented as the regional center. There are, however, greater regional influences among East Asian counties in the post-crisis period. As mentioned earlier, these results may suffer from bias estimations due to omitting US interest rates.

Table 12 reports the regression results from the estimation in differences (equation (4.9)). As in Table 10, the rows indicate which of the regional interest rates appeared as the dependent variable in the differenced form. For both periods, the U.S. coefficient remains largely the same, irrespective of which regional interest rate variable is added. For example, the coefficients of US interest rates in Korea are about 1.7 in the pre-crisis period and 0.17 in the post-crisis period, which are virtually the same as those in Table 7.

At the same time, none of the coefficients of regional variables is statistically significant in the pre-crisis period, except the unusually high correlation in the

Table 11

Effects of Changes in Regional Interest Rates on Changes in Domestic Interest Rates

Regional interest rates are in columns and the dependent variables are in rows.

Local Variables		HKR	IND[a]	KOR	MAL	PHI	SNG	THA
IND	*Pre*	-0.0004 *-1.581*		0.000 *-1.242*	-0.0002 *-1.017*	-0.0002 *-1.038*	0.0003 *-1.575*	0.000 *-0.958*
	Post	-2.072 *-2.598*		-4.059 *-1.389*	5.012 *0.466*	-0.311 *-0.560*	-1.877 *-2.523*	-1.555 *-1.054*
KOR	*Pre*	0.302 *1.558*	-0.011 *-0.248*		0.095 *0.572*	0.015 *0.630*	0.535 *1.142*	0.013 *0.202*
	Post	0.011 *0.147*	-0.014 *-1.531*		0.098 *3.027*	0.087 *2.794*	0.147 *2.061*	0.109 *1.416*
MAL	*Pre*	0.057 *0.715*	-0.014 *-1.056*	0.017 *0.535*		0.010 *1.034*	-0.032 *-0.242*	0.015 *0.550*
	Post	0.085 *0.837*	0.029 *1.257*	0.191 *1.662*		0.107 *1.094*	-0.088 *-1.160*	0.196 *1.009*
PHI	*Pre*	1.404 *1.204*	0.518 *0.844*	0.307 *0.559*	1.191 *1.841*		-0.401 *-0.145*	-0.191 *-1.033*
	Post	-0.057 *-0.253*	0.008 *0.229*	1.286 *2.052*	0.807 *6.294*		0.797 *1.712*	0.330 *1.729*
THA	*Pre*	0.385 *1.190*	-0.060 *-0.802*	0.043 *0.202*	0.284 *0.559*	-0.032 *-1.112*	-0.154 *-0.168*	
	Post	-0.151 *-1.238*	-0.001 *-0.043*	0.299 *1.149*	0.277 *3.489*	0.062 *1.283*	-0.119 *-0.892*	

Note: [a] Unlike other country, the starting date in the post-crisis period for Indonesia is in July 1999, instead of January 1999. Consistent estimates of t-statistic are in italic under the estimated coefficients.

Philippines, when Malaysia is a regional center. When the interest rate dynamic is taken into consideration, however, the coefficient of Malaysian interest rates in the Philippines is large (0.78), but not statistically different from zero (see Appendix 11). The Wald test confirms that Malaysia's coefficient in the Philippines in the pre-crisis period is not significantly different from zero with a p-value of 0.747.

In the post-crisis period, there are more cases of statistically significant estimates of regional interdependence in East Asia, but the magnitude of the coefficients are much smaller than those numbers from the level estimates. Moreover, there is evidence that Korea is probably the most significant regional center because other countries tend to follow any changes in Korean interest rates more closely than any other regional countries. The similar scenarios have been observed in the estimation in levels, which confirm the leading position of Korea within the region.

Malaysia continues to have strong correlation to the interest rates in Korea, the Philippines, and Thailand; however, the magnitudes of the coefficients are lower than those when Korea represents the regional center. When compared with the estimate in level, Malaysia's coefficients have been reduced by almost half of the values reported in Table 10. Interest rates in the Philippines, on the other hand, still exhibit close correlations to changes in interest rates in the US, Korea and Malaysia. Using a Wald test, I cannot reject a null hypothesis of a full adjustment of the Philippines interest rates with respect to the changes in Korean and Malaysian interest rates, with the *p*-values of 0.9 and 0.1, respectively.

The results in the short-run, however, under the dynamic specification (Appendix 11) show that Korea's and Malaysia's coefficients in the Philippines are 0.73 and 0.56,

Table 12

Effects of the Changes in U.S. and Selected Regional Interest Rates on Changes in Local Interest Rate in First Difference
(Without lag of dependent variable)

		US	IND	US	KOR	US	MAL	US	PHI	US	THA
IND	*Pre*			0.573 *0.511*	-0.049 *-0.360*	0.496 *0.506*	-0.203 *-0.647*	0.274 *0.270*	0.062 *1.014*	0.475 *0.484*	-0.043 *-0.624*
	Post[a]			-1.017 *-0.712*	-2.890 *-0.846*	-1.933 *-1.353*	5.847 *0.539*	-1.643 *-1.126*	-0.078 *-0.134*	-1.781 *-1.431*	-1.582 *-1.074*
KOR	*Pre*	1.768 *2.893*	-0.019 *-0.373*			1.755 *2.893*	0.086 *0.531*	1.728 *2.830*	0.009 *0.396*	1.764 *2.856*	0.016 *0.271*
	Post	0.152 *1.351*	-0.013 *-1.236*			0.175 *1.706*	0.091 *3.328*	0.076 *1.837*	0.096 *0.656*	0.182 *1.875*	0.111 *1.527*
MAL	*Pre*	0.049 0.183	-0.015 -1.052	0.014 *0.051*	0.016 *0.527*			0.006 *0.023*	0.010 *1.029*	0.046 *0.172*	0.015 *0.548*
	Post	0.117 *0.809*	0.031 *1.220*	0.017 *0.173*	0.186 *1.702*			-0.076 *-0.684*	0.115 *1.121*	0.055 *0.524*	0.197 *1.004*
PHI	*Pre*	3.221 *1.173*	0.504 *0.813*	3.132 *1.145*	0.190 *0.368*	3.417 *1.145*	1.174 *1.695*			3.410 *1.163*	-0.185 *-0.966*
	Post	1.142 *2.113*	0.021 *0.550*	0.910 *1.645*	1.040 *2.115*	1.058 *1.865*	0.766 *5.302*			1.106 *1.928*	0.346 *1.599*
THA	*Pre*	-0.274 *-0.227*	-0.059 *-0.761*	-0.405 *-0.345*	0.058 *0.270*	-0.315 *-0.263*	0.286 *0.561*	-0.196 *-0.163*	-0.031 *-1.028*		
	Post	-0.029 -0.179	-0.001 -0.068	-0.085 *-0.536*	0.322 *1.153*	-0.041 *-0.253*	0.279 *3.591*	-0.108 *-0.602*	0.074 *1.472*		

Note: a) The post-crisis in Indonesia is from 1999:07-2003:06 due to aftershocks of the crisis persisted until mid 1999. Consistent t-statistics are in italic.

respectively, which are rather large when considering that these are regional effects. Contrary to the results in Table 11 that there is no influence of Korean interest rates on the Thai rates, the new finding from the dynamic (Appendix 11) suggests that changes in Korean interest rate exerts a rather strong influence (coefficient of 0.52) on interest rates in Thailand in the post-crisis period.

For a further robustness check, changes in domestic control variables and the lag dependent variable are included in the difference specification (equation (4.10)). As before, changes in domestic control variables have negligible impact on the domestic interest rates in most countries, except the inflation rate in the Philippines.

Lastly, I allow for dynamic adjustment in all the explanatory variables. With the exceptions of Thailand, the results reported in Appendix 12 are mostly similar to those in Table 12. The results in Table 12 and Appendix 12 indicate that Malaysian interest rates coefficients in Thailand are 0.28 and 0.45, respectively. By allowing more flexibility in the short-run, results from the dynamic specification indicate that Malaysia, Korea, and the Philippines have influenced the Thai rates in the post-crisis period, with magnitudes 0.46 and 0.09, respectively.

In summary, the evidence from either method indicates that there are more interest rate correlations among the East Asian countries after the post-crisis period. The correlation coefficients between local and US interest rates rarely change, regardless of the regional interest rate or domestic control variables in the specification. On the other hand, when omitting the US interest rates from regression and directly measuring interest rate interdependence among East Asian countries, results from the estimation in levels are less precise because of an omitted variable bias. The estimation in differences,

however, allow less exposure to such bias because there are fewer interest rates correlations with the US.

With the exception for Indonesia, the evidence indicates there are more interest rates interconnections among East Asian countries in the post-crisis period, with the possibility that Malaysia and Korea are the major sources of regional transmission. The leading role of Malaysia within the region is a questionable finding because of the size of its money markets and capital controls. On the other hand, every regression estimates consistently find that Korean interest rates have the largest regional impact on other countries. Since Korea has the largest money markets among these countries, the size of money markets in other countries in this study are less than half of the Korean markets, which is a more plausible finding.

However, it is rather difficult to distinguish whether the findings on intraregional interest rates are in fact the actual degrees of financial interdependence or just spurious correlations. It is a valid concern because the pattern of regional integration in the post-crisis period is concentrated among the low inflation countries and the correlations may simply reflect the policy rules adopted by each country.

CONCLUDING REMARKS

In the past, most empirical studies on Asian monetary integration have focused on the degree of capital mobility between East Asian countries and the world markets, mostly either the US or Japan. There are, however, a major number of disagreements in the empirical results attributed to different methodologies and time periods. Despite some consistency in findings, such studies do not provide little direction about monetary interdependence among Asian countries. To investigate such issues, further research is encouraged on assessing the appropriateness of the different methodologies that have been commonly used.

This dissertation made practical use of the well-known methodologies both in levels and in differences in order to assess the interest rate relationships, which can be measured by the coefficient of the effects of foreign interest rates on the domestic interest rates. I have, therefore, employed the UIP approach, similar to the Edwards-Khan model, where local interest rates can be determined by foreign interest rates from UIP and domestic macroeconomic variables.

The main conclusions derived from my research indicate the coefficient of foreign influences on the domestic interest rates can be highly unstable, depending on different methodologies, sample periods, control variables, and dynamic specifications. With the exception of the two financial centers in East Asia, my research indicates that every country experiences significant changes in degree of foreign influences between the pre- and post-crisis periods. While the US influence on the region has been reduced in the post-crisis period, there appears to be more regional integration in the post-crisis period, where perhaps Korea is the major regional influence.

There is no one, clear-cut specification in determining interest rate interdependence, even though most literature in this field employ either the estimate in levels or in differenced form. Results from the standard OLS estimate can be seemingly high and statistically significant when in fact these results may be just contemporaneous correlations rather than meaningful casual relations if the variables are not stationary.[36] The differenced equation is generally a recommended method to solve a nonstationary issue in the regression. Nevertheless, differencing is not a panacea for unit root problems because the valuable long-run relationships provided by the levels might be lost if the two nonstationary series are in fact cointegrated.

Therefore, it is not obvious how much weight should be given to the results from different specifications because of the unresolved issue of whether nominal interest rates are level stationary, I(0), or first difference stationary, I(1), variables. In addition, the lack of precision of interest rate interdependence derived from the current estimates raises even more skepticism about the results and the methods utilized in the literature. The high degree of interest rate relationships commonly found in the estimation in levels may in fact be spurious. The estimation in differenced form, therefore, under ceteris paribus conditions, provides a more promising approach. In the meantime, any such estimates need to bear a warning label "Highly Unstable, Handle With Care."

The first and foremost difficulty in implementing the UIP framework is to select an appropriate proxy for exchange rate expectations. I have applied three proxies: static, perfect foresight, and extrapolative, for exchange rate expectations. After running all three proxies through rigorous tests, I concluded the static assumption was the most

[36] The regression in level of the two nonstationary variables can yield meaningful long run relationships if these two variables are cointegrated. Then, an error correction estimate can measure a short-run correlation

appropriate fit, except when there are substantial trends under flexible rates, or large disequilibrium, under a pegged regime. On the other hand, the recent exchange rates volatility in East Asia have been largely unexpected, making actual *ex post* of the exchange rate a poor proxy for *ex ante* expectations.

The level estimates between local and US interest rates when using the whole period (the crisis dummies are from 1997:07 to 1998:12) give the false impression that Korea, Malaysia, the Philippines, and Thailand have full financial integration with the US. Once the whole period has been divided into pre- and post-crisis periods, the estimated coefficients of US interest rates are small for these countries, except for the Philippines in the post-crisis period and for Thailand in the pre-crisis period. While there appears to be no interest rate relationships between Indonesia and the US when using the whole period, the estimated coefficient of the US interest rate in the pre-crisis period indicates full adjustment of Indonesian interest rates to the US rates. Only the interest rates of Hong Kong and Singapore consistently show full adjustment to the US interest rates in the whole period and in both sub periods. This fits well with the findings since both countries have extremely open financial markets.

I find that the sensitivity of local to US interest rates in the level estimates has declined for Korea and become insignificantly different from zero for Indonesia and Thailand after they adopted floating exchange rate regimes. Perhaps due to capital controls imposed by the authorities after the financial crisis, interest rates in Malaysia do not follow movements of interest rates in the US, even though the ringgit is pegged to the US dollar after 1998. On the other hand, the Philippines shows a symptom of fear of floating because its interest rates are very sensitive to an adjustment of the US rates, even

if the authorities officially claim to support a floating exchange rate regime. Overall, these results contradict the recent empirical findings by Frankel et al. (2000, 2002) that the East Asian countries are tightly integrated with the world financial markets, regardless of currency regimes.

Many explanatory variables may have effects that persist over time; therefore, when employing high frequency data, it is more appropriate to permit the past values of the dependent and independent variables to determine the current values of the dependent variable. Once the dynamic specifications have been applied to the level analyses, the US coefficients are lower across countries, especially for Hong Kong and the Philippines in the post-crisis period, and for Indonesia in the pre-crisis period.

The first difference estimates produce similar results to those of the level estimates for Hong Kong, Singapore, the Philippines, and Malaysia (less so in the pre-crisis period). There are several cases pertaining to Korea, Indonesia, and Thailand in which the regressions in differenced form derive rather different results. In the pre-crisis period, for example, the US coefficients of Indonesia and Thailand were not statistically significant from zero. On the contrary, a full integration with the US was observed in the estimation in levels.

Similar to the level estimates, the US coefficients do not change with an inclusion of domestic control variables to the first differencing specifications, except for the inflation rate of the Philippines. However, the dynamic specifications in differenced form, unlike the estimates in levels, do not significantly change the estimated coefficients of the US interest rate.

With the exceptions of Hong Kong and Singapore as the regional centers, adding regional interest rates, as well as domestic control variables, to the specification does not significantly affect the estimated US coefficients in either method. Without the US interest rate as a control, the estimation in levels of regional interdependence tends to be less precise in the pre-crisis period due to an omitted variable bias, since many of the regional interest rates are highly correlated with the US interest rate. However, the estimates in differenced form find much more consistent results, whether or not the US interest rates have been included.

The previous statement is sensitive to the starting point of the sample period in some cases. While it seems appropriate to start the post-crisis period in January 1999 for most countries, Indonesia still appears to have been in the aftershocks of the crisis. The volatility of Indonesian interest rates with respect to the other interest rates persists until June 1999. Thus, it is better to set the starting date of the post-crisis period for Indonesia to July 1999. With the earlier starting date, the estimated coefficients of the US and regional interest rates for Indonesia become unreasonably large.

The level estimates of regional integration indicate that during the pre-crisis period, there is evidence of interest rate interconnection between Indonesia and Malaysia, Korea and Malaysia, Malaysia and Thailand, and Thailand and Indonesia. According to the estimates, this leaves the Philippines playing no role either as an influence to, or being influenced by, other countries. These might be spurious results since the estimations in differences reported in Table 14 do not find such relationships in the same time period.

Table 13

Summary Coefficients of Selected Regional Interest Rates in Levels

Dependent variable	Regional Center	Period	Table 9 **Only** $i^{regional}$	Table 10 i^{US} and $i^{regional}$	App. 9 Dynamic i^{US}, $i^{regioanl}$	App. 10 i^{US}; $i^{regioanl}$; domestic Variables; lagged dependent.
IND[a]	KOR	*Pre*	0.27*	0.12	-0.001	0.002
		Post	-1.46	-3.03	-0.76	-3.4***
	MAL	*Pre*	0.36	0.94***	0.17**	0.18**
		Post	6.73**	5.77	4.38**	-4.19
	PHI	*Pre*	-0.03	0.02	0.06	0.07
		Post	0.01	0.48	0.4**	0.05
	THA	*Pre*	0.53***	0.33**	0.09**	0.09**
		Post	1.46	1.64	0.54**	1.03
KOR	IND	*Pre*	0.13***	0.07	0.21***	-0.03
		Post	-0.04	0.02**	0.05***	-0.01**
	MAL	*Pre*	0.46***	0.67**	0.04	0.03
		Post	0.38***	0.33***	-0.05	-0.14***
	PHI	*Pre*	0.11*	0.13**	0.02	0.02
		Post	0.2***	0.12***	0.01	-0.01
	THA	*Pre*	0.14**	0.09	-0.03	-0.02
		Post	0.4*	0.28	-0.06*	-0.09*
MAL	IND	*Pre*	0.05	0.15***	-0.01	0.03
		Post	0.01	0.05***	0.001	0.01
	KOR	*Pre*	0.13***	0.18***	0.03**	0.07*
		Post	0.53*	1.41***	0.39**	0.41**
	PHI	*Pre*	0.04	0.03	-0.01	0.002
		Post	0.13	0.26**	0.04*	0.04
	THA	*Pre*	-0.02	0.11**	-0.02*	-0.01
		Post	0.8*	0.79*	0.25*	0.24*
PHI	IND	*Pre*	-0.05	0.05	0.03	0.04
		Post	0.004	0.09***	0.01	0.2***
	KOR	*Pre*	0.46**	0.54***	0.46***	0.28
		Post	3.35***	2.68***	0.43**	0.53**
	MAL	*Pre*	0.64	0.55	0.50	0.33
		Post	1.57***	1.41***	0.25***	0.6***
	THA	*Pre*	-0.13	-0.04	-0.09	-0.10
		Post	1.78***	1.32**	0.24**	0.79***
THA	IND	*Pre*	0.52***	0.26***	0.02	0.07
		Post	0.02	0.02**	-0.01**	-0.01
	KOR	*Pre*	0.31*	0.12	0.002	0.09
		Post	0.23	0.47**	0.27***	0.31***
	MAL	*Pre*	-0.11	0.55***	0.34**	0.38**
		Post	0.32***	0.32***	0.07	0.17**
	PHI	*Pre*	-0.07	2.22	0.02	0.003
		Post	0.06*	-0.53**	0.02	0.02

*,**, and *** indicate statistically significant at the 10 percent, 5 percent, and 1 percent levels.

[a]) The starting date of the post-crisis period is in July 1999, instead of January 1999 like other countries.

Table 14

Summary Coefficients of Selected Regional Interest Rates in Differences

Dependent variable	Regional Center	Period	**Table 11 Only** $i^{regional}$	Table 12 i^{US}; $i^{regioanl}$	Appendix 11 Dynamic i^{US}, $i^{regioanl}$	Appendix 12 *Dynamic:* i^{US}; $i^{regioanl}$; domestic Variables; lagged dependent.
IND[a]	KOR	*Pre*	0.00	-0.05	-0.05[b]	-0.08
		Post	-4.06	-2.89	-2.89	-2.90
	MAL	*Pre*	-0.0002	-0.20	-0.20	-2.6
		Post	5.01	5.85	5.85	7.01
	PHI	*Pre*	-0.0002	0.06	0.06	0.06
		Post	-0.31	-0.08	-0.08	0.12
	THA	*Pre*	0.0003	-04	-04	-0.11
		Post	-1.56	-1.58	-1.58	-1.46
KOR	IND	*Pre*	-0.01	-0.02	-0.02	-0.05
		Post	-0.01*	-0.01	-0.01***	-0.01***
	MAL	*Pre*	0.10	0.09	0.09	0.05
		Post	0.1***	0.09***	-0.16***	-0.16***
	PHI	*Pre*	0.02	0.01	0.01	0.01
		Post	0.09***	0.10	0.02*	0.03**
	THA	*Pre*	0.01	0.02	0.02	0.01
		Post	0.11*	0.11*	0.08**	0.05
MAL	IND	*Pre*	-0.01	-0.02	-0.01	-0.02
		Post	0.03	0.03	0.03	0.02*
	KOR	*Pre*	0.02	0.02	0.01	0.01
		Post	0.19**	0.19**	0.10	0.11
	PHI	*Pre*	0.01	0.01	0.01	0.004
		Post	0.11	0.12	0.09	0.08
	THA	*Pre*	0.02	0.02	0.02	0.02
		Post	0.20	0.20	0.19	0.13*
PHI	IND	*Pre*	0.52	0.50	0.185	0.54
		Post	0.01	0.02	0.002	0.03
	KOR	*Pre*	0.31	0.19	0.13	0.22
		Post	1.29**	1.04**	0.72**	0.42
	MAL	*Pre*	1.19**	1.17**	0.78	0.33
		Post	0.81***	0.77***	0.56***	0.6***
	THA	*Pre*	-0.19	-0.19	0.18	0.17
		Post	0.33**	0.35*	0.26*	0.33*
THA	IND	*Pre*	-0.06	-0.06	-0.001	-0.02
		Post	-0.001	-0.001	0.00	-0.002
	KOR	*Pre*	0.04	0.06	0.03	-0.005
		Post	0.30	0.32	0.52***	0.46**
	MAL	*Pre*	0.28	0.29	0.11	0.10
		Post	0.28***	0.28***	0.36***	0.45***
	PHI	*Pre*	-0.15	-0.03	-0.03	-0.04
		Post	-0.12	0.07*	0.08*	0.09***

*,**, and *** indicate statistically significant at the 10 percent, 5 percent, and 1 percent levels.

[a]) The starting date of the post-crisis period is in July 1999, instead of January 1999 like other countries.

[b]) No additional lag is needed for the dynamic process in Indonesia.

In the post-crisis period, the estimation in levels suggests much more pronounced financial integration among East Asian countries. However, the last column of Table 13 indicates the inclusion of domestic controls and the lag dependent variables diminish the effect of the regional interest rates across countries.

In the post-crisis period, Korea and Malaysia appear to have significant effects on the other countries. The most noticeable case is in the Philippines because its interest rates follow the interest rates of the US and of other regional countries more closely, except for Indonesia. Comparing the last two columns of Table 13, the regional coefficients of Indonesia in the post-crisis period are relatively large and highly unstable, once adding the domestic controls. This may reflect persistence of interest rate volatility of Indonesia, even after most of the East Asian countries have recovered from the crises.

For the estimation in differences, there is no evidence of regional integration in the pre-crisis period, except for the Philippines, when Malaysia represents the regional center. In the post-crisis period, however, there appears to be a high number of cases of regional interest rate interconnections. A crucial piece of evidence extrapolated from the results in Tables 13 and 14 is that Korean interest rates appear to have the strongest influence on interest rates of Malaysia, the Philippines, and Thailand in the post-crisis period, regardless of specification.

Despite some skepticism about the validity of each method and the true nature of interest rate correlations, the findings consistently indicate that Korea is the dominant force among the countries examined in my study. As the country presiding over the most dominant money markets in East Asia (excluding Japan and China), it is plausible, and quite feasible, for Korea to transmit its robust monetary policy to other countries.

The influence of other East Asian countries on Korean interest rates in the post-crisis period is rather limited, due to their much smaller money markets. The size of a nation's money market, on average, may determine whether its money market influences, or becomes influenced by, the monetary policies adopted by neighboring countries. In addition, Hong Kong and Singapore have both been excluded as regional centers due to their financial integration with the US economy, as well as their possibility of incurring perfect multicollinearity problems.

These results obtained from my observations need to be carefully interpreted because the level of interest rate interdependence may change over time. For example, it is not clear whether the estimated coefficients are in fact the degree of interest rate interdependence or a combination of monetary policy reaction function or just spurious correlations. In general, the central bank adjusts monetary policy rules, via short-term nominal interest rates, in response to deviations of inflation and real output from the target levels. The policy rules, on the other hand, can be expressed as a function of the expected change in exchange rate, output gap, and inflation rate (see Taylor, 1999; Clarida et al., 1999). Since the exchange rate is one of the factors driving the domestic inflation rate, any changes in the exchange rate are likely to affect the domestic inflation rate and in return affect the domestic interest rates. As a result, a nation with a floating exchange rate regime can appear as if it follows the changes in foreign interest rate movements.

Similar to a regime switching exchange rates, which clearly causes a structural break in interest rate behavior, the widespread shift to lower inflation levels may create a high correlation of intra regional interest rates. Further research must attempt to

distinguish between low inflation rate regimes and the effect of changes in the exchange rate on local interest rates in nonpegged countries.

Several monetary implications can be drawn from these empirical results. An acceleration of financial market integration within the region implies that monetary authorities need to be attentive to economic development not only in the major world markets, but also within the regional setting, because a policy implemented by a neighboring country may have adverse effects that can be felt across the region. On the other hand, as most of these countries move away from rigid exchange rate regimes to more flexible exchange rates, monetary transmission is likely to move away from the interest rates to the expected change in the exchange rate. Therefore, further research should incorporate to what degree changes in the exchange rate effect local interest rates.

Studies conducted for this dissertation appear to support the assumption that despite an increase in international capital mobility, the degree of financial integration of most East Asian countries is far from perfect. One of the most crucial points which can be drawn from this study is that, in the pre-crisis period, most of these countries are more financially integrated with the United States than with each other. In the post-crisis period, there seems to be a much lower degree of financial interconnection between the non-financial center countries and the US after these countries switched to a floating exchange rate regime.

On the other hand, the findings suggest more intra regional financial integration among the East Asian countries, but the direction and degree of interest rate interdependence tend to vary across country pairs. The size of money markets is possibly one of the most important factors that determines the strength of regional interaction.

Appendix A
Data Definitions

r — Money market rate on short-term interbank rate (line 60b of IFS) for every county except Hong Kong Interbabk Offered Rate (HIBOR) is from Monetary Authority of Hong Kong and Singapore (MAHK) and Interbank Offered Rate (SIBOR) is from Monetary Authority of Singapore (MAS).

r* — US treasury bill rate and Japan money market rate (IFS)

M1 — Narrow definition of money (line 34 of IFS), except Hong Kong where M1 is obtained from MAHK. The unit of every country is in billions of national currency, except Malaysia and Singapore that are in millions.

CPI — Consumer price index (CPI) (line 64 of IFS).

IP — Industrial production Index (line 66 of IFS); except for Thailand's manufacturing production index is from Bank of Thailand and Indonesia's is from the Central Bank of Indonesia's total production indices for large and medium manufacturing series.

Y — Gross domestic product (GDP) (line 99b of IFS), except data of Singapore is from Ministry of Investment and Trade (MITI). The unit of every country is in billions of national currency, except Malaysia and Singapore that are in millions of national currency.

E — End of period of exchange rate (series ***ae*** from IFS) which expresses as units of national currency per US dollar.

Appendix 1

Selected Empirical Findings on Capital Mobility in East Asia

	Data Range	*Method*	*HONG KONG*	*Indonesia*	*Korea*	*MALAYSIA*	*Philippines*	*Singapore*	*Thailand*
Edwards and Khan (84)	1976:03 - 1983:04	OLS	-	-	-	-	-	0.922	-
Ahn (94)	1976:03 - 1983:04	OLS	-	-	-	-	-	0.304	-
	1979:02 - 1993:04	OLS	-	-	(0.018)	-	-	0.253	-
Haque and Montiel (91)	1969 - 87	IV	-	0.865 (not different from 1)	-	0.638 (not different from 1)	0.577 (not different from 1)	-	-
Dooley and Mathieson (94)	1964-89	OLS	-	0.972 (less than perfectly mobile)	0.95 (not different from 1)	0.91 (not different from 1)	1.11 (not different from 1)	-	0.91 (not different from 1)
		IV	-	0.66	0.95	0.94	1.13	-	0.85
Chinn and Frankel (94)	1982:09 - 1992:03	OLS with time trend	1.276	(0.037)	-0.989 / (-0.066)	(0.013)	-	(0.809)	0.997
Frankel, Schmukler, and Serven (00)	1990:01- 1999:12	OLS	1.07	1.26	-	-	1.29	0.86	1.42
Frankel, Schmukler, and Serven (02)	1990:01- 1999:12	ADL / EC	0.91	-	-	-	2.16	0.99	1.4
Kim and Lee (04)	1987:01 - 2002:4	First differencing	1.641	0.043	Before 2.946 After (-0.29)	Before (0.152) After (- 0.42)	1.731	(0.118)	Before 3.514 After (0.392)

Note: The estimated coefficients in parenthesis are not statistically significant from zero.

Appendix 2
Quinn-Type Index of Capital Controls

	Hong Kong	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand
1990	12.00	9.00	7.55	10.70	4.58	11.80	6.60
1991	12.00	9.00	7.70	10.70	5.60	11.80	7.20
1992	12.00	9.00	7.70	10.80	7.28	11.90	7.60
1993	12.00	11.00	8.60	10.80	9.80	12.00	9.00
1994	12.00	11.00	9.40	11.00	9.80	12.00	9.00
1995	12.00	12.00	10.50	11.50	10.20	12.00	10.10
1996	12.50	12.00	7.75	12.00	10.20	12.50	8.85
1997	11.00	10.00	6.00	7.00	8.50	13.00	6.50
1998	10	9.50	6.50	6.00	9.00	9.50	6.50
1999	8.8	9.00	7.00	7.00	13.00	7.00	6.00

Note: High index means low capital controls. These indexes are coded at Claremont Graduate University.

Appendix 3
Exchange Rate Regime Classification

Country	Period	De Facto[a]		Period	De Jure[b]	
		Exchange rate regime classification			Exchange rate regime classification	
		Narrow	Broad		Narrow	Broad
Hong Kong	1983:10 -2001:12	Currency board/ Peg to US dollar	Fixed	1983:10 - 2002:01	Pegged to US dollar	Fixed
Indonesia	1978:11 - 1997:07	Crawling pegged to US dollar	Intermediate	1978:11 - 1997:07	Managed floating	Intermediate
	1997:08 - 2002:01	Freely floating / Free falling	Floating	1997:08 - 2002:01	Independently floating	Floating
	1999:03 - 2001:12	Freely floating				
Korea	1980:02 -1994:11	Pre announced crawling band	Intermediate	1980:02 - 1997:11	Managed floating	Intermediate
	1994:11 - 1997:01	Crawling pegged to US dollar		1997:12 - 2002:01	Independently floating	Floating
	1997:12 - 1998:07	Free Falling	Floating			
	1998:07 - 2001:12	Freely floating				
Malaysia	1975:09 - 1997:07	Limited flexibility with respect to US dollar	Intermediate	1975:09 - 1993:03	Limited flexibility with respect to US dollar	Intermediate
	1997:12 - 1998:09	Freely floating/ Free falling	Floating	1993:04 - 1998:08	Managed floating	
	1998:09 - 2001:12	Pegged arrangement	Fixed	1998:09 - 2002:01	Pegged to US dollar	
Philippines	1985:03 - 1992:04	Crawling pegged to US dollar	Intermediate	1984:10 - 2002:01	Independently floating	Floating
	1992:04 - 1995:08	Band around US dollar				
	1995:09 - 1997:07	Pegged to US dollar	Fixed			

	1997:07 - 1997:12	Freely floating/ Free falling	Floating			
	1997:12 -2001:12	Managed floating	Intermediate			
Singapore	1973:06 - 1998:11	Moving band around US dollar	Intermediate	1987:07 - 2002:01	Managed floating	Intermediate
	1998:12 - 2001:12	Managed floating				
Thailand	1987:03 -1997:07	Pegged to US dollar	Fixed	1984:11 - 1997:07	Limited flexibility with respect to a basket	Intermediate
	1997:07 -1998:01	Freely floating / Free falling	Floating	1997:07 - 1998:06	Managed floating	
	1998:01 -2001:12	Managed floating	Intermediate	1998:07 - 2002:01	Independently floating	Floating

Note (a) from Reinhart and Rogoff (2004) and (b) from Frankel, et al. (2002) and the IMF *Annual Report on Exchange Arrangements and Exchange.*

Appendix 4

Unit Roots Test of the Interest Rates

Interest Rate		ADF (constant)	ADF (+ trend)	PP (constant)	PP (+ trend)	Δ ADF (constant)
Hong Kong	*Pre*	-2.18	-1.91	-2.01	-1.76	-11.48***
	Post	-0.15	3.62**	-0.02	-2.63	-5.97***
Indonesia	*Pre*	-2.97**	-2.97	-2.93**	-2.93	-8.18***
	Post	-2.25	-3.91**	-2.25	-2.04	-13.70**
Korea	*Pre*	-2.71*	-3.47**	-2.71*	-3.47**	-9.32***
	Post	-1.56	-3.33	-3.84***	-4.09**	-4.66***
Malaysia	*Pre*	-1.54	-1.52	-2.11	-2.14	-4.07***
	Post	-3.87***	-3.79**	-4.78***	-4.21***	-3.04**
Philippines	*Pre*	-7.47***	-8.00***	-7.54***	-7.98***	-14.81***
	Post	-2.56	-3.01	-2.13	-2.23	-4.08***
Singapore	*Pre*	-1.97	-1.52	-1.91	-1.41	-7.14***
	Post	-0.24	-2.04	-0.15	-1.81	-3.85***
Thailand	*Pre*	-3.42**	-3.31*	-3.4**	-3.28*	-10.30***
	Post	-3.29**	-3.24*	-3.23**	-3.20*	-7.99***
USA	*Pre*	-2.25	-1.88	-1.96	-1.51	-5.29***
	Post	-0.21	-1.93	-0.01	-1.79	-3.75***

Note: ADF is the Augmented Dickey-Fuller test and PP is the Phillips-Peron test. *, **, and *** indicate significance at the 10% , 5%, and 1% levels.

Appendix 5

The Cointegration Tests between the local interest rates and the US interest rates

Interest Rate		Trace Statistic		Max-Eigen Statistic	
		$H_0: r = 0$	$H_0: r \leq 1$	$H_0: r = 0$	$H_0: r \leq 1$
Hong Kong	*Pre*	26.98**	6.28*	19.80**	6.28*
	post	8.38	0.43	7.96	0.43
Indonesia	*Pre*	28.64**	6.81**	21.82**	6.81**
	post	7.67	0.02	7.65	0.02
Korea	*Pre*	16.22*	6.37*	9.85	6.37*
	post	40.33**	0.18	40.14**	0.003
Malaysia	*Pre*	34.96**	8.90**	26.06**	8.90**
	post	14.75	0.13	14.62*	0.13
Philippines	*Pre*	22.62**	5.81*	16.81*	3.81*
	post	13.63	0.09	13.54	0.09
Singapore	*Pre*	22.20**	5.31*	16.88*	5.31*
	post	24.66**	0.52	24.13**	0.52
Thailand	*Pre*	29.67**	7.07**	22.60**	7.07**
	post	13.67	0.14	13.53	0.14

Notes: If r denotes the number of significant vector, then the Johansen trace statistics and maximum-eigen statistic test the hypothesis of at most one and zero cointegrating vectors respectively. * and ** indicate significance at the 5 % and 1% respectively.

Appendix 6

Replication of Frankel, Schmukler, and Serven (2000)

Country	Sample	Constant	US t-bill	Lag of dependent	Test slope =1 (p value)	R^2	Num. Observations
Hong Kong	94:1 - 99:12	0.01 (0.01)	0.93** (0.18)	-	0.69	0.12	69
	94:1 - 99:12	0.01 (0.01)	0.76** (0.18)	0.20 0.11	0.19	0.15	69
Indonesia	90s	0.08** (0.03)	0.92 (0.57)	-	0.88	0.72	119
Philippines (market rate)	90s	0.14** (0.02)	-0.42 (0.33)	-		0.13	119
(90-day t-bill)	90s	0.06** (0.02)	1.51** (0.49)	-	0.30	0.29	119
Singapore	90s	-0.01 (0.01)	0.87** (0.12)	-	0.26	0.41	120
	90s	0.00 (0.00)	0.13** (0.07)	0.85** (0.05)	0.00	0.84	120
Thailand	90s	0.02** (0.01)	1.42** (0.18)	-	0.02	0.44	87
	90s	0.01 (0.01)	0.64** (0.19)	0.56** (0.06)	0.05	0.62	87

Consistent standard errors are in parenthesis. ** indicates statistical significant at the 5 % level.

Note: Controls variables: hyperinflation, crisis, and regime change , are not reported.

Note: Appendixes 7 to 12 report the estimated coefficients of each variable and t-statistics are in italic.

Appendix 7

Effect of the US interest rates on domestic interest rates with domestic controls variables in the dynamic model *(in level)*

Hong Kong

(local interest rate as dependent variable)

Explanatory Variables		4.3a	4.3.1
C	*PRE*	-	0.000 *-0.765*
	Post	0.001 *1.224*	0.003 *3.228*
i_t^{US}	*Pre*	-	1.184 *24.974*
	Post	0.625 *6.135*	0.862 *11.341*
$Income_t$	*Pre*	-	-
	Post		
$Inflation_t$	*Pre*	-	0.005 *0.840*
	Post	-0.013 *-1.766*	-0.006 *-0.694*
$Inflation_{t-1}$	*Pre*	-	-
	Post	-0.020 *-2.110*	
$Inflation_{t-2}$	*Pre*	-	-
	Post	-0.023 *-3.247*	
$Inflation_{t-3}$	*Pre*	-	-
	Post	-0.021 *-3.958*	
$Inflation_{t-4}$	*Pre*	-	-
	Post	-0.032 *-2.889*	
$M1_{t-1}$	*Pre*	-	0.000 *0.260*
	Post	-0.004 *-3.379*	-0.003 *-3.322*

$M1_{t-2}$	*Pre*		-
	Post	-0.003 *3.049*	
i_{t-1}	*Pre*	-	-
	Post	0.334 *2.529*	
Summary Statistics			
N.	*Pre*	89	-
	Post	53	53
$Adj.R^2$	*Pre*	0.909	-
	Post	0.964	0.975
$p-value$ $H_0: i_t^{US} = 0$	*Pre*	0.000	-
	Post	0.000	0.000
$p-value$ $H_0: i_t^{US} = 1$	*Pre*	0.020	-
	Post	0.000	0.0002

Indonesia

		4.3	4.3a	4.3.1
C	*Pre*	-0.016 *-1.290*	-0.005 *-0.871*	-
	Post	0.001 *0.035*	0.008 *0.280*	-0.014 *-0.520*
i_t^{US}	*Pre*	0.436 *2.639*	0.444 *2.599*	-
	Post	-0.002 *-0.013*	0.035 *0.211*	-0.082 *-0.499*
$Income_t$	*Pre*	0.002 *1.181*	-	-
	Post	0.002 *0.386*		0.007 *2.362*
$Inflation_t$	*Pre*	0.033 *1.310*	0.032 *1.254*	-
	Post	0.114 *2.221*	0.112 *2.202*	0.098 *2.356*
$Inflation_{t-1}$	*Pre*	-	-	-
	Post			0.091 *2.931*

$Inflation_{t-2}$	*Pre*	-	-	-
	Post			-0.016 *-0.371*
$Inflation_{t-3}$	*Pre*	-	-	-
	Post			0.172 *2.560*
$M1_{t-1}$	*Pre*	0.001 *1.209*	0.001 *0.948*	-
	Post	-0.002 *-0.342*	-0.001 *-0.292*	-0.003 *-0.715*
i_{t-1}	*Pre*	0.715 *6.647*	0.734 *7.155*	-
	Post	0.924 *10.613*	0.921 *10.308*	0.575 *5.437*
i_{t-2}	*Pre*	-	-	
	Post			0.045 *0.994*
i_{t-3}	*Pre*	-	-	
	Post			0.043 *0.863*
i_{t-4}	*Pre*	-	-	
	Post			0.150 *3.034*
Summary Statistics				
N.	*Pre*	89	89	-
	Post	53	53	53
$Adj.R^2$	*Pre*	0.693	0.694	-
	Post	0.860	0.863	0.929
$p-value$	*Pre*	0.008	0.009	-
$H_0 : i_t^{US} = 0$	*Post*	0.980	0.832	0.618
$p-value$	*Pre*	0.0006	0.001	-
$H_0 : i_t^{US} = 1$	*Post*	0.000	0.000	0.000

Korea

		4.3	4.3a	4.3.1
C	*PRE*	0.011 *2.119*	0.012 *2.700*	0.015 *2.664*

	Post	-0.002 *-1.210*	-0.003 *-2.595*	-0.002 *-1.099*
i_t^{US}	*Pre*	0.126 *0.984*	0.103 *1.190*	0.022 *0.164*
	Post	0.077 *3.809*	0.111 *8.485*	0.093 *2.491*
$Income_t$	*Pre*	-0.001 *-0.257*	-	-0.005 *-1.298*
	Post	0.001 *1.862*		0.0004 *-0.654*
$Income_{t-1}$	*Pre*	-	-	0.007 *1.647*
	Post			-
$Inflation_t$	*Pre*	-0.028 *-1.155*	-0.028 *-1.162*	-0.030 *-1.172*
	Post	0.000 *-0.042*	0.001 *0.227*	0.001 *0.459*
$M1_{t-1}$	*Pre*	-0.001 *-0.512*	-0.001 *-2.335*	-0.002 *-1.467*
	Post	0.000 *-0.322*	0.000 *3.364*	-0.0005 *-1.560*
$M1_{t-2}$	*Pre*	-	-	-
	Post			0.001 *2.414*
i_{t-1}	*Pre*	0.746 *10.986*	0.741 *10.676*	0.725 *10.718*
	Post	0.733 *16.494*	0.697 *20.428*	1.149 *10.236*
i_{t-2}	*Pre*	-	-	-
	Post			-0.406 *-4.663*
Summary Statistics				
N.	*Pre*	89	89	89
	Post	53	53	53
$Adj.R^2$	*Pre*	0.715	0.718	0.727
	Post	0.960	0.959	0.976
$p-value$ $H_0: i_t^{US}=0$	*Pre*	0.325	0.234	0.870
	Post	0.0001	0.000	0.013
$p-value$ $H_0: i_t^{US}=1$	*Pre*	0.000	0.000	0.000
	Post	0.000	0.000	0.000

Malaysia

		4.3	4.3a	4.3.1
C	*Pre*	0.0005 *0.309*	0.001 *0.595*	-0.002 *-1.054*
	Post	-0.005 *-2.189*	-0.003 *-1.944*	-
i_t^{US}	*Pre*	-0.006 *-0.074*	0.043 *0.856*	0.182 *2.108*
	Post	0.058 *1.863*	0.027 *2.056*	-
$Income_t$	*Pre*	0.0008 *0.923*	-	0.000 *0.623*
	Post	-0.001 *-0.895*		-
$Inflation_t$	*Pre*	-0.008 *-0.587*	-0.010 *-0.723*	-0.008 *-0.508*
	Post	-0.001 *-0.097*	-0.005 *-0.395*	-
$M1_{t-1}$	*Pre*	-0.001 *-1.056*	0.000 *-0.559*	0.000 *-0.516*
	Post	0.001 *1.697*	0.001 *2.128*	-
i_{t-1}	*Pre*	0.887 *7.894*	0.908 *9.223*	0.527 *3.079*
	Post	0.894 *6.028*	0.876 *8.477*	-
i_{t-2}	*Pre*	-	-	-0.195 *-0.415*
	Post			-
i_{t-3}	*Pre*	-	-	0.721 *1.262*
	Post			-
Summary Statistics				
N	*Pre*	89	89	87
	Post	53	53	-
$Adj.R^2$	*Pre*	0.807	0.807	0.849
	Post	0.870	0.872	-
$p-value$ $H_0: i_t^{US} = 0$	*Pre*	0.941	0.392	0.035
	Post	0.061	0.040	-
$p-value$	*Pre*	0.000	0.000	0.000

	Post	0.000	0.000	-

Philippines

		4.3	4.3a	4.3.1
C	*Pre*	0.017 *0.807*	0.014 *4.496*	-
	Post	0.002 *1.188*	0.000 *0.065*	0.005 *3.039*
i_t^{US}	*Pre*	-0.585 *-1.304*	-0.553 *-1.539*	-
	Post	0.139 *3.110*	0.145 *3.169*	0.108 *2.402*
$Income_t$	*Pre*	-0.001 *-0.159*	-	-
	Post	-0.0003 *-1.758*		0.000 *-0.137*
$Inflation_t$	*Pre*	0.110 *1.456*	0.111 *1.452*	-
	Post	0.073 *1.401*	0.074 *1.405*	0.120 *2.298*
$Inflation_{t-1}$	*Pre*	-	-	-
	Post			0.049 *2.466*
$Inflation_{t-2}$	*Pre*	-	-	-
	Post			0.089 *3.196*
$Inflation_{t-3}$	*Pre*	-	-	-
	Post			0.090 *2.715*
$Inflation_{t-3}$	*Pre*	-	-	-
	Post			0.068 *2.188*
$Inflation_{t-5}$	*Pre*	-	-	-
	Post			0.059 *2.265*
$Inflation_{t-6}$	*Pre*	-	-	-
	Post			0.061 *2.220*
$M1_{t-1}$	*Pre*	-0.004 *-0.523*	-0.006 *-2.896*	-
	Post	-0.001 *-0.391*	0.000 *0.300*	-0.003 *-2.552*
i_{t-1}	*Pre*	0.109 *0.721*	0.107 *0.704*	-

	Post	0.832 *12.764*	0.840 *12.836*	0.800 *5.861*
i_{t-2}	*Pre*	-	-	-
	Post			-0.414 *-6.657*
Summary Statistics				
N.	*Pre*	89	89	-
	Post	53	53	53
$Adj.R^2$	*Pre*	0.106	0.116	-
	Post	0.927	0.926	0.964
$p-value$	*Pre*	0.192	0.124	-
$H_0 : i_t^{US} = 0$	*Post*	0.002	0.002	0.016
$p-value$	*Pre*	0.0004	0.000	-
$H_0 : i_t^{US} = 1$	*Post*	0.000	0.000	0.000

Singapore

		4.3	4.3a	4.3.1
C	*Pre*	-	-0.0004 -0.781	-
	Post	0.010 *2.286*	0.009 *3.576*	0.007 *2.349*
i_t^{US}	*Pre*	-	0.889 8.068	-
	Post	0.597 *2.634*	0.716 *4.214*	0.692 *4.270*
$Income_t$	*Pre*	-	-	-
	Post	0.001 *2.784*		0.001 *1.623*
$Inflation_t$	*Pre*	-	0.003 0.796	-
	Post	0.009 *1.260*	0.014 *1.534*	0.006 *0.992*
$M1_{t-1}$	*Pre*	-	8.23E-5 0.897	-
	Post	-0.003 *-3.010*	-0.002 *-3.602*	-0.002 *-2.457*
i_{t-1}	*Pre*	-	0.186 1.802	-
	Post	0.396 *1.908*	0.320 *2.099*	0.797 *4.063*

i_{t-2}	*Pre*	-	-	-
	Post			-0.463 *-4.764*
Summary statistics				
N.	*Pre*	-	89	-
	Post	53	53	53
$Adj.R^2$	*Pre*	-	0.987	-
	Post	0.991	0.990	0.994
$p-value$ $H_0: i_t^{US} = 0$	*Pre*	-	0.000	-
	Post	0.000	0.000	0.000
$p-value$ $H_0: i_t^{US} = 1$	*Pre*	-	0.311	-
	Post	0.075	0.236	0.057

Thailand

		4.3	4.3a	4.3.1
C	*Pre*	-0.011 *-0.612*	0.000 *0.173*	0.010 *0.526*
	Post	0.008 *2.508*	0.000 *0.189*	0.006 *2.003*
i_t^{US}	*Pre*	0.746 *3.947*	0.634 *3.122*	0.745 *3.129*
	Post	-0.046 *-1.871*	0.011 *0.824*	-0.033 *-1.350*
$Income_t$	*Pre*	0.003 *0.620*	-	-0.012 *-2.222*
	Post	-0.002 *-2.547*		-0.001 *-2.140*
$Income_{t-1}$	*Pre*	-	-	0.010 *1.318*
	Post			-
$Inflation_t$	*Pre*	0.045 *1.051*	0.044 *1.048*	0.041 *1.071*
	Post	-0.009 *-0.799*	-0.008 *-0.714*	-0.013 *-1.190*
$M1_{t-1}$	*Pre*	-0.002 *-0.538*	0.000 *0.346*	-0.016 *-2.364*
	Post	0.001 *1.828*	0.000 *0.806*	0.001

$M1_{t-2}$	*Pre*	-	-	0.009 *0.943*
	Post			-
$M1_{t-3}$	*Pre*	-	-	0.010 *1.432*
	Post			-
i_{t-1}	*Pre*	0.549 *7.764*	0.573 *8.763*	0.510 *6.360*
	Post	0.577 *5.911*	0.683 *6.624*	0.698 *5.249*
i_{t-2}	*Pre*	-	-	-
	Post			-0.381 *-2.210*
i_{t-3}	*Pre*	-	-	-
	Post			0.276 *2.354*
Summary Statistics				
N.	*Pre*	89	89	87
	Post	53	53	53
$Adj.R^2$	*Pre*	0.586	0.589	0.661
	Post	0.514	0.485	0.569
$p-value$	*Pre*	0.000	0.002	0.002
$H_0: i_t^{US} = 0$	*Post*	0.061	0.409	0.177
$p-value$	*Pre*	0.180	0.071	0.285
$H_0: i_t^{US} = 1$	*Post*	0.000	0.000	0.000

Appendix 8

Effects of Changes in US interest rates on the local Interest rate in Dynamic *(Difference)*

Hong Kong (Changes in the local interest rates as dependent variable)

		4.4	4.4.1	4.4.1a	4.5	4.5.1	4.5.1a
C	*Pre*	0.000 *0.009*	0.000 *-0.037*	0.000 *-0.499*	0.000 *-0.115*	0.000 *-0.074*	0.000 *-0.534*
	Post	0.000 *-0.485*	0.000 *-0.788*	0.000 *-1.926*	0.000 *0.156*	0.000 *0.037*	0.000 *-1.143*
Δi_t^{US}	*Pre*	0.909 *3.182*	1.153 *3.695*	1.649 *5.230*	0.939 *3.265*	1.175 *3.830*	1.620 *5.241*
	Post	0.856 *5.118*	0.947 *5.223*	1.149 *6.570*	0.888 *5.078*	1.012 *5.282*	1.203 *7.017*
Δi_{t-1}	*Pre*	-	-0.294 *-2.470*	-0.374 *-2.629*	-	-0.274 *-2.249*	-0.353 *-2.419*
	Post		-0.234 *-1.825*	-0.278 *-2.226*		-0.295 *-2.150*	-0.336 *-2.454*
Δi_{t-2}	*Pre*	-	-	-0.351 *-2.842*	-	-	-0.320 *-2.558*
	Post			-0.334 *-3.300*			-0.350 *-3.205*
Δi_{t-3}	*Pre*	-	-	-0.081 *-0.935*	-	-	-0.071 *-0.847*
	Post			-0.183 *-1.603*			-0.164 *-1.410*
Δi_{t-4}	*Pre*	-	-	-0.291 *-2.477*	-	-	-0.274 *-2.271*
	Post			-0.073 *-5.087*			-0.072 *-5.198*
$\Delta Income_t$	*Pre*	-	-	-	-	-	-
	Post						
$\Delta Inflation_t$	*Pre*	-	-	-	0.003 *0.622*	0.003 *0.594*	0.004 *1.002*
	Post				-0.006 *-0.890*	-0.006 *-0.980*	0.002 *0.396*
$\Delta M1_{t-1}$	*Pre*	-	-	-	0.001 *4.584*	0.001 *4.012*	0.001 *2.499*
	Post				-0.002 *-1.785*	-0.003 *-2.530*	-0.003 *-2.195*
Summary statistics							
N.	*Pre*	89	88	85	88	88	85
	Post	54	54	54	53	53	53
$Adj.R^2$	*Pre*	0.059	0.128	0.259	0.091	0.153	0.264
	Post	0.177	0.218	0.453	0.187	0.258	0.482

$p-value$	*Pre*	0.002	0.002	0.000	0.001	0.000	0.000
$H_0 : i_t^{US} = 0$	*Post*	0.000	0.000	0.000	0.000	0.000	0.000
$p-value$	*Pre*	0.749	0.625	0.040	0.833	0.568	0.045
$H_0 : i_t^{US} = 1$	*Post*	0.390	0.772	0.396	0.520	0.948	0.236

Indonesia

		4.4	4.4.1	4.5	4.5.1
C	*Pre*	0.000 *0.320*	0.000 *0.379*	0.000 *-0.263*	0.000 *-0.217*
	Post	0.000 *-1.219*	-0.001 *-1.546*	0.000 *-0.911*	-0.001 *-1.461*
Δi_t^{US}	*Pre*	0.488 *0.502*	0.545 *0.577*	0.149 *0.199*	0.169 *0.232*
	Post	-2.181 *-1.470*	-2.306 *-1.519*	-2.037 *-1.160*	-2.452 *-1.578*
Δi_{t-1}	*Pre*	-	-0.128 *-0.679*	-	-0.079 *-0.347*
	Post		-0.098 *-1.070*		-0.122 *-1.086*
$\Delta Income_t$	*Pre*	-	-	0.001 *0.688*	0.001 *0.739*
	Post			0.003 *0.953*	0.006 *1.975*
$\Delta Inflation_t$	*Pre*	-	-	0.027 *1.123*	0.023 *0.893*
	Post			-0.021 *-0.562*	-0.022 *-0.638*
$\Delta M1_{t-1}$	*Pre*	-	-	0.013 *1.484*	0.012 *1.481*
	Post			-0.020 *-1.418*	-0.015 *-1.286*
Summary statistics					
N.	*Pre*	89	88	88	88
	Post	54	54	53	53
$Adj.R^2$	*Pre*	-0.009	-0.004	0.063	0.058
	Post	0.005	0.015	0.034	0.052
$p-value$ $H_0 : i_t^{US} = 0$	*Pre*	0.616	0.564	0.842	0.817
	Post	0.142	0.129	0.246	0.115
$p-value$ $H_0 : i_t^{US} = 1$	*Pre*	0.589	0.630	0.257	0.254
	Post	0.032	0.030	0.084	0.026

Korea

		4.4	4.4.1	4.4.1a	4.5	4.5.1	4.5.1a
C	*Pre*	0.000 *0.414*	0.000 *0.451*	-	0.000 *0.812*	0.000 *0.822*	-
	Post	0.000 *-1.062*	0.000 *-0.767*	0.000 *0.660*	0.000 *-0.390*	0.000 *-0.083*	0.000 *0.768*
Δi_t^{US}	*Pre*	1.759 *2.904*	1.788 *2.964*		1.780 *3.128*	1.785 *3.176*	-
	Post	0.179 *1.800*	0.054 *0.816*	0.151 *2.753*	0.217 *2.673*	0.046 *0.592*	0.188 *2.911*
Δi_{t-1}	*Pre*	-	-0.020 *-0.215*		-	-0.036 *-0.367*	-
	Post		0.719 *4.592*	0.510 *5.253*		0.728 *4.034*	0.443 *3.253*
Δi_{t-2}	*Pre*	-	-		-	-	-
	Post			0.070 *0.795*			-0.008 *-0.085*
Δi_{t-3}	*Pre*	-	-		-	-	-
	Post			-0.247 *-2.306*			-0.135 *-1.272*
Δi_{t-4}	*Pre*	-	-		-	-	-
	Post			-0.001 *-0.014*			-0.041 *-0.567*
Δi_{t-5}	*Pre*	-	-		-	-	-
	Post			0.241 *9.507*			0.108 *1.806*
Δi_{t-6}	*Pre*	-	-	-	-	-	-
	Post						0.106 *1.967*
$\Delta Income_t$	*Pre*	-	-	-	-0.006 *-1.545*	-0.006 *-1.529*	-
	Post				-0.002 *-1.779*	0.000 *0.229*	-0.001 *-0.991*
$\Delta Inflation_t$	*Pre*	-	-	-	-0.017 *-0.843*	-0.018 *-0.839*	-
	Post				0.004 *1.931*	0.001 *0.233*	0.003 *1.676*
$\Delta M1_{t-1}$	*Pre*	-	-	-	-0.001 *-0.362*	-0.001 *-0.421*	-
	Post				-0.001 *-2.787*	-0.001 *-2.546*	0.000 *-1.489*
$\Delta M1_{t-2}$	*Pre*	-	-	-			-

	Post						0.001 *2.199*
Summary statistics							
N.	*Pre*	89	88	-	88	88	-
	Post	54	54	54	53	53	53
$Adj.R^2$	*Pre*	0.055	0.046	-	0.072	0.062	-
	Post	0.030	0.540	0.735	0.081	0.556	0.782
$p-value$	*Pre*	0. 004	0.003	-	0.002	0.002	-
$H_0 : i_t^{US} = 0$	*Post*	0.072	0.415	0.006	0.008	0.554	0.004
$p-value$	*Pre*	0.210	0.192	-	0.171	0.162	-
$H_0 : i_t^{US} = 1$	*Post*	0.000	0.000	0.000	0.008	0.000	0.000

Malaysia

		4.4	**4.4.1**	**4.4.1a**	**4.5**	**4.5.1**	**4.5.1a**
c	*Pre*	0.000 *0.612*	0.000 *0.813*	0.000 *0.449*	0.000 *0.544*	0.000 *0.872*	0.000 *0.577*
	Post	0.000 *-1.092*	0.000 *-0.847*		0.000 *-0.851*	0.000 *-0.142*	0.000 *1.451*
Δi_t^{US}	*Pre*	0.042 *0.158*	-0.090 *-0.336*	0.262 *0.936*	-0.056 *-0.210*	-0.185 *-0.632*	0.154 *0.465*
	Post	0.050 *0.524*	0.124 *1.073*		0.078 *0.675*	0.163 *1.113*	0.507 *1.410*
Δi_{t-1}	*Pre*	-	-0.404 *-1.543*	-0.306 *-2.416*	-	-0.406 *-1.499*	-0.310 *-2.417*
	Post		0.256 *7.202*			0.251 *10.352*	0.242 *6.29000*
Δi_{t-2}	*Pre*	-	-	-0.519 *-1.105*	-	-	-0.554 *-1.181*
	Post						
Δi_{t-3}	*Pre*	-	-	0.639 *2.109*	-	-	0.624 *2.055*
	Post						
Δi_{t-4}	*Pre*	-	-	0.358 *2.261*	-	-	0.349 *2.155*
	Post						

$\Delta Income_t$	*Pre*	-	-	-	0.001 *1.013*	0.001 *1.346*	0.001 *1.034*
	Post				-0.001 *-1.088*	-0.001 *-1.368*	-0.002 *-1.486*
$\Delta Income_{t-1}$	*Pre*	-	-	-	-	-	
	Post						-0.004 *-1.526*
$\Delta Income_{t-2}$	*Pre*	-	-	-	-	-	
	Post						-0.004 *-1.184*
$\Delta Inflation_t$	*Pre*	-	-	-	-0.014 *-1.677*	-0.012 *-1.704*	-0.009 *-0.967*
	Post				0.002 *0.506*	0.002 *0.380*	0.004 *0.547*
$\Delta M1_{t-1}$	*Pre*	-	-	-	0.000 *-0.362*	-0.001 *-0.739*	-0.001 *-0.994*
	Post				-0.002 *-1.348*	-0.001 *-1.428*	0.000 *0.183*
Summary statistics							
N.	*Pre*	89	88	85	88	88	85
	Post	54	54		53	53	53
$Adj.R^2$	*Pre*	-0.011	0.081	0.279	-0.031	0.064	0.272
	Post	-0.017	0.035		-0.046	0.002	0.258
$p-value$	*Pre*	0.875	0.737	0.349	0.833	0.528	0.642
$H_0: i_t^{US} = 0$	*Post*	0.600	0.283		0.500	0.266	0.159
$p-value$	*Pre*	0.0003	0.000	0.009	0.0001	0.0001	0.011
$H_0: i_t^{US} = 1$	*Post*	0.000	0.000	0.000	0.000	0.000	0.170

Philippines

		4.4	**4.4.1**	**4.4.1a**	**4.5**	**4.5.1**	**4.5.1a**
C	*Pre*	0.000 *0.446*	0.000 *0.389*	0.000 *0.030*	0.000 *0.516*	0.000 *0.260*	0.000 *-0.299*
	Post	0.000 *-0.434*	0.000 *-0.167*	-	0.000 *-0.048*	0.000 *0.272*	-
Δi_t^{US}	*Pre*	3.466 *1.172*	2.406 *0.983*	0.258 *0.111*	2.746 *1.103*	1.661 *0.752*	-0.304 *-0.124*
	Post	1.097 *1.972*	0.831 *2.032*	-	1.146 *2.149*	0.840 *2.280*	-
Δi_{t-1}	*Pre*	-	-0.430 *-4.851*	-0.576 *-4.748*	-	-0.446 *-5.376*	-0.585 *-4.841*

	Post		0.465 *4.349*	-		0.472 *4.262*	-
Δi_{t-2}	*Pre*	-	-	-0.328 *-2.513*	-	-	-0.314 *-2.093*
	Post			-			-
$\Delta Income_t$	*Pre*	-	-	-	-0.004 *-0.309*	0.005 *0.568*	0.007 *0.818*
	Post				0.000 *-1.279*	0.000 *0.136*	-
$\Delta Inflation_t$	*Pre*	-	-	-	0.118 *2.505*	0.129 *2.720*	0.103 *2.198*
	Post				0.025 *1.358*	0.032 *1.665*	-
$\Delta M1_{t-1}$	*Pre*	-	-	-	0.003 *0.105*	-0.002 *-0.117*	0.008 *0.304*
	Post				-0.005 *-2.197*	-0.003 *-1.683*	-
Summary statistics							
N.	*Pre*	89	88	87	88	88	87
	Post	54	54		53	53	
$Adj.R^2$	*Pre*	0.001	0.178	0.254	0.004	0.192	0.258
	Post	0.106	0.306		0.147	0.354	
$p-value$	*Pre*	0.241	0.325	0.912	0.483	0.452	0.901
$H_0 : i_t^{US} = 0$	*Post*	0.049	0.042		0.032	0.020	
$p-value$	*Pre*	0.404	0.565	0.751	0.270	0.767	0.595
$H_0 : i_t^{US} = 1$	*Post*	0.862	0.679		0.785	0.665	

Singapore

		4.4	4.4.1	4.5	4.5.1
C	*Pre*	0.000 *-0.008*	0.000 *0.062*	0.000 *0.219*	-
	Post	0.000 *-0.875*	0.000 *-0.681*	0.000 *-0.367*	0.000 *-0.302*
Δi_t^{US}	*Pre*	0.941 *9.829*	1.214 *9.167*	0.953 *9.852*	-
	Post	0.861 *7.298*	0.752 *4.440*	0.834 *7.735*	0.704 *4.679*
Δi_{t-1}	*Pre*	-	-0.309 *-3.341*	-	-
	Post		0.158 *1.245*		0.000 *1.797*
$\Delta Income_t$	*Pre*	-	-	-	-

	Post			0.000 *1.576*	0.008 *2.192*
$\Delta Inflation_t$	*Pre*	-	-	-0.003 *-0.716*	-
	Post			0.008 *2.356*	-0.001 *-1.042*
$\Delta M1_{t-1}$	*Pre*	-	-	0.000 *-1.555*	-
	Post			-0.002 *-1.251*	0.173 *1.385*
Summary statistics					
N.	*Pre*	89	88	88	-
	Post	54	54	53	53
$Adj.R^2$	*Pre*	0.475	0.530	0.474	-
	Post	0.561	0.568	0.578	0.587
$p-value$	*Pre*	0.000	0.000	0.000	-
$H_0: i_t^{US} = 0$	*Post*	0.000	0.000	0.000	0.000
$p-value$	*Pre*	0.541	0.106	0.628	-
$H_0: i_t^{US} = 1$	*Post*	0.239	0.144	0.122	0.049

Thailand

		4.4	4.4.1	4.4.1a	4.5	4.5.1	4.5.1a
C	*Pre*	0.000 *0.063*	0.000 *0.160*	0.000 *0.426*	0.000 *1.159*	0.000 *1.091*	0.000 *1.197*
	Post	0.000 *-0.564*	0.000 *-0.557*	-	0.000 *-0.186*	0.000 *-0.171*	0.000 *0.897*
Δi_t^{US}	*Pre*	-0.303 *-0.258*	-0.237 *-0.197*	0.309 *0.255*	-0.135 *-0.112*	-0.156 *-0.127*	0.308 *0.243*
	Post	-0.027 *-0.171*	-0.024 *-0.153*	-	0.009 *0.055*	0.019 *0.119*	0.181 *1.079*
Δi_{t-1}	*Pre*	-	-0.111 *-1.189*	-0.154 *-1.479*	-	-0.102 *-1.079*	-0.139 *-1.361*
	Post		-0.020 *-0.167*			-0.046 *-0.398*	-0.030 *-0.281*
Δi_{t-2}	*Pre*	-	-	-0.178 *-1.956*	-	-	-0.158 *-1.637*
	Post						-
$\Delta Income_t$	*Pre*	-	-	-	-0.014 *-1.999*	-0.014 *-2.131*	-0.013 *-1.919*
	Post				-0.001 *-0.504*	-0.001 *-0.553*	-0.002 *-1.060*
$\Delta Income_{t-1}$	*Pre*	-	-	-	-	-	-

	Post						-0.003 *-1.203*
$\Delta Income_{t-2}$	*Pre*	-	-	-	-	-	-
	Post						-0.005 *-3.126*
$\Delta Income_{t-3}$	*Pre*	-	-	-	-	-	-
	Post						-0.003 *-1.291*
$\Delta Income_{t-4}$	*Pre*	-	-	-	-	-	-
	Post						0.005 *2.122*
$\Delta Inflation_t$	*Pre*	-	-	-	0.027 *0.923*	0.023 *0.841*	0.031 *1.203*
	Post				-0.005 *-0.680*	-0.005 *-0.694*	-0.008 *-1.372*
$\Delta M1_{t-1}$	*Pre*	-	-	-	-0.015 *-1.960*	-0.015 *-1.968*	-0.013 *-1.793*
	Post	-	-	-	-0.001 *-1.205*	-0.001 *-1.275*	-0.001 *-0.712*
Summary statistics							
N.	*Pre*	89	88	87	88	88	87
	Post	54	54	-	53	53	53
$Adj.R^2$	*PRE*	-0.011	-0.011	0.014	0.051	0.050	0.067
	Post	-0.019	-0.038	-	-0.063	-0.084	0.181
$p-value$	*PRE*	0.796	0.844	0.798	0.911	0.899	0.808
$H_0: i_t^{US} = 0$	*Post*	0.864	0.878	-	0.956	0.905	0.281
$p-value$	*PRE*	0.266	0.303	0.568	0.344	0.349	0.585
$H_0: i_t^{US} = 1$	*Post*	0.000	0.000	-	0.000	0.000	0.000

Appendix 9

Effect of US and Regional Interest Rates on the Local Interest Rate in Dynamic (Level)

Indonesia* (Dependent variable: Indonesia Market Rate)

Explanatory Variables		II Korea	III Malaysia	IV Philippines	VI Thailand
C	*Pre*	0.001 0.917	0.000 *0.095*	0.000 *0.106*	0.001 *1.256*
	Post	0.007 *1.161*	-0.005 *-0.895*	0.003 *1.540*	0.003 *1.332*
i_t^{US}	*Pre*	0.468 *2.373*	0.542 *2.639*	0.478 *2.518*	0.353 *1.845*
	Post	0.066 *0.163*	-0.008 *-0.037*	-0.421 *-1.797*	-0.126 *-0.702*
$i_t^{Regional}$	*Pre*	-0.001 -0.016	0.165 *1.703*	0.061 *0.966*	0.094 *1.711*
	Post	-0.762 *-0.402*	4.378 *1.856*	0.403 *1.789*	1.434 *1.644*
i_{t-1}	*Pre*	0.722 6.996	0.696 *6.155*	0.732 *6.676*	0.699 *7.163*
	Post	0.538 *3.900*	0.540 *3.525*	0.540 *3.703*	0.544 *4.271*
Summary Statistics					
N	*Pre*	89	89	89	89
	Post	48	48	48	48
$Adj.R^2$	*Pre*	0.689	0.692	0.696	0.694
	Post	0.339	0.357	0.369	0.362
$p-value$	*Pre*	0.018	0.008	0.052	0.065
$H_0: i_t^{US} = 0$	*Post*	0.871	0.971	0.131	0.483
$p-value$	*Pre*	0.007	0.026	0.004	0.0007
$H_0: i_t^{US} = 1$	*Post*	0.022	0.000	0.000	0.000
$p-value$	*Pre*	0.988	0.089	0.119	0.087
$H_0: i_t^{Regional} = 0$	*Post*	0.688	0.063	0.099	0.100
$p-value$	*Pre*	0.000	0.000	0.313	0.000
$H_0: i_t^{Regional} = 1$	*Post*	0.353	0.152	0.037	0.619

* The post-crisis period is from 1999:07-2003:06.

Consistent t-statistics are in italic under the estimated coefficients.

Korea

Explanatory Variables		II Indonesia	III Malaysia	IV Philippines	VI Thailand
C	*Pre*	0.001 *1.858*	0.001 *1.208*	0.001 *1.276*	0.001 *1.610*
	Post	0.0007 *7.919*	0.0007 *9.358*	0.0007 *9.091*	0.0008 *11.297*
i_t^{US}	*Pre*	0.207 *2.654*	0.181 *2.478*	0.179 *2.515*	0.205 *2.035*
	Post	0.052 *5.607*	0.045 *3.241*	0.051 *6.398*	0.051 *6.135*
$i_t^{Regional}$	*Pre*	-0.032 *-0.902*	0.040 *0.385*	0.023 *0.849*	-0.025 *-0.438*
	Post	-0.003 *-0.942*	-0.051 *-0.843*	0.008 *0.919*	-0.063 *-1.595*
i_{t-1}	*Pre*	0.830 *11.645*	0.817 *10.875*	0.813 *11.642*	0.830 *12.196*
	Post	1.160 *11.265*	1.189 *11.477*	1.213 *13.495*	1.221 *16.855*
i_{t-2}	*Pre*	-	-	-	-
	Post	-0.386 *-3.889*	-0.383 *-2.867*	-0.469 *-6.956*	-0.439 *-8.474*
Summary Statistics					
N	*Pre*	89	89	89	89
	Post	54	54	54	54
$Adj.R^2$	*Pre*	0.706	0.705	0.706	0.705
	Post	0.973	0.973	0.973	0.974
$p-value$	*Pre*	0.008	0.013	0.012	0.042
$H_0 : i_t^{US} = 0$	*Post*	0.000	0.001	0.000	0.000
$p-value$	*Pre*	0.000	0.000	0.000	0.000
$H_0 : i_t^{US} = 1$	*Post*	0.000	0.000	0.000	0.000
$p-value$	*Pre*	0.367	0.700	0.396	0.661
$H_0 : i_t^{Regional} = 0$	*Post*	0. 346	0.399	0.358	0.111
$p-value$	*Pre*	0.000	0.000	0.000	0.000
$H_0 : i_t^{Regional} = 1$	*Post*	0.000	0.000	0.000	0.000

Malaysia

Explanatory Variables		II Indonesia	III Korea	IV Philippines	VI Thailand
C	*Pre*	-0.001 *-1.666*	-0.001 *-1.736*	-0.001 *-1.529*	-0.001 *-1.672*
	Post	0.000 *1.503*	-0.001 *-1.367*	0.000 *1.435*	0.000 *0.924*
i_t^{US}	*Pre*	0.227 *2.773*	0.181 *2.224*	0.203 *2.430*	0.249 *2.648*
	Post	-0.004 *-0.517*	-0.091 *-2.051*	-0.038 *-1.412*	-0.008 *-0.804*
$i_t^{Regional}$	*Pre*	-0.012 *-0.482*	0.030 *1.770*	-0.005 *-0.525*	-0.024 *-1.464*
	Post	0.001 *0.160*	0.394 *2.031*	0.043 *1.382*	0.247 *1.505*
i_{t-1}	*Pre*	0.538 *3.380*	0.543 *3.657*	0.544 *3.379*	0.564 *3.866*
	Post	0.800 *5.269*	0.714 *6.471*	0.764 *6.253*	0.760 *7.338*
i_{t-2}	*Pre*	-0.195 *-0.393*	-0.233 *-0.461*	-0.213 *-0.432*	-0.240 *-0.476*
	Post	-	-	-	-
i_{t-3}	*Pre*	0.724 *1.266*	0.725 *1.266*	0.728 *1.276*	0.746 *1.305*
	Post	-	-	-	-
Summary Statistics					
N	*Pre*	87	87	87	87
	Post	54	54	54	54
$Adj.R^2$	*Pre*	0.852	0.854	0.852	0.854
	Post	0.871	0.895	0.878	0.892
$p-value$ $H_0: i_t^{US}=0$	*Pre*	0.0006	0.026	0.015	0.008
	Post	0.605	0.040	0.158	0.421
$p-value$ $H_0: i_t^{US}=1$	*Pre*	0.000	0.000	0.000	0.000
	Post	0.000	0.042	0.000	0.000
$p-value$ $H_0: i_t^{Regional}=0$	*Pre*	0.879	0.077	0.599	0.143
	Post	0.873	0.002	0.167	0.132
$p-value$ $H_0: i_t^{Regional}=1$	*Pre*	0.630	0.000	0.000	0.000
	Post	0.000	0.000	0.000	0.000

Philippines

Explanatory Variables		II Indonesia	III Korea	IV Malaysia	VI Thailand
C	*Pre*	0.010 *4.366*	0.006 *2.507*	0.007 *1.723*	0.010 *4.866*
	Post	0.001 *3.950*	0.000 *-0.448*	0.001 *4.755*	0.001 *3.230*
i_t^{US}	*Pre*	-0.280 *-0.840*	-0.438 *-1.426*	-0.113 *-0.304*	-0.113 *-0.289*
	Post	0.180 *2.413*	0.105 *1.958*	0.209 *2.732*	0.178 *2.448*
$i_t^{Regional}$	*Pre*	0.028 *0.122*	0.462 *2.256*	0.502 *1.019*	-0.086 *-0.518*
	Post	0.006 *0.657*	0.431 *1.930*	0.247 *3.842*	0.244 *1.733*
i_{t-1}	*Pre*	0.208 *1.437*	0.160 *1.236*	0.202 *1.420*	0.214 *1.503*
	Post	1.297 *16.872*	1.251 *17.258*	1.262 *15.474*	1.260 *14.953*
i_{t-2}	*Pre*	-	-	-	-
	Post	-0.503 *-6.488*	-0.483 *-6.359*	-0.509 *-6.001*	-0.466 *-5.823*
Summary Statistics					
N	*Pre*	89	89	89	89
	Post	54	54	54	54
$Adj.R^2$	*Pre*	0.021	0.069	0.037	0.023
	Post	0.937	0.940	0.940	0.939
$p-value$ $H_0: i_t^{US} = 0$	*Pre*	0.401	0.154	0.762	0.773
	Post	0.016	0.050	0.006	0.014
$p-value$ $H_0: i_t^{US} = 1$	*Pre*	0.000	0.000	0.003	0.005
	Post	0.000	0.000	0.000	0.000
$p-value$ $H_0: i_t^{Regional} = 0$	*Pre*	0.903	0.024	0. 308	0.605
	Post	0.511	0.054	0.0001	0.083
$p-value$ $H_0: i_t^{Regional} = 1$	*Pre*	0.000	0.009	0.312	0.000
	Post	0.000	0.011	0.000	0.000

Thailand

Explanatory Variables		II Indonesia	III Korea	IV Malaysia	V Philippines
C	*Pre*	0.000 *0.455*	0.000 *0.239*	-0.002 *-1.315*	0.000 *0.106*
	Post	0.0004 *2.960*	0.000 *-1.092*	0.0004 *2.145*	0.000 *2.235*
i_t^{US}	*Pre*	0.922 *5.268*	0.936 *5.465*	1.112 *5.828*	0.946 *5.426*
	Post	0.009 *0.665*	-0.050 *-1.567*	0.010 *0.658*	-0.003 *-0.109*
$i_t^{Regional}$	*Pre*	0.020 *0.233*	0.002 *0.015*	0.341 *1.670*	0.019 *0.527*
	Post	-0.011 *-1.682*	0.267 *2.250*	0.069 *0.793*	0.016 *0.591*
i_{t-1}	*Pre*	0.595 *6.065*	0.599 *6.608*	0.584 *6.550*	0.604 *6.499*
	Post	0.837 *6.345*	0.642 *6.795*	0.623 *6.233*	0.662 *8.576*
i_{t-2}	*Pre*	-0.094 *-0.834*	-0.090 *-0.768*	-0.088 *-0.779*	-0.094 *-0.795*
	Post	-0.328 *-1.784*	-	-	-
i_{t-3}	*Pre*	-0.026 *-0.287*	-0.025 *-0.272*	-0.078 *-0.847*	-0.027 *-0.301*
	Post	0.299 *2.829*	-	-	-
Summary Statistics					
N	*Pre*	87	87	87	87
	Post	54	54	54	54
$Adj.R^2$	*Pre*	0.628	0.628	0.640	0.629
	Post	0.544	0.528	0.494	0.489
$p-value$	*Pre*	0.000	0.000	0.000	0.000
$H_0: i_t^{US} = 0$	*Post*	0.506	0.117	0.510	0.913
$p-value$	*Pre*	0.658	0.711	0.558	0.758
$H_0: i_t^{US} = 1$	*Post*	0.000	0.000	0.000	0.000
$p-value$	*Pre*	0.816	0.988	0.095	0.598
$H_0: i_t^{Regional} = 0$	*Post*	0.092	0.024	0.428	0.554
$p-value$	*Pre*	0.000	0.000	0.001	0.000
$H_0: i_t^{Regional} = 1$	*Post*	0.000	0.000	0.000	0.000

Appendix 10

Effect of US and Regional Interest Rates on the Local Interest Rate with Domestic Control Variables (Level)

Indonesia* (Dependent variable: Indonesia Market Rate)

Explanatory Variables		II Korea	III Malaysia	IV Philippines	VI Thailand
C	*Pre*	-0.016 *-1.278*	-0.015 *-1.216*	-0.015 *-1.035*	-0.018 *-1.491*
	Post	-0.058 *-2.418*	-0.056 *-2.149*	-0.038 *-1.273*	-0.038 *-1.630*
i_t^{US}	*Pre*	0.436 *2.524*	0.518 *2.756*	0.455 *2.667*	0.331 *2.033*
	Post	0.651 *1.869*	-0.138 *-0.686*	-0.159 *-0.421*	-0.164 *-0.810*
$i_t^{Regional}$	*Pre*	0.002 *0.028*	0.179 *1.636*	0.066 *0.904*	0.088 *1.603*
	Post	-3.400 *-2.385*	-4.192 *-1.238*	0.054 *0.183*	1.025 *1.251*
i_{t-1}	*Pre*	0.715 *6.655*	0.691 *6.043*	0.732 *6.311*	0.688 *6.775*
	Post	0.582 *3.933*	0.650 *3.798*	0.608 *3.218*	0.608 *3.917*
$Income_t$	*Pre*	0.002 *1.091*	0.001 *0.840*	0.001 *0.446*	0.002 *1.427*
	Post	0.008 *2.461*	0.007 *2.055*	0.005 *1.681*	0.006 *2.096*
$Inflation_t$	*Pre*	0.033 *1.301*	0.033 *1.313*	0.029 *1.152*	0.029 *1.115*
	Post	0.036 *1.045*	0.048 *1.279*	0.051 *1.333*	0.050 *1.414*
$M1_{t-1}$	*Pre*	0.001 *1.218*	0.002 *1.229*	0.002 *1.511*	0.001 *1.260*
	Post	0.006 *2.332*	0.006 *1.848*	0.003 *0.747*	0.002 *0.753*
Summary Statistics					
N	*Pre*	89	89	89	89
	Post	47	47	47	47
$Adj.R^2$	*Pre*	0.690	0.693	0.697	0.694
	Post	0.390	0.361	0.345	0.366
$p-value$	*Pre*	0.012	0.006	0.008	0.042
$H_0: i_t^{US} = 0$	*Post*	0.061	0.493	0.674	0.418
$p-value$	*Pre*	0.001	0.010	0.001	0.000
$H_0: i_t^{US} = 1$	*Post*	0.317	0.000	0.002	0.000
$p-value$	*Pre*	0.978	0.102	0.366	0.109

	Post	0.017	0.216	0.855	0.211
$p-value$	*Pre*	0.000	0.000	0.000	0.000
$H_0 : i_t^{Regional} = 1$	*Post*	0.002	0.125	0.001	0.976

*The post-crisis is from 1999:07-2003:06.
Consistent t-statistics are in italic under neat the estimated coefficients.

Korea

Explanatory Variables		II Indonesia	III Malaysia	IV Philippines	VI Thailand
C	*Pre*	0.011 *2.107*	0.010 *2.033*	0.010 *1.977*	0.011 *2.097*
	Post	0.001 *0.362*	-0.0001 *-0.072*	-0.002 *-1.412*	-0.002 *-1.427*
i_t^{US}	*Pre*	0.150 *1.142*	0.144 *1.043*	0.152 *1.207*	0.148 *0.935*
	Post	0.051 *1.963*	0.034 *1.285*	0.086 *3.875*	0.069 *3.219*
$i_t^{Regional}$	*Pre*	-0.025 *-0.734*	0.026 *0.273*	0.024 *0.769*	-0.017 *-0.319*
	Post	-0.009 *-2.271*	-0.140 *-2.514*	-0.010 *-0.575*	-0.094 *-1.577*
i_{t-1}	*Pre*	0.749 *10.867*	0.743 *10.410*	0.736 *10.657*	0.749 *10.881*
	Post	0.778 *15.299*	0.871 *12.081*	0.753 *13.409*	0.778 *14.423*
$Income_t$	*Pre*	-0.0003 *-0.153*	-0.001 *-0.338*	-0.001 *-0.284*	-0.0004 *-0.214*
	Post	0.0002 *0.541*	0.0004 *1.114*	0.0006 *1.630*	0.0007 *2.112*
$Inflation_t$	*Pre*	-0.029 *-1.182*	-0.028 *-1.138*	-0.035 *-1.278*	-0.028 *-1.176*
	Post	0.0004 *0.116*	-0.0001 *-0.017*	-0.0003 *-0.089*	-0.0008 *-0.278*
$M1_{t-1}$	*Pre*	-0.001 *-0.579*	-0.001 *-0.415*	-0.001 *-0.453*	-0.001 *-0.555*
	Post	-0.0001 *-0.322*	-0.0001 *-0.463*	0.0000 *-0.085*	-0.0001 *-0.407*
Summary Statistics					
N	*Pre*	89	89	89	89
	Post	54	54	54	54
$Adj.R^2$	*Pre*	0.712	0.712	0.714	0.712
	Post	0.964	0.965	0.959	0.963
$p-value$	*Pre*	0.253	0.297	0.227	0.350

	Post	0.050	0.199	0.0001	0.001
$p-value$	*Pre*	0.000	0.000	0.000	0.000
$H_0 : i_t^{US} = 1$	*Post*	0.000	0.000	0.000	0.000
$p-value$	*Pre*	0.463	0.785	0.442	0.750
$H_0 : i_t^{Regional} = 0$	*Post*	0.023	0.012	0.565	0.115
$p-value$	*Pre*	0.000	0.000	0.000	0.000
$H_0 : i_t^{Regional} = 1$	*Post*	0.000	0.000	0.000	0.000

Malaysia

Explanatory Variables		II Indonesia	III Korea	IV Philippines	VI Thailand
C	*Pre*	0.001 *0.367*	-0.002 *-0.976*	0.0005 *0.295*	0.0004 *0.290*
	Post	-0.006 *-1.623*	-0.001 *-0.310*	-0.003 *-1.091*	-0.002 *-1.035*
i_t^{US}	*Pre*	-0.066 *-0.487*	-0.094 *-0.744*	-0.006 *-0.073*	0.015 *0.179*
	Post	0.065 *1.509*	-0.083 *-1.310*	0.010 *0.322*	0.019 *0.839*
$i_t^{Regional}$	*Pre*	0.025 *0.867*	0.069 *1.586*	0.0002 *0.021*	-0.010 *-0.635*
	Post	0.010 *0.723*	0.407 *1.888*	0.039 *1.091*	0.235 *1.374*
i_{t-1}	*Pre*	0.854 *6.229*	0.837 *6.282*	0.887 *7.793*	0.896 *8.227*
	Post	0.819 *5.013*	0.710 *5.111*	0.811 *6.021*	0.797 *6.317*
$Income_t$	*Pre*	0.001 *0.929*	0.002 *1.293*	0.001 *0.913*	0.001 *0.830*
	Post	-0.0005 *-0.883*	-0.0003 *-0.824*	-0.001 *-1.124*	-0.0003 *-0.641*
$Inflation_t$	*Pre*	-0.012 *-0.861*	-0.002 *-0.168*	-0.008 *-0.592*	-0.009 *-0.624*
	Post	-0.002 *-0.214*	0.005 *0.897*	-0.001 *-0.090*	-0.004 *-0.343*
$M1_{t-1}$	*Pre*	-0.001 *-1.036*	-0.001 *-1.297*	-0.001 *-1.055*	-0.001 *-0.971*
	Post	0.001 *1.496*	0.0003 *0.483*	0.001 *1.627*	0.001 *1.272*

Summary Statistics					
N	*Pre*	89	89	89	89
	Post	53	53	53	53
$Adj.R^2$	*Pre*	0.807	0.814	0.804	0.805
	Post	0.869	0.889	0.872	0.887
$p-value$ $H_0: i_t^{US} = 0$	*Pre*	0.627	0.457	0.942	0.858
	Post	0.131	0.190	0.747	0.401
$p-value$ $H_0: i_t^{US} = 1$	*Pre*	0.000	0.000	0.000	0.000
	Post	0.000	0.000	0.000	0.000
$p-value$ $H_0: i_t^{Regional} = 0$	*Pre*	0.386	0.113	0.983	0.526
	Post	0.470	0.059	0.275	0.169
$p-value$ $H_0: i_t^{Regional} = 1$	*Pre*	0.000	0.000	0.000	0.000
	Post	0.000	0.006	0.000	0.000

Philippines

Explanatory Variables		II Indonesia	III Korea	IV Malaysia	VI Thailand
C	*Pre*	0.017 *0.803*	0.013 *0.628*	0.009 *0.392*	0.019 *0.853*
	Post	0.001 *0.483*	0.001 *0.644*	-0.0001 *-0.057*	-0.004 *-2.126*
i_t^{US}	*Pre*	-0.641 *-1.161*	-0.671 *-1.505*	-0.424 *-0.785*	-0.460 *-0.908*
	Post	0.201 *2.988*	0.055 *0.969*	0.243 *3.522*	0.177 *3.594*
$i_t^{Regional}$	*Pre*	0.043 *0.230*	0.283 *1.180*	0.330 *0.665*	-0.097 *-0.527*
	Post	0.026 *1.165*	0.527 *2.070*	0.598 *3.567*	0.788 *3.809*
i_{t-1}	*Pre*	0.108 *0.706*	0.100 *0.697*	0.105 *0.696*	0.119 *0.802*
	Post	0.789 *12.760*	0.775 *12.467*	0.734 *13.534*	0.819 *15.264*
$Income_t$	*Pre*	-0.001 *-0.164*	-0.001 *-0.107*	0.001 *0.140*	-0.001 *-0.240*
	Post	-0.0003 *-2.000*	-0.0003 *-1.939*	-0.0003 *-2.122*	0.0002 *2.195*
$Inflation_t$	*Pre*	0.109 *1.484*	0.113 *1.488*	0.105 *1.368*	0.114 *1.477*

	Post	0.081 *1.417*	0.077 *1.461*	0.089 *1.762*	0.088 *1.736*
$M1_{t-1}$	*Pre*	-0.004 *-0.518*	-0.003 *-0.384*	-0.007 *-0.848*	-0.003 *-0.375*
	Post	0.001 *0.506*	-0.001 *-0.733*	0.001 *0.919*	0.002 *2.059*
Summary Statistics					
N	*Pre*	89	89	89	89
	Post	53	53	53	53
$Adj.R^2$	*Pre*	0.096	0.110	0.101	0.098
	Post	0.927	0.930	0.938	0.936
$p-value$	*Pre*	0.246	0.132	0.432	0.364
$H_0 : i_t^{US} = 0$	*Post*	0.003	0.333	0.0004	0.0003
$p-value$	*Pre*	0.003	0.0002	0.008	0.004
$H_0 : i_t^{US} = 1$	*Post*	0.000	0.000	0.000	0.000
$p-value$	*Pre*	0.818	0.238	0.506	0.599
$H_0 : i_t^{Regional} = 0$	*Post*	0.244	0.038	0.004	0.0001
$p-value$	*Pre*	0.000	0.003	0.177	0.000
$H_0 : i_t^{Regional} = 1$	*Post*	0.000	0.063	0.017	0.306

Thailand (Dependent variable: Money Market Rate in Thailand)

Explanatory Variables		II Indonesia	III Korea	IV Malaysia	V Philippines
C	*Pre*	-0.007 *-0.405*	-0.009 *-0.511*	-0.001 *-0.047*	-0.011 *-0.606*
	Post	0.009 *2.646*	0.007 *2.164*	0.006 *2.174*	0.008 *2.570*
i_t^{US}	*Pre*	0.655 *2.708*	0.693 *3.234*	0.766 *4.067*	0.747 *3.886*
	Post	-0.054 *-2.042*	-0.116 *-2.630*	-0.041 *-1.474*	-0.057 *-1.402*
$i_t^{Regional}$	*Pre*	0.071 *0.644*	0.089 *0.575*	0.377 *1.812*	0.003 *0.082*
	Post	-0.006 *-0.483*	0.312 *2.559*	0.172 *1.787*	0.015 *0.549*
i_{t-1}		0.528 *6.607*	0.552 *7.648*	0.546 *8.103*	0.549 *7.656*
		0.605 *4.998*	0.528 *5.423*	0.457 *3.959*	0.557 *6.237*

$Income_t$	*Pre*	0.002 *0.396*	0.002 *0.444*	-0.001 *-0.107*	0.003 *0.616*
	Post	-0.002 *-2.695*	-0.002 *-2.366*	-0.001 *-2.271*	-0.002 *-2.582*
$Inflation_t$	*Pre*	0.043 *0.995*	0.047 *1.105*	0.051 *1.213*	0.045 *1.040*
	Post	-0.010 *-0.858*	-0.011 *-1.021*	-0.008 *-0.749*	-0.009 *-0.765*
$M1_{t-1}$	*Pre*	-0.001 *-0.306*	-0.001 *-0.238*	0.001 *0.284*	-0.002 *-0.534*
	Post	0.0004 *1.140*	0.0006 *2.120*	0.0008 *2.334*	0.0005 *1.814*
Summary Statistics					
N	*Pre*	89	89	89	89
	Post	53	53	53	53
$Adj.R^2$	*Pre*	0.584	0.583	0.595	0.581
	Post	0.507	0.562	0.535	0.507
$p-value$	*Pre*	0.007	0.001	0.000	0.0001
$H_0: i_t^{US} = 0$	*Post*	0.041	0.009	0.140	0.161
$p-value$	*Pre*	0.154	0.151	0.214	0.188
$H_0: i_t^{US} = 1$	*Post*	0.000	0.000	0.000	0.000
$p-value$	*Pre*	0.520	0.566	0.070	0.935
$H_0: i_t^{Regional} = 0$	*Post*	0.629	0.011	0.074	0.583
$p-value$	*Pre*	0.000	0.000	0.003	0.000
$H_0: i_t^{Regional} = 1$	*Post*	0.000	0.000	0.000	0.000

Appendix 11

Effect of Changes in US and Regional Interest Rates on the Local Interest Rate in Dynamic *(Difference)*

Note: No further dynamic specification for Indonesia since it already has the lowest BIC without any further lag adjustment.

Korea

Explanatory Variables		II Indonesia	III Malaysia	IV Philippines	VI Thailand
C	*Pre*	0.000 *0.460*	0.000 *0.429*	0.000 *0.436*	0.000 *0.446*
	Post	0.000 *0.322*	0.000 *0.652*	0.000 *0.526*	0.000 *0.738*
Δi_t^{US}	*Pre*	1.799 *2.956*	1.784 *2.950*	1.757 *2.884*	1.793 *2.919*
	Post	0.132 *2.385*	0.163 *3.167*	0.124 *1.751*	0.197 *3.309*
$\Delta i_t^{Regional}$	*Pre*	-0.020 *-0.410*	0.085 *0.520*	0.009 *0.383*	0.017 *0.296*
	Post	-0.009 *-2.807*	-0.161 *-4.417*	0.024 *1.356*	0.081 *1.769*
Δi_{t-1}	*Pre*	-0.021 *-0.227*	-0.022 *-0.235*	-0.021 *-0.221*	-0.026 *-0.295*
	Post	0.490 *5.221*	0.357 *3.432*	0.504 *5.012*	0.269 *1.901*
Δi_{t-2}	*Pre*	-	-	-	-
	Post	0.108 *1.160*	0.187 *1.940*	0.069 *0.773*	0.160 *1.676*
Δi_{t-3}	*Pre*	-	-	-	-
	Post	-0.228 *-2.691*	-0.074 *-1.060*	-0.262 *-2.391*	-0.250 *-2.109*
Δi_{t-4}	*Pre*	-	-	-	-
	Post	0.046 *0.695*	-0.093 *-1.829*	-0.017 *-0.192*	-0.042 *-0.623*
Δi_{t-5}	*Pre*	-	-	-	-
	Post	0.206 *6.725*	0.070 *1.611*	0.245 *9.487*	0.154 *2.301*
Δi_{t-6}	*Pre*	-	-	-	-
	Post		0.145 *3.635*		0.113 *1.983*
Summary Statistics					

N	*Pre*	88	88	88	88
	Post	54	54	54	54
$Adj.R^2$	*Pre*	0.035	0.036	0.036	0.035
	Post	0.750	0.766	0.737	0.756
$p-value$	*Pre*	0.003	0.003	0.004	0.004
$H_0 : \Delta i_t^{US} = 0$	*Post*	0.017	0.002	0.080	0.001
$p-value$	*Pre*	0.189	0.195	0.214	0.197
$H_0 : \Delta i_t^{US} = 1$	*Post*	0.000	0.000	0.000	0.000
$p-value$	*Pre*	0.682	0.603	0.702	0.768
$H_0 : \Delta i_t^{Regional} = 0$	*Post*	0.005	0.000	0.175	0.077
$p-value$	*Pre*	0.000	0.000	0.000	0.000
$H_0 : \Delta i_t^{Regional} = 1$	*Post*	0. 0.000	0.000	0.000	0.000

Malaysia

Explanatory Variables		II Indonesia	III Korea	IV Philippines	VI Thailand
C	*Pre*	0.000 *0.463*	0.000 *0.445*	0.000 *0.444*	0.000 *0.436*
	Post	0.000 *-0.724*	0.000 *-0.872*	0.000 *-0.926*	0.000 *-0.852*
Δi_t^{US}	*Pre*	0.276 *0.961*	0.245 *0.863*	0.233 *0.793*	0.261 *0.941*
	Post	0.159 *1.094*	0.101 *0.979*	0.002 *0.021*	0.126 *1.006*
$\Delta i_t^{Regional}$	*Pre*	-0.013 *-0.540*	0.010 *0.297*	0.005 *0.656*	0.017 *0.725*
	Post	0.027 *1.091*	0.100 *0.818*	0.090 *0.904*	0.188 *0.990*
Δi_{t-1}	*Pre*	-0.310 *-2.426*	-0.307 *-2.419*	-0.310 *-2.429*	-0.320 *-2.444*
	Post	0.173 *2.042*	0.240 *5.620*	0.176 *1.972*	0.247 *6.787*
Δi_{t-2}	*Pre*	-0.499 *-1.006*	-0.517 *-1.091*	-0.514 *-1.102*	-0.513 *-1.108*
	Post	-	-	-	-
Δi_{t-3}	*Pre*	0.649 *2.203*	0.640 *2.105*	0.629 *2.103*	0.623 *2.111*
	Post	-	-	-	-
Δi_{t-4}	*Pre*	0.354 *2.249*	0.359 *2.248*	0.346 *2.148*	0.375 *2.465*
	Post	-	-	-	-
Summary Statistics					
N	*Pre*	85	85	85	85
	Post	54	54	54	54
$Adj.R^2$	*Pre*	0.272	0.270	0.273	0.275
	Post	0.125	0.021	0.066	0.069
$p-value$ $H_0 : \Delta i_t^{US} = 0$	*Pre*	0.337	0.388	0.428	0.347
	Post	0.274	0.328	0.984	0.314
$p-value$ $H_0 : \Delta i_t^{US} = 1$	*Pre*	0.012	0.008	0.009	0.008
	Post	0.000	0.000	0.000	0.000
$p-value$ $H_0 : \Delta i_t^{Regional} = 0$	*Pre*	0.589	0.766	0. 512	0.469
	Post	0.275	0.413	0.366	0.322
$p-value$ $H_0 : \Delta i_t^{Regional} = 1$	*Pre*	0.000	0.000	0.000	0.000
	Post	0.000	0.000	0.000	0.000

Philippines

Explanatory Variables		II Indonesia	III Korea	IV Malaysia	VI Thailand
C	*Pre*	0.000 *0.010*	0.000 *0.015*	0.000 *-0.013*	0.000 *-0.015*
	Post	0.000 *-0.145*	0.000 *0.177*	0.000 *0.128*	0.000 *-0.105*
Δi_t^{US}	*Pre*	0.255 *0.111*	0.029 *0.012*	0.254 *0.106*	0.182 *0.077*
	Post	0.837 *1.988*	0.719 *1.735*	0.823 *1.967*	0.843 *1.995*
$\Delta i_t^{Regional}$	*Pre*	0.185 *0.400*	0.131 *0.322*	0.784 *1.193*	0.176 *0.977*
	Post	0.002 *0.096*	0.731 *1.735*	0.562 *8.655*	0.262 *1.413*
Δi_{t-1}	*Pre*	-0.561 *-5.342*	-0.575 *-4.813*	-0.572 *-4.628*	-0.595 *-4.679*
	Post	0.463 *4.607*	0.430 *4.161*	0.428 *4.727*	0.456 *4.501*
Δi_{t-2}	*Pre*	-0.316 *-2.858*	-0.328 *-2.501*	-0.326 *-2.463*	-0.333 *-2.522*
	Post	-	-	-	-
Summary Statistics					
N	*Pre*	87	87	87	87
	Post	54	54	54	54
$Adj.R^2$	*Pre*	0.249	0.245	0.250	.249
	Post	0.292	0.327	0.334	0.305
$p-value$ $H_0: \Delta i_t^{US} = 0$	*Pre*	0.911	0.990	0.916	0.939
	Post	0.047	0.083	0.049	0.046
$p-value$ $H_0: \Delta i_t^{US} = 1$	*Pre*	0.745	0.688	0.755	0.730
	Post	0.698	0.499	0.673	0.710
$p-value$ $H_0: \Delta i_t^{Regional} = 0$	*Pre*	0.689	0.747	0.233	0.329
	Post	0.923	0.083	0.000	0.158
$p-value$ $H_0: \Delta i_t^{Regional} = 1$	*Pre*	0.078	0.032	0.743	0.000
	Post	0.000	0.524	0.000	0.001

Thailand

Explanatory Variables		I Indonesia	II Korea	III Malaysia	IV Philippines
C	*Pre*	0.000 *0.425*	0.000 *0.420*	0.000 *0.411*	0.000 *0.429*
	Post	0.000 *-0.562*	0.000 *-0.451*	0.000 *-0.235*	0.000 *-0.470*
Δi_t^{US}	*Pre*	0.309 *0.253*	0.254 *0.222*	0.298 *0.241*	0.383 *0.310*
	Post	-0.024 *-0.156*	-0.154 *-0.989*	-0.023 *-0.146*	-0.105 *-0.587*
$\Delta i_t^{Regional}$	*Pre*	-0.001 *-0.016*	0.031 *0.154*	0.108 *0.211*	-0.025 *-0.879*
	Post	0.000 *-0.020*	0.522 *2.268*	0.358 *3.410*	0.077 *1.505*
Δi_{t-1}	*Pre*	-0.154 *-1.393*	-0.153 *-1.416*	-0.148 *-1.610*	-0.162 *-1.527*
	Post	-0.019 *-0.168*	0.041 *0.294*	-0.142 *-1.188*	-0.044 *-0.393*
Δi_{t-2}	*Pre*	-0.178 *-1.934*	-0.178 *-1.943*	-0.173 *-1.703*	-0.174 *-1.908*
	Post	-	-0.272 *-2.429*	-	-
Summary Statistics					
N	*Pre*	87	87	87	87
	Post	54	54	54	54
$Adj.R^2$	*Pre*	0.002	0.002	0.003	0.006
	Post	-0.059	0.084	0.019	-0.030
$p-value$ $H_0: \Delta i_t^{US} = 0$	*Pre*	0.801	0.824	0.810	0. 705
	Post	0.876	0.323	0.884	0.557
$p-value$ $H_0: \Delta i_t^{US} = 1$	*Pre*	0.573	0.514	0. 570	0. 643
	Post	0.000	0.000	0.000	0.000
$p-value$ $H_0: \Delta i_t^{Regional} = 0$	*Pre*	0.987	0.878	0.833	0. 642
	Post	0.984	0.038	0.0006	0.132
$p-value$ $H_0: \Delta i_t^{Regional} = 1$	*Pre*	0.000	0.000	0.000	0.000
	Post	0.000	0.000	0.000	0.000

Appendix 12

Effects of Changes in US and Selected Regional Interest Rates on Local Interest Rate with Domestic Control Variables in Dynamic (Difference)

Note: No dynamic adjustment for Indonesia since it has the lowest BIC without any further lag.

Korea

		I Indonesia	II Malaysia	III Philippines	IV Thailand
C	*Pre*	0.000 *0.843*	0.000 *0.802*	0.000 *0.785*	0.000 *0.820*
	Post	0.000 *0.121*	0.000 *0.052*	0.000 *0.011*	0.000 *0.772*
Δi_t^{US}	*Pre*	1.815 *3.173*	1.783 *3.155*	1.750 *3.061*	1.789 *3.142*
	Post	0.133 *2.286*	0.147 *2.080*	0.138 *1.824*	0.204 *2.975*
$\Delta i_t^{Regional}$	*Pre*	-0.047 *-0.822*	0.046 *0.276*	0.013 *0.508*	0.009 *0.169*
	Post	-0.011 *-4.653*	-0.165 *-3.438*	0.028 *2.023*	0.054 *1.049*
Δi_{t-1}	*Pre*	-0.036 *-0.372*	-0.037 *-0.376*	-0.037 *-0.377*	-0.039 *-0.408*
	Post	0.615 *5.906*	0.585 *5.266*	0.588 *5.042*	0.371 *2.002*
Δi_{t-2}	*Pre*	-	-	-	-
	Post	-0.050 *-0.503*	-0.037 *-0.383*	-0.120 *-1.692*	0.026 *0.237*
Δi_{t-3}	*Pre*	-	-	-	-
	Post	-0.155 *-2.053*	0.048 *0.603*	-0.117 *-0.961*	-0.176 *-1.560*
Δi_{t-4}	*Pre*	-	-	-	-
	Post	0.097 *1.431*	-0.108 *-1.733*	-0.101 *-1.142*	-0.018 *-0.243*
Δi_{t-5}	*Pre*	-	-	-	-
	Post	0.152 *5.957*	0.017 *0.330*	0.123 *1.796*	0.109 *1.751*
Δi_{t-6}	*Pre*	-	-	-	-
	Post	-	0.146 *3.019*	0.095 *1.592*	0.116 *1.907*
$\Delta Income_t$	*Pre*	-0.007 *-1.556*	-0.006 *-1.494*	-0.006 *-1.437*	-0.006 *-1.524*
	Post	-0.0002 *-0.591*	-0.0003 *-0.401*	-0.001 *-0.780*	-0.001 *-0.812*

$\Delta Inflation_t$	*Pre*	-0.018 *-0.800*	-0.018 *-0.825*	-0.022 *-0.994*	-0.018 *-0.843*
	Post	0.003 *1.890*	0.002 *0.817*	0.003 *1.454*	0.003 *1.662*
$\Delta Inflation_{t-1}$	*Pre*	-	-	-	-
	Post	-	-0.003 *-1.497*	-0.001 *-0.458*	-
$\Delta Inflation_{t-2}$	*Pre*	-	-	-	-
	Post	-	0.004 *1.743*	0.005 *2.121*	-
$\Delta M1_{t-1}$	*Pre*	-0.001 *-0.312*	-0.001 *-0.415*	-0.001 *-0.398*	-0.001 *-0.412*
	Post	-0.0005 *-1.518*	-0.0002 *-0.825*	-0.0001 *-0.440*	-0.0004 *-1.448*
$\Delta M1_{t-2}$	*Pre*	-	-	-	-
	Post	0.001 *2.405*	0.001 *2.774*	0.001 *3.566*	0.0006 *1.964*
Summary statistics					
N.	*Pre*	88	88	88	88
	Post	53	53	53	53
$Adj.R^2$	*Pre*	0.056	0.051	0.054	0.051
	Post	0.616	0.862	0.808	0.782
$p-value$	*Pre*	0.002	0.002	0.002	0.002
$H_0: i_t^{US} = 0$	*Post*	0.022	0.038	0.068	0.003
$p-value$	*Pre*	0.154	0.166	0.189	0.166
$H_0: i_t^{US} = 1$	*Post*	0.000	0.000	0.000	0.000
$p-value$	*Pre*	0.411	0.782	0.612	0.866
$H_0: \Delta i_t^{Regional} = 0$	*Post*	0.000	0.0006	0.043	0.294
$p-value$	*Pre*	0.000	0.000	0.000	0.000
$H_0: \Delta i_t^{Regional} = 1$	*Post*	0.000	0.000	0.000	0.000

Malaysia

		I Indonesia	II Korea	III Philippines	IV Thailand
C	*Pre*	0.000 *0.517*	0.000 *0.573*	0.000 *0.609*	0.000 *0.563*
	Post	0.0001 *1.487*	0.0001 *1.416*	0.0001 *1.460*	0.0001 *1.464*
Δi_t^{US}	*Pre*	0.159 *0.479*	0.145 *0.433*	0.148 *0.439*	0.146 *0.444*
	Post	0.497 *1.501*	0.477 *1.402*	0.393 *1.378*	0.498 *1.434*
$\Delta i_t^{Regional}$	*Pre*	-0.015 *-0.558*	0.006 *0.190*	0.004 *0.433*	0.019 *0.740*
	Post	0.022 *1.485*	0.113 *1.137*	0.081 *1.058*	0.129 *1.401*
Δi_{t-1}	*Pre*	-0.313 *-2.433*	-0.311 *-2.415*	-0.313 *-2.423*	-0.326 *-2.391*
	Post	0.179 *2.492*	0.220 *4.886*	0.172 *2.304*	0.241 *5.521*
Δi_{t-2}	*Pre*	-0.532 *-1.059*	-0.553 *-1.167*	-0.550 *-1.176*	-0.549 *-1.186*
	Post	-	-	-	-
Δi_{t-3}	*Pre*	0.632 *2.127*	0.625 *2.050*	0.620 *2.052*	0.605 *2.060*
	Post	-	-	-	-
Δi_{t-4}	*Pre*	0.351 *2.138*	0.350 *2.134*	0.335 *1.956*	0.371 *2.403*
	Post	-	-	-	-
$\Delta Income_t$	*Pre*	0.001 *1.372*	0.001 *1.017*	0.001 *0.869*	0.001 *1.096*
	Post	-0.002 *-1.269*	-0.002 *-1.576*	-0.002 *-1.591*	-0.002 *-1.622*
$\Delta Income_{t-1}$	*Pre*	-	-	-	-
	Post	-0.004 *-1.575*	-0.004 *-1.553*	-0.004 *-1.619*	-0.004 *-1.691*
$\Delta Income_{t-2}$	*Pre*	-	-	-	-
	Post	-0.004 *-1.265*	-0.005 *-1.164*	-0.004 *-1.216*	-0.004 *-1.128*
$\Delta Inflation_t$	*Pre*	-0.009 *-0.970*	-0.009 *-0.946*	-0.009 *-0.877*	-0.009 *-0.901*
	Post	0.006 *0.750*	0.004 *0.525*	0.005 *0.610*	0.004 *0.549*
$\Delta M1_{t-1}$	*Pre*	-0.001 *-0.807*	-0.001 *-0.990*	-0.002 *-0.992*	-0.002 *-1.014*
	Post	0.001 *0.857*	0.0001 *0.105*	0.0004 *0.425*	0.0001 *0.092*

Summary statistics					
N.	*Pre*	85	85	85	85
	Post	53	53	53	53
$Adj.R^2$	*Pre*	0.265	0.262	0.264	0.269
	Post	0.301	0.247	0.285	0.267
$p-value$	*Pre*	0.632	0.665	0.661	0.657
$H_0 : i_t^{US} = 0$	*Post*	0.134	0.161	0.168	0.152
$p-value$	*Pre*	0.012	0.010	0.011	0.009
$H_0 : i_t^{US} = 1$	*Post*	0.129	0.125	0.033	0.149
$p-value$	*Pre*	0.577	0.849	0.665	0.459
$H_0 : \Delta i_t^{Regional} = 0$	*Post*	0.138	0.256	0.290	0.161
$p-value$	*Pre*	0.000	0.000	0.000	0.000
$H_0 : \Delta i_t^{Regional} = 1$	*Post*	0.000	0.000	0.000	0.000

Philippines

		I Indonesia	II Korea	III Malaysia	IV Thailand
C	*Pre*	0.000 *-0.302*	0.000 *-0.354*	0.000 *-0.313*	0.000 *-0.354*
	Post	0.000 *0.478*	0.000 *0.417*	0.000 *0.165*	0.000 *0.202*
Δi_t^{US}	*Pre*	-0.486 *-0.186*	-0.697 *-0.271*	-0.289 *-0.116*	-0.366 *-0.147*
	Post	0.909 *2.317*	0.782 *2.042*	0.710 *2.600*	0.823 *2.163*
$\Delta i_t^{Regional}$	*Pre*	0.539 *0.903*	0.222 *0.551*	0.325 *0.482*	0.173 *0.935*
	Post	0.027 *1.221*	0.415 *1.110*	0.598 *4.525*	0.333 *1.460*
Δi_{t-1}	*Pre*	-0.637 *-5.373*	-0.587 *-4.930*	-0.583 *-4.711*	-0.605 *-4.693*
	Post	0.450 *4.569*	0.450 *4.318*	0.591 *5.006*	0.479 *4.495*
Δi_{t-2}	*Pre*	-0.431 *-2.195*	-0.316 *-2.088*	-0.315 *-2.085*	-0.320 *-2.101*
	Post	-	-	-0.262 *-2.232*	-
Δi_{t-3}	*Pre*	-0.265 *-1.298*	-	-	-
	Post	-	-	-	-

$\Delta Income_t$	*Pre*	0.006 *0.618*	0.008 *0.967*	0.006 *0.760*	0.007 *0.848*
	Post	-4.58E-5 *-0.345*	0.000 *0.301*	0.0002 *1.148*	0.0002 *0.933*
$\Delta Inflation_t$	*Pre*	0.108 *2.537*	0.103 *2.193*	0.098 *2.004*	0.101 *2.225*
	Post	0.037 *1.761*	0.028 *1.469*	0.034 *1.787*	0.036 *1.820*
$\Delta M1_{t-1}$	*Pre*	0.001 *0.053*	0.009 *0.330*	-	0.008 *0.302*
	Post	-0.004 *-1.782*	-0.003 *-1.407*	-0.001 *-0.620*	-0.001 *-0.563*
Summary statistics					
N.	*Pre*	86	87	87	87
	Post	53	53	53	53
$Adj.R^2$	*Pre*	0.299	0.251	0.250	0.257
	Post	0.354	0.351	0.419	0.357
$p-value$	*Pre*	0.852	0.787	0.908	0.883
$H_0 : i_t^{US} = 0$	*Post*	0.021	0.041	0.009	0.031
$p-value$	*Pre*	0.569	0.510	0.606	0.584
$H_0 : i_t^{US} = 1$	*Post*	0.818	0.570	0.288	0.643
$p-value$	*Pre*	0.366	0.582	0.630	0.350
$H_0 : \Delta i_t^{Regional} = 0$	*Post*	0.222	0.267	0.002	0.144
$p-value$	*Pre*	0.439	0.053	0.317	0.000
$H_0 : \Delta i_t^{Regional} = 1$	*Post*	0.000	0.118	0.000	0.003

Thailand

		I Indonesia	II Korea	III Malaysia	IV Philippines
C	*Pre*	0.0002 *1.196*	0.0002 *1.205*	0.0002 *1.177*	0.0002 *1.224*
	Post	0.000 *0.889*	0.000 *-0.844*	-4.62E-5 *-1.473*	0.000 *0.807*
Δi_t^{US}	*Pre*	0.308 *0.242*	0.317 *0.259*	0.290 *0.222*	0.429 *0.330*
	Post	0.178 *1.040*	-0.245 *-1.483*	-0.171 *-1.408*	0.085 *0.509*
$\Delta i_t^{Regional}$	*Pre*	-0.015 *-0.161*	-0.005 *-0.027*	0.103 *0.206*	-0.040 *-1.413*

	Post	-0.002 *-0.161*	0.456 *1.742*	0.447 *2.927*	0.091 *2.243*
Δi_{t-1}	*Pre*	-0.137 *-1.263*	-0.140 *-1.314*	-0.133 *-1.453*	-0.150 *-1.456*
	Post	-0.026 *-0.246*	0.002 *0.015*	-0.346 *-2.600*	-0.051 *-0.544*
Δi_{t-2}	*Pre*	-0.155 *-1.553*	-0.158 *-1.628*	-0.152 *-1.369*	-0.154 *-1.557*
	Post	-	-0.237 *-1.974*	-	-
$\Delta Income_t$	*Pre*	-0.013 *-1.936*	-0.013 *-1.902*	-0.013 *-1.818*	-0.013 *-1.888*
	Post	-0.002 *-1.044*	-0.002 *-1.117*	-0.0003 *-0.260*	-0.001 *-0.957*
$\Delta Income_{t-1}$	*Pre*	-	-	-	-
	Post	-0.003 *-1.202*	-	-	-0.003 *-1.259*
$\Delta Income_{t-2}$	*Pre*	-	-	-	-
	Post	-0.005 *-3.245*	-	-	-0.005 *-3.272*
$\Delta Income_{t-3}$	*Pre*	-	-	-	-
	Post	-0.003 *-1.298*	-	-	-0.003 *-1.164*
$\Delta Income_{t-4}$	*Pre*	-	-	-	-
	Post	0.005 *1.993*	-	-	0.005 *2.202*
$\Delta Inflation_t$	*Pre*	0.031 *1.211*	0.030 *1.195*	0.031 *1.196*	0.036 *1.446*
	Post	-0.008 *-1.427*	-0.008 *-1.091*	-0.0002 *-0.040*	-0.009 *-1.484*
$\Delta M1_{t-1}$	*Pre*	-0.013 *-1.692*	-0.013 *-1.765*	-0.012 *-1.761*	-0.014 *-1.904*
	Post	-0.001 *-0.705*	-0.001 *-0.962*	-0.001 *-1.847*	-0.001 *-0.731*
$\Delta M1_{t-2}$	*Pre*	-	-	-	-
	Post	-	2.81E-6 *0.003*	-4.15E-6 *-0.006*	-
$\Delta M1_{t-3}$	*Pre*	-	-	-	-
	Post	-	0.002 *2.715*	0.003 *3.327*	-
$\Delta M1_{t-4}$	*Pre*	-	-	-	-
	Post	-	-	0.003 *3.613*	-
Summary statistics					

N.	*Pre*	87	87	87	87
	Post	53	53	53	53
$Adj.R^2$	*Pre*	0.055	0.055	0.056	0.066
	Post	0.162	0.161	0.212	0.207
$p-value$	*Pre*	0.809	0.796	0.825	0.742
$H_0 : i_t^{US} = 0$	*Post*	0.298	0.138	0.159	0.611
$p-value$	*Pre*	0.588	0.577	0.588	0.661
$H_0 : i_t^{US} = 1$	*Post*	0.000	0.000	0.000	0.000
$p-value$	*Pre*	0.872	0.979	0.837	0.158
$H_0 : \Delta i_t^{Regional} = 0$	*Post*	0.872	0.082	0.003	0.025
$p-value$	*Pre*	0.000	0.000	0.071	0.000
$H_0 : \Delta i_t^{Regional} = 1$	*Post*	0.000	0.038	0.0003	0.000

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