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ESSAYS ON EAST ASIAN CAPITAL MARKETS:
INTEGRATION AND IMPLICATIONS FOR ECONOMIC ACTIVITY

by

FENG GUO

A dissertation submitted to the Graduate Faculty in Economics in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

2005

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Abstract

ESSAYS ON EAST ASIAN CAPITAL MARKETS:
INTEGRATION AND IMPLICATIONS FOR ECONOMIC ACTIVITY

by

Feng Guo

Adviser: Professor Merih Uctum

This dissertation assesses two important aspects of capital markets in East Asia: (a) financial integration and its volatility and (b) feasibility of forming an optimum currency area.

The first aspect focuses on the impact of the financial regime on real activity. It examines the evidence on saving-investment correlations and the covered interest parity conditions to gauge the degree of financial integration in eight East Asia emerging markets. It is found that Hong Kong and Singapore have fairly mobile capital markets while other countries exhibit financial openness only to a certain extent. The results also indicate that financial integration has been broadly enhanced among these markets following their liberalizations. However, except for Hong Kong, the degree of financial integration in all markets has not yet returned to the level before the Asian crisis. The volatility of differentials from covered interest parity is also tested using a GARCH model. For all economies with the exception of China show significant volatility during the financial crisis, this means drastic decline of the degree of financial integration during this time period.

The second aspect reviews the theory of optimum currency areas, exploring the

impact of underlying real behavior on the choice of the monetary regime. This investigates the feasibility of creating a currency union in East Asia following the monetary cooperation in recent years. The approach mainly consists of a multivariate Structural VAR model by identifying various types of shocks in nine East Asian economies, and nine European Monetary Union countries are adopted as a benchmark. The analysis of structural disturbances suggests that Hong Kong, Indonesia, Korea, Malaysia, Singapore and Thailand may benefit from having a common monetary arrangement since these economies exhibit (a) significant and positive correlations of underlying disturbances, (b) small size of underlying disturbances and (c) similar impulse response function of real exchange rate.

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Chapter 1

Overview of Financial Liberalization in East Asia

1.1 Introduction

Over the last two decades, East Asian economies are thought to have been moving towards closer regional integration among their markets for goods, capital and foreign exchange. This is because most of these economies deregulated and liberalized their domestic markets during 1980s. East Asian economies have focused on ensuring regional security and political stability in the past decades. Since having achieved these things gradually, East Asia began to turn its attention towards developing greater economic cooperation, reforming the financial sectors through the deregulation of interest rates, and opening up the financial markets to foreign investors and introducing new financial instruments. Financial liberalization induces change in basic economic structure and in the operating environment for policy, business and households.

On the other hand, the financial crisis during 1997-98 raised inevitable questions concerning the sustainability of growth and revitalization of many economies in East Asia. Besides, there came several other things which deterred the growth in no small measure:

(a) Japanese prolonged recession since the early 1990s and the following curtailment of capital flows to the other economies in the region from Japan;

(b) Intensified competition for foreign direct investment (FDI) and export markets within the region, particularly form the "newly emerging markets", such as China and Vietnam;

(c) The sharp downturn of capacity utilization as the information technology

bubble burst in U.S. and tepid growth in the global economy in 2001, which result in the decline of external demand for East Asia exports;

(d) The concerns about regional and international terrorism after 9.11 and consequent decrease of business investment from developed countries.

All these factors have generated more uncertainty about this region, thus it is worth to re-examine these issues by using up-to-date data. The East Asian economies examined in the dissertation consist of members of APT economic group[1]: five Southeast countries (Indonesia, Malaysia, the Philippines, Singapore, and Thailand) and three Northeast countries (China including Hong Kong, Korea, Japan). These nine economies are grouped together under the shorthand description of "East Asia".

The region is chosen as the object of analysis of financial integration for several reasons. Firstly, it is a region of growing importance in the world economic and political environment, accounting for about one third of world income and trade in 2004, surging from about eleven percent in 1970. There are growing applied research on trade and investment linkages in the APT region and growing literature on macroeconomic structure and policy. But the literature on financial structure and integration is relatively small, even if expanding. Besides, finance in East Asia has not been explored in as much detail as other issues since quality and availability of data are generally lower than for trade and investment analysis. Integration has been a major topic of analysis in Europe for decades but the focus on East Asia is only

[1] Ten-member of ASEAN (Association of Southeast Asian Nations: Thailand, Indonesia, Malaysia, Philippines, Singapore, Brunei, Cambodia, Laos, Myanmar, Vietnam) and three Northeast Asian nations (China, Japan, and Korea).

relatively recent. There has also been substantial reform and growth in the domestic financial system and liberalization of the capital account in many of these economies over the past decades. More recently, East Asia has experienced the financial crisis during 1997-98, with sharp downward movements in asset and financial prices as well as economic contraction. Finally, policymakers in APT economies are interested in identifying the openness of markets as part of negotiating and defining an agenda of reform and liberalization in the region. Thus these changes and the implications for financial reform pursued are worthy to be examined.

In the dissertation, I concentrate on the financial dimension of regional integration in East Asia and its implications for regional monetary integration. Two aspects of integration in East Asia will be examined – dynamic financial integration and feasibility of forming an optimum currency area – to underline their close interaction. The first part of dissertation, on financial integration, focuses on the impact of the financial regime on real activity. Revising the causation, the second part on the theory of optimum currency areas, explores the impact of underlying real behavior on the choice of the monetary regime. It thus explains how the real side of the economy affects the level of financial integration. These two key questions are different sides of the same coin. Combining both subjects in a single work thus provides a unified view and whole understanding of the interactions between the real side of the economy and the level of financial integration in East Asia- hence the title of this dissertation.

The remainder of the dissertation is organized as follows. The next section of

this chapter reviews East Asian financial market developments before and after the 1997 financial crisis. Chapter 2 examines the evidence on saving-investment correlations and the covered interest parity conditions to gauge the degree of financial integration and its volatility in eight East Asia emerging markets. Our concerns are not so much with level of financial openness in East Asia, but with the dynamic changes of integration degree over time, especially in the 1990s. Chapter 3 reviews the theory of optimum currency areas, exploring the impact of underlying real behavior on the choice of the monetary regime. This investigates the feasibility of creating a currency union in East Asia following the monetary cooperation in recent years. The approach mainly consists of a multivariate Structural VAR model by identifying various types of shocks in nine East Asian economies, and then nine European Monetary Union countries are adopted as a benchmark. Some other criteria for optimum currency union, such as intra-regional trade factor and labor market mobility, are also assessed. The final chapter provides some concluding thoughts, summarizing the earlier study and presents an overall policy assessment of financial integration in East Asia.

1.2 The Liberalizations before the Financial Crisis

The East Asian economies began liberalizing their financial sectors in the 1980s and completed most of these reforms by 1990. Financial market liberalization has been undertaken for (a) deregulating domestic financial market, (b) removing restrictions on capital account transactions that will increase mobility of capital

between countries and (c) opening financial services industries to foreign competition. Hong Kong and Singapore were the first, having started liberalizing their financial sector and abolished capital controls in the 1970s, while Indonesia, Malaysia, the Philippines and Thailand followed with major reforms in the 1980s. On the other hand, Korea and China undertook more gradual measures towards financial liberalization which were intensified in the early 1990s. Together with this move towards the liberalization of domestic financial markets, East Asia also undertook measures to relax international capital controls and to adopt more flexible exchange rate arrangements.

Hong Kong has the longest and most consistently open exchange system in the region: the abolition of restrictions on the capital account in 1972, the lifting of the moratorium on bank licensing in 1978 and the consequent entry of foreign banks have ensured tight competition and expansion in both the domestic money market and the foreign exchange market.

Indonesia is well known for its open capital account and has employed a liberal exchange system with minimal controls since August 1971. Because of their relatively low saving rates, Indonesia needs large amount of foreign capital to sustain rapid growth. And for this reason they actively deregulated inbound FDI and cross-border financial transactions beginning in the early 1980s when capital inflows decreased sharply as a result of the Latin American debt crisis in 1982. Bank of Indonesia determined the exchanged rate under a system of managed float against a basket of currencies until July 1997, after which the currency was floated.

Singapore aimed to be a financial center in Asia since 1970s. Domestic deposit and lending rates cartel in Singapore were abolished, and all banks were free to quote their own interest rates in 1975. The capital account was completely liberalized in 1978 and there are no exchange restrictions on current transactions.

Malaysia's capital account has been progressively liberalized since the float of the ringgit in June 1973, and spot and forward exchange transactions were free. The recession in the mid-1980s, however, prompted the government to impose some controls on interest rates together with stronger prudential regulation. As the lift of these controls in 1987, the capital account was generally opened. Portfolio inflows were free of restrictions; portfolio outflows were also free except for resident corporations with domestic borrowing; and no restriction, except for net foreign exchange open position limits, applied to banks' foreign borrowing or lending in foreign exchange. Until 1997, local banks could provide forward cover against ringgit to nonresidents, facilitating arbitrage between domestic and offshore markets. Following the Asian financial crisis, Malaysia imposed restrictions on capital flows and fixed the exchange rate in September 1998.

In Thailand, attempts were made in the 1980s to gradually deregulate the interest rate. In 1990, Thailand accepted the obligations of Article VIII. Further liberalizations followed, with the removal of limits on the amounts of foreign exchange that could be purchased or brought or taken out of the country. Deposits rates ceiling were completely lifted in 1989-90 and interest rate ceilings on lending rates were removed in 1992. In contrast to the promotion of capital inflows, controls

on capital outflows by residents were liberalized only gradually. In 1991 Thai residents were permitted to invest abroad or lend limited amounts to companies that had at least a 25 percent Thai equity participation.

The Philippines peso has been floated since September 1992, but payments restrictions still apply on both the Philippines current and capital accounts. In 1980, the Philippines began to partially liberalize interest rates. Capital flows are largely unrestricted in the Philippines though there are some restrictions on current transactions.

Korea followed a liberal managed float, introduced in March 1990, by which the exchange rate varied within a bank around a rate posted by the Bank of Korea. Controls remained on inward FDI and on foreign borrowing by Korean firms and banks. Faced with a significant surplus in the current account balance of payments over the period 1986-89, Korean government progressively liberalized the import regime through a pre-announced schedule of measures. Restrictions on payment for current international transactions were relaxed and Korea accepted the obligations of IMF Article Ⅷ in 1998. Capital outflows were also promoted by liberalizing direst investment, purchased of real estate overseas, and certain portfolio investments outflows by institutional investors. Foreign borrowing limits and restrictions in investing in overseas stock were partially eased in 1994. As a result of these reform efforts in deregulating both current and capital account transactions, Korea had developed a relatively liberalized capital account.

China's financial deregulation process began from mid–1990s. China

introduced a new financial reform at the beginning of 1994. The dual–track foreign exchange rates were unified in 1994 and then a unified national foreign exchange market was established. In 1996, China liberalized the current account and set a target for liberalizing the capital account by 2000. That program was quickly shelved on the outbreak of the financial crisis in 1997 and was postponed indefinitely. After Asian financial crisis, controls over credit quotas had been abolished. Total loans of commercial banks are determined according to an asset–to–liability ratio management system. The central bank lowered the interest rates on the central banks six times since the early 1996.

1.3 During the Financial Crisis and Thereafter

In the second half of 1997 and early 1998, there was a severe loss of confidence in East Asian financial markets. The crisis began with the sharp fall in the Thai baht, and then spread to Indonesia, Malaysia and the Philippines quickly. These four ASEAN countries floated their currencies, which then depreciated substantially. In October and November 1997, the Korean financial and economic system came under market scrutiny, and the won was sold down by the markets. As currencies came under more pressure and the financial and macroeconomic outlook deteriorated, the governments of Thailand, Korea and Indonesia entered into negotiations with the IMF and other countries for financial support to aid economic and financial restructuring.

Before the 1997 crisis most of the East Asia economies pegged their

currencies to the US dollar and managed their dollar exchange rates within a relatively narrow band. Most of the East Asian economies including Indonesia, Korea, the Philippines and Thailand shifted to free floating after the crisis. Korea has undertaken reform measures of liberalization after the crisis. Thailand and Indonesia have done very little in deregulating further capital flows. Most of the other East Asian economies have shown little enthusiasm for speeding up the liberalization of capital account transactions.

Since the crisis, Thailand has not taken any steps towards deregulating further portfolio capital flows. Instead, the authorities imposed capital controls on May 15, 1997, to stabilize the foreign exchange market and stem speculative attacks on the baht. These measures were adopted against the background of a sharp decline in free international reserves, and the potential adverse effects of an interest rate defense on economic activity and the banking system. The controls, in addition to the real economic fundamental, undermined investor confidence, and discouraged foreign capital inflows, resulting in a decline in net private inflows of capital to Thailand during this period[2]. Once the economic environment showed signs of improvement, the Bank of Thailand lifted the controls on January 30, 1998. The baht appreciated, stock market prices increased.

On July 11, 1997 immediately after crisis touched off, to protect against speculation Indonesia widened the trading bank for the exchange rate against US dollar to 12 percent from 8 percent. Subsequently, concern also emerged about the

[2] The inflows were from more than 5 percent of GDP in 1996 to an average of about negative 12 percent in 1998.

stability of the banking system and the Indonesian authorities imposed limits per customers on forward currency trading between non-residents and banks and on each bank's outstanding position in the forward market ($5 million) to restore stability in the foreign exchange market. However, the Indonesian government agreed to phase out these controls as soon as possible in its letter of intent to the IMF on October 31, 1997. At the same time, the Indonesian authorities allowed foreign investors to purchase unlimited domestic share except for bank shares as of September 4, 1997 to encourage inflows of foreign capital. In 1998, many restrictions on foreign direct investment were eased in order to stimulate domestic investment. Some of the deregulation measures include: removal of all formal and informal barriers to FDI in palm oil plantation, retail and wholesale trade; and reducing the number of activities heretofore closed to foreign investors in July, 1998. In the following year, "Act on the Foreign Exchange Flows and Exchange system" was promulgated in which ownership and uses of foreign exchange were in principle liberalized. The Act also provides a legal basis for introducing prudential regulation on foreign exchange transactions. The Act gives the central bank authority to request information and data concerning foreign exchange transactions conducted by residents and to prescribe provisions for prudential regulations on various types of foreign exchange transactions.

When Malaysia came under speculative attacks in July 1997, it imposed a number of administrative exchange and capital control measures in September 1998, aiming specifically at containing ringgit speculation and the outflow of capital by

eliminating the offshore ringgit market and at stabilizing short-term capital flows. The ringgit was pegged to the US dollar at the rate of 3.8 the next day. In early February 1999, the authorities announced modifications to the one-year restriction on the outflow of repatriated portfolio investment. Portfolio capital invested before February 1999 would become subject to a graduated exit levy depending on the length of the period between funds being brought in and repatriation.

Korea has managed a substantial degree of capital account liberalization after accepting the IMF-led agreement in December, 1997. In response to foreign pressure, Korean government agreed to liberalize further the foreign exchange system over a three-year period divided into two phases beginning in April, 1999. These measures of liberalization were aimed at stabilizing domestic financial markets by inducing foreign capital inflows. During the first phase, controls of capital account transactions were converted into a negative system, removing all restrictions except for those limited by law. In order to promote overseas investment by private corporations and financial institutions, residents' purchases of overseas real estate were deregulated and their overseas borrowing and issuance of foreign currency denominated bonds with maturity less than one year were also allowed. At the same time non-residents were permitted to make deposits and open trust accounts denominated in Korean won with maturity more than one year. Beginning in January 2001, the foreign exchange liberalization entered its second phase with further liberalization for individuals and streamlining of remaining restrictions on corporations and financial institutions regarding their foreign exchange transactions. Since the start of the second phase of

the liberalization: (a) restrictions on obligatory repatriation of external claims have been eased; (b) ceiling's on overseas payments and monetary possessions for residents when leaving the country have been eliminated; (c) the US$20,000 ceiling on foreign currency purchase by residents has been lifted; (d) The maturity restrictions on Korean won denominated deposits or trusts via domestic financial institutions by non-residents has been removed.

The economic recovery in the crisis-hit East Asian economies has been impressive by any measure of performance. Recovery began approximately one year after the crisis erupted in July 1997 and continued through 2004, though the rates of growth were various. To a certain extent, the measures of financial liberalization during the crisis were regarded to contribute to the recovery in these economies.

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Chapter 2

An Examination of Financial Integration and Its Volatility

2.1 Introduction

East Asia is widely thought to have been moving towards closer financial market integration since most economies in the region began liberalizing their financial sector in the 1980s and completed most of these reforms by 1990. Singapore took a leading role, starting liberalizing its financial sector and abolishing capital controls in the 1970s. Hong Kong, Indonesia, Malaysia, the Philippines and Thailand followed suit with major reforms in the 1980s, whereas Korea and China undertook more gradual measures towards financial liberalization that was intensified during the early 1990s.

There is a substantial body of applied research on financial market integration and international capital mobility.[3] However, the existing literature has been focusing narrowly on developed economies, which are already open and integrated. Tests of financial integration in the context of East Asia emerging economies are relatively deficient albeit expanding. For instance, estimations for six East Asia countries can be found in Montiel (1994),[4] which measures saving-investment correlations for the period 1970-1990. The uncovered interest parity (UIP) for Korea, Malaysia, Singapore and Thailand are examined by Faruqee (1992). Moosa and Bhatti (1997), Min et al (2002) also applied UIP to assess the degree of financial integration between Japan and Asian countries. Chinn and Frankel (1994) reports covered interest differentials for Hong Kong, Malaysia and Singapore, where forward exchange

[3] As indicated by Moosa and Bhatti (1997), the two terms are often used interchangeably because it is plausible to postulate that capital moves more freely if capital moves more freely if capital markets are integrated.
[4] Altogether over fifty developing countries are studied.

correlation and the covered interest parity condition. And then the volatility using GARCH model is presented. Finally, summary and some policy implications are drawn in the conclusions.

2.2 Theoretical Framework

The essence of financial liberalization and integration is increased financial integration and relatively open capital accounts. Testing the correlation between national saving and investment is first found in the work of Feldstein and Horioka (1980). They argue that saving and investment should be uncorrelated in a small country that produces a single good and is integrated in both the goods and the financial markets, since a shortfall in domestic savings can always be financed by foreign capital. In other words, the increase in investment should imply a low regression coefficient of domestic investment, as countries with high financial integration would be free to seek out the most productive investment opportunities worldwide.

In addition, financial integration can be assessed in terms of the interest rate parity conditions. The basic characteristic of an integrated financial market is that the rates of return on similar assets have to be the same across different countries. This is because as markets become more open and unified, differences in rates of return should only reflect such fundamental factors as differences in asset quality, risk and so on. Thus, it is natural to examine interest parity conditions for evidence of financial integration. The convergence of returns is typically measured by covered interest

parity (CIP) and uncovered interest parity (UIP). Under CIP, interest rates across countries are equalized when contracted in a common currency, say, US dollars; while under UIP, expected rates of returns are equalized without exchange rate risk. That is, the interest rate spread between two currencies is equal to the difference between the expected future and current exchange rate.

As pointed out by Frankel (1992) and Obstfeld (1995), all but covered interest parity tests cannot be interpreted unambiguously as tests of a country's integration into world capital markets. CIP, in essence, states that capital flows should equalize returns on assets with equal maturity and default risk across countries, once currency risk has been eliminated by hedging the transaction through the use of forward contracts. Since the transaction is almost riskless (only subject to default risk), CIP is usually considered to be an arbitrage condition and deviations from CIP are regarded as reflecting barriers to cross-border capital flows.

However, the main difficulty in testing for covered interest parity has been that liquid forward foreign exchange markets with publicly quoted prices did not exist until recently for most East Asian emerging markets. Hence, the related studies for East Asia have been restricted basically to the examination of uncovered interest parity condition, which provides little information about the degree of financial integration if there is risk premium.[5] As capital markets become more integrated, one possibility is that assets denominated in different currencies become more

[5] Dooley and Isard (1980), Hansen and Hodrick(1980) are among the many papers which reject uncovered interest parity for open markets, arguing that rejection would appear to be due to time-varying currency risk premium or non-rationally formed expectations about exchange rate movement.

substitutable. This has the effect of lowering risk and reducing interest differentials. Consequently a tightening in the covered interest differential over time would be associated with an increasing level of financial integration and is conducive to growing financial integration of the home currency vis-à-vis the rest of the world.

2.3 Methodology and Data

2.3.1 Saving–investment correlations

The traditional approach to test the financial integration hypothesis, proposed by Feldstein and Horioka (1980), consists of regressing the saving ratio on the investment ratio. A positive and close to one coefficient of the saving rate would be suggestive of imperfect financial integration:

$$(I/Y)_t = \alpha + \beta\,(S/Y)_t + \epsilon_t \qquad (2.1)$$

where $(S/Y)_t$ is the gross domestic saving as a ratio to GDP; $(I/Y)_t$ is the equivalent ratio for gross domestic investment. For small countries, β should be close to zero under the null hypothesis of perfect financial integration. When β equals zero, there is no relationship between domestic saving and investment. In that case "any additional saving is part of a world pool of saving seeking the highest return worldwide". Conversely, when β large, capital is is considered immobile. If β equals 1, for example, then all additional saving goes to financing domestic investment.

However, as critics of Feldstein and Horioka (1980) point out, there are limitations in Equation (2.1). The regression results depend on the assumption that $(S/Y)_t$ and $(I/Y)_t$ are stationary, which may not always be the case. If the two series

are non-stationary, the empirical estimates of the parameters α and β will be consistent but their estimated standard errors will no longer be reliable. The use of cointegration technique developed by Engle and Granger (1987) suffices for straightforward inspection. On the basis of cointegration theory, if saving and investment ratios are integrated of order one so that the error term ϵ_t is still a stationary *I(0)* series, then the two time series are said to be *cointegrated*. Application of this technique to East Asia emerging markets seems desirable, given the historical shifts in savings and investment in the course of long-run growth of these economies.

2.3.2 Covered interest parity conditions

The international integration of financial markets implies an increase in capital flows and a greater tendency for the common-currency prices and returns on traded financial assets in different countries to converge. The convergence of returns in this paper is measured by covered interest parity over traded assets including money market instruments, long-term securities and equity.

I begin from covered interest parity (CIP) hypothesis, which holds if the forward premium or discount equals the difference between the domestic and foreign nominal interest rates. CIP is a direct consequence of covered interest arbitrage. Based on the pure arbitrage argument, CIP can be expressed as:

$$F_{t,\ t+k} / S_t = (1+ I_{t,\ k}) / (1+ I^*_{t,\ k}) \qquad (2.2)$$

where S_t is the spot exchange rate at time t denoted as domestic currency per unit of foreign currency, $F_{t,\ t+k}$ is the forward exchange rate at time t for delivery of the

foreign currency at time $t+k$; $I_{t,k}$ and $I^*_{t,k}$ are the domestic and foreign interest rate respectively at time t for k-period maturity. Moreover, the domestic asset, the foreign asset and the forward contract all have the same maturity, and it is assumed that the securities are identical except for the currency in which future payments are denominated.[6] Taking the logarithm of Equation (2.2) yields Equation (2.3):

$$f_{t,\,t+k} - s_t = i_{t,k} - i^*_{t,k} \tag{2.3}$$

If the domestic nominal interest rate is higher than the foreign nominal interest rate, the higher domestic nominal interest rate will be offset by a forward discount. For simplicity, I rewrite the Equation (2.3) as follows:

$$i_{t,k} = i^*_{t,k} + fd_{t,\,t+k} \tag{2.4}$$

where $fd_{t,\,t+k}$ is the forward discount, i.e. $f_{t,\,t+k} - s_t$ in Equation (2.3), on the domestic currency. The covered interest differential (CID) can therefore be defined as:

$$CID = i_{t,k} - i^*_{t,k} - fd_{t,\,t+k} \tag{2.5}$$

According to Frankel (1992), national barriers, such as capital controls, transaction costs, information costs, default risk, to full integration of financial markets would lead to deviations from CID. Otherwise, the covered interest rate differential should be zero if well-integrated financial markets exist. If CID < 0, the rate of return on home assets is lower than foreign assets, indicating capital outflows from the home country. Similarly, there tends to be capital inflows if CID > 0. CID will vary over time and it can be used as a measure of dynamic financial integration.

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[6] In reality, one of the causes of the Asian crisis is the "double mismatch" of currencies and maturities. That is, long-term local investments were financed with short-term dollar loans.

2.3.3 GARCH model

Finally, financial returns tend to exhibit periods of relative volatility and stability, and this suggests that estimation can be made more efficient by modeling a generalized autoregressive conditional heteroscedasticity (GARCH) framework. Interest parities are not the only indicator of measuring financial integration. As Faruqee (1992), Kuen and Song (1996) argued, another way to measure financial integration is to look at the conditional variance of such differentials. With greater financial integration, not only covered differential rates but also the variance would decline over time. If I denote y generically as differentials from covered interest parity, a time–series model that captures autoregressive (AR) structure in both mean and variance can be written as follows:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \ldots + \alpha_p y_{t-h} + \xi_t \tag{2.6}$$

$$\xi_t \sim N(0, \sigma^2_t) \tag{2.7}$$

$$\sigma^2_t = \beta_0 + \sum_{i=1}^{q} \beta_1 \xi^2_{t-i} + \sum_{j=1}^{p} \beta_2 \sigma^2_{t-j} \tag{2.8}$$

Where $\Sigma \beta_1 \xi^2_{t-i}$ is q order of the ARCH term, generally news about volatility from the previous period; $\Sigma \beta_2 \sigma^2_{t-j}$ is p order of GARCH term. Thus, y_t follows an AR (h) process with a conditional variance equation described by a GARCH (p, q) process. The GARCH model is jointly implemented for the data via maximum likelihood

estimation (MLE) of the log likelihood function, instead of the two-stage method used by Faruqee (1992). The estimated conditional variance σ^2_t will give us an indication of the changing conditions of financial integration. In this chapter, GARCH (1, 1) model is adopted, which is sufficient to capture the dynamics of the conditional variance.

2.3.4 Data

For saving–investment correlations test, the annual data from the *Statistics Data Division* of *Asia Development Bank* and the *International Financial Statistics CD-ROM* during 1965-2002 are used, because most East Asia emerging markets have data available during this period. Investment is measured by gross fixed capital formation, which appears directly in national accounts. As Bayoumi (1990) points out, it has a less tendency to behave procyclically because the data exclude highly procyclical inventories component. Saving used in these tests is gross domestic saving, which is defined as national income minus total consumption. Due to the extensive financial liberalization process and financial structural changes in East Asia mostly happening during the 1980s, I divide each economy's data into two time periods according to its individual major financial liberalization year, in order to check change of financial integration.

Monthly data are used in testing of the covered interest parity condition. The domestic interest rates used for the seven East Asia emerging markets[7] are three-month market interest rates from *International Financial Statistic CD-ROM* of IMF, while the 91-day Treasury bill rates are used for the Philippines due to data availability. The foreign interest rates are three-month interbank offered US dollar interest rates in London market (LIBOR) from US *Federal Reserve Board of Governors*. Spot exchange rates are taken from the end of period and forward exchange rates are monthly three-month forward rates. The exchange rates data for East Asia emerging markets examined in this paper are all retrieved from *Reuters*, though the time span for each country varies.

The sample covers monthly data from January 1990 to June 2003 in light of the large financial liberalization process and unstable financial structural changes in East Asia[8]. To examine the changes during the Asian financial crisis, I group the interest rate observations into three sub-periods: the pre-crisis period (January 1990 - December 1996), the crisis period (January 1997 - December 1998) and post-crisis period (January 1999 - June 2003). Though the disaster in East Asia originated from Thailand in mid-1997, the Thai baht has been under speculative attack for several months before its final collapse and speculative pressure transmitted rapidly to the rest of the region. Therefore, I only consider the period up to the end of 1996 as the period of relative stability.

Table 2.1 summarizes some statistics of interest rata data. It is identified that

[7] Test of covered interest parity for China has been excluded because of incomplete forward exchange rate data.
[8] See Chapter 1 in detail.

Hong Kong, Malaysia and Singapore have relatively low interest rates. These are the regions that less affected by Asia crisis during 1997–98 and have comparably developed financial system. Other regions have higher levels and variability of interest rates reflecting their higher levels of inflation. The highest market interest rate was 81 percent, happening in August of 1998 in Indonesia. Table 2.2 presents the correlation matrix for interest rates. The correlation of the interest rates between East Asia and US are very low or negative with the exception of Hong Kong (0.73) and Singapore (0.54), reflecting their closer relations with US financial market as two important financial centers in East Asia.

2.4 Empirical Results

The properties of the dataset are examined before analyzing the empirical results. I employ Phillips–Perron (PP) test, which corrects, in a non–parametric way, any possible presence of autocorrelation in the standard ADF test. It is found in Table 2.3 that the null hypothesis of one unit root is not rejected in most of the time series. The only exception is the market interest rate for Hong Kong.

2.4.1 Test of saving-investment correlation results

I first turn to Engle and Granger's technique to test for cointegration. Saving and investment ratios are plotted in Figure 2.1. For the full sample period in each economy, the estimated residual term in the OLS equation is tested for stationarity. It is identified that, except for China, the residual terms are stationary among all the

emerging markets under analysis.[9] In the cointegration world, the existence of a long-term equilibrium relationship between saving and investment clearly suggests that the proportion of domestic saving flowing into domestic investment is likely be stable over time for these East Asia emerging markets.

The estimated saving-investment correlation coefficient β helps to pin down the proportion of domestic saving that flows into domestic investment. Table 2.4 shows that during 1965-2002 the overall β for East Asia is 0.54,[10] implying that both the perfect financial integration and the perfect capital immobility hypotheses are rejected. Instead, if a value of 0.60 derived by Murphy (1984) as well as by Caprio and Howard (1984) is taken as the "representative" value for a developed country, the coefficient obtained here is apparently smaller than this benchmark. As a consequence, the Feldstein-Horioka test result supports the presence of a reasonably high degree of financial integration in the group of emerging markets.

Using the above criterion, the saving-investment correlation coefficients of Hong Kong, Korea, and especially Singapore are estimated to be rather small. Little correlation between saving and investment suggests high financial integration in these markets. On the other hand, those less-developed markets in the region, such as China and Thailand, turn out to have much bigger coefficients on savings, indicating a very strong yet incomplete flow from saving to investment. That is, these two markets have imposed significant capital controls and are not financially integrated with the rest of

[9] Refer to the fourth column in Table 2.4.
[10] The results for East Asia as a whole are calculated using a GDP weighted average of saving and investment ratios.

the world. Based on the saving-investment test, the following rough ranking of financial integration from high to low for East Asia emerging markets is perceived: Singapore, Hong Kong, Korea, the Philippines, Malaysia, Indonesia, Thailand and China.

In order to verify whether the adoption of flexible exchange rates and the enforcement of deregulations of financial markets in the 1980s have affected financial integration in any fashion, separate regressions are run for the pre-liberalization and post-liberalization periods.[11] The results presented in Table 2.5 demonstrate that the saving-investment correlation coefficient declines from 0.53 to 0.46 for whole region. This might be interpreted as a higher level of financial integration for the whole region since the accelerated financial deregulatory process in the 1980s. Individual markets (except Thailand) tend to have smaller saving-investment correlation coefficients in the post-liberalization period, pointing out that most markets become more open financially and experience greater financial integration. Specifically, Singapore has the most dynamic performance: its β shrinks down from 1.08 to 0.01 after all banks were free to quote their own interest rates in 1975. Therefore, I cannot reject the null hypothesis of perfect financial integration for this country. This finding confirms that the changes in financial integration are in line with the successful financial liberalization process and structural adjustments in East Asia.

[11] The sample breakpoint is chosen such that it is the year when individual economy witnessed major financial liberalization event, see Chapter 1 in detail.

2.4.2 Test of covered interest parity results

For the post-liberalization period, I explicitly investigate the extent to which covered interest rate parity (CIP) holds in each emerging market since the early 1990s. I begin the examination by checking the means and the standard deviations of the covered interest differentials over the full sample. The results are reported in Table 2.6. I find that the mean differentials are generally positive and different from zero in East Asia except for Singapore, suggesting that the rates of return on domestic assets have been generally higher than the covered rate on US assets and hence some sort of domestic control on capital inflows into these economies. The likely explanation for negative CID in Singapore is that Singaporean commercial banks, for instance, have generally maintained the lowest returns on their deposit rates. This may be due to a low inflationary environment, relatively stable currency and overall macroeconomic climate which all contribute to a negative CID rate.

Since mean differentials may mask deviations of opposite signs, I also report the average absolute deviations. The larger the absolute value of CID, the higher capital or foreign exchange control in that country, and therefore the lower financial integration. The results reveal that Hong Kong and Singapore are by far the most integrated capital markets in East Asia over the entire period because of their smallest CID rates in absolute terms. This is not surprising given that they are two regional financial centers and have fairly open economic systems. Due to limited forward data obtained on Korea, its results are not directly comparable with others for the whole sample. Compared with the numbers obtained on Hong Kong and Singapore, the

absolute deviations from CIP for Thailand, the Philippines, Malaysia and Indonesia are quite substantial, which are induced mainly by significant spreads against US interest rates under the high interest rate policy adopted in these markets.

It is of great interest to see the intertemporal evolvement of the CIDs, especially during the 1997-98 financial crisis, therefore I break down the full sample into three sub-periods: the pre-crisis period, the crisis period and the post-crisis period. Inspection of the plots in Figure 2.2 reveals that the CIDs all spike up and reach record-high levels during the Asian financial crisis. A combination of sharply weakened currencies and high interest rates stance in the midst of the financial crisis led to CID increased dramatically. Indonesia and the Philippines, in particular, witnessed extended periods of exceptionally large positive deviations from CIP. It is noted that these two countries traditionally tend to have high interest rate policies, reflecting a country premium required for holding the assets in these two countries and it may provide explanation why the Indonesian rupiah and the Philippine peso devalued a lot in the past.

The CID results are contained in Table 2.6. A much clearer picture emerges due to the split of the sample — the markets became more segmented during the crisis period as the CIDs exhibit sizeable deviations from the covered interest parity condition compared with those in the pre-crisis period. For example, the differentials for Indonesia and Malaysia went up by a striking 100 percent and 300 percent respectively. Factors that may have contributed to the considerable upward swing in CID during this period include the continued high degree of foreign exchange

volatility tied to increased concerns regarding sustainability and stability, coupled with the adopted high interest rate policy intended to bring about capital inflows. All these East Asia markets under analysis become somewhat more insulated than in the pre-crisis period, reflecting imperfect financial integration triggered by the currency crisis.

The results for the post-crisis period are mixed. On the one hand, the lowering of interest rates in many markets after the crisis and the recovery of these currencies against US dollar are responsible for declining CID rates, as I compare the post-crisis period with the crisis period. On the other hand, if the pre-crisis period is picked as the benchmark level, one notable exception is Hong Kong, which shows a higher degree of financial integration (smaller CID in absolute terms). Indonesia, Malaysia, the Philippines, Singapore and Thailand all have slightly larger differentials from the covered interest parity. It signals that the degree of financial integration in each of these markets has failed to return to the pre-crisis level.

2.4.3 GARCH model test results

The unit root test results in Table 2.7 show that covered differential rates for most economies are non–stationary series at level, or *I* (1). Thus I fit an autoregressive process with GARCH residuals. A GARCH approach is chosen for firstly, it addresses the issue of heteroscedasticity of the data and secondly, it also has the additional advantage that it allows testing the volatility of differentials from covered interest parity. Note that the order of autoregressive process is based

well–established selection criteria: Akaike information criteria. Table 2.8 presents the estimation of the AR model (Equation 2.7) for the East Asian markets. The dependent variables are CID rates. It is found that most CID rates are driven AR (1) process with exception of Malaysia and Thailand, for which CID rate follows an AR (2) process. It is found from this table that most of the estimated coefficients are highly significant and all diagnostic statistics are reasonable.

Table 2.9 presents the results of the GARCH model. The GARCH model is jointly implemented for the data via maximum likelihood estimation of the log likelihood function. And numerical maximization is used through the algorithm developed by Bollerslev (1986) to get the final parameter estimates. This Table reveals that most of the estimated coefficients are highly significant.

The estimated conditional variance σ^2_t gives us an indication of the changing conditions of financial integration. Figure 2.3, which plots out the GARCH conditional variance for each East Asia market, confirms our earlier finding. That is, all markets show that there is one large spike in 1997 or 1998. In other words, each market's conditional heteroscedasticity jumped to extremely high levels, reflecting its sudden increased capital–market risk and decreased financial integration during financial crisis. Indonesia and Malaysia are considered to be the markets that had the most drastic movement of conditional variance. The factors that may have contributed include the continued higher degree of foreign exchange volatility, and upward swing in interbank rate during the financial crisis.

2.5 Concluding Remarks

Existent tests of financial integration in East Asia emerging economies are *de facto* quite few. Thus, there is scope for this paper to contribute to the ongoing exploration of the openness of the East Asia capital market and its integration with the rest of the world in the wake of various liberalization measures taken in each economy. Our main concern is to see whether these countries have become more integrated into the world capital market over the past few decades, and especially how the degree of financial integration has changed after the fallout of the 1997-98 financial crisis. By measuring saving-investment correlations and deviations from the covered interest parity, the following conclusions have been derived from our analysis:

First, it is noted that Hong Kong and Singapore are highly integrated with the world market, while Korea and Malaysia exhibit financial openness only to a certain extent. On the other hand, the lower income countries, Indonesia and the Philippines are acknowledged to be relatively less financially integrated. As for China, it shows strong financial autarky. That is, the country has been implementing extensive capital control measures and is not financially integrated with the rest of the world. However, the evidence on Thailand is mixed, because the results of two tests are essentially the opposite.

Second, using Feldstein-Horioka's saving-investment correlation test covering the period 1965-2002, it can be established that the degree of financial integration has virtually been enhanced among most East Asia emerging markets except for Thailand

in the post-liberalization period. This bears out the general completion of liberalization in these emerging markets.

Third, the period between 1990 and 2003 is characterized by decreasing financial integration in the majority of the markets under study. Covered interest differentials after the 1997-98 Asian crisis fail to return to their pre-crisis levels. For those countries that incurred heavy losses from the financial crisis, namely Indonesia, Malaysia, the Philippines, Singapore and Thailand, larger covered interest differentials are found. The conditional covariance from the GARCH model confirms that all markets had sudden increased capital–market risk and decreased financial integration during financial crisis.

At least two relevant policy implications from this study should be on these governments' agenda. Historically countries with capital controls, in general, tend to have higher real interest rates than countries with free markets. This implies higher costs of capital and constitutes an impediment to growth as the financial markets are liberalized. Thus, single-mindedly pursuing a high fixed domestic interest rate and currency peg may make the domestic economy vulnerable with exposure to concomitant external shocks. Capital control cannot serve as a panacea and should not be exercised on an overly rigid, longer term basis. Here another important lesson arises from the perspective of exchange rate management. Since financial integration is always associated with less volatile exchange rates and lower foreign exchange risk, for prudent East Asia policy makers, maintaining a stable exchange rate system calls for more supervision in meeting the challenges posed by financial integration.

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Table 2.1 Summary Statistics of Interest Rates

	Maximum	Minimum	Mean	Standard Deviation
RCH	10.44	3.24	7.63	2.38
RHK	17.75	3.38	5.80	2.31
RIN	81.01	5.68	19.22	16.81
RKO	25.63	4.74	12.12	4.41
RMA	11.44	2.51	6.18	2.02
RPH	28.57	8.43	14.39	4.78
RSI	9.00	1.00	3.61	1.62
RTH	23.87	1.23	8.75	5.16
LIBUS	8.44	3.08	5.42	1.34

Note: RCH, RHK, RIN, RKO, RMA, RPH, RSI, RTH and LIBUS stand for interest rates of China, Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore, Thailand and US respectively

Table 2.2 Correlation Matrix of Interest Rates

	RCH	RHK	RIN	RKO	RMA	RPH	RSI	RTH	LIBUS
RCH	1.000								
RHK	-0.041	1.000							
RIN	-0.209	0.214	1.000						
RKO	0.553	-0.045	0.161	1.000					
RMA	0.427	-0.060	0.339	0.739	1.000				
RPH	0.200	0.376	0.086	0.554	0.385	1.000			
RSI	0.201	0.512	0.302	0.603	0.342	0.654	1.000		
RTH	0.487	0.251	0.363	0.711	0.623	0.464	0.614	1.000	
LIBUS	-0.116	0.734	0.072	-0.024	-0.274	0.361	0.546	0.261	1.000

Note: RCH, RHK, RIN, RKO, RMA, RPH, RSI, RTH and LIBUS stand for interest rates of China, Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore, Thailand and US respectively

Table 2.3 Test of Unit Roots

Levels	Lag[1]	ADF	PP Test[2]	Difference	Lag[1]	ADF	PP Test[2]
Forward discount							
XHK	1	-2.25	–2.51	ΔXHK	1	-15.18***	–15.53***
XIN	0	-1.12	–0.89	ΔXIN	0	-10.71***	–10.79***
XKO	0	-1.38	–1.36	ΔXKO	0	-11.58***	–11.59***
XMA	0	-0.86	–0.76	ΔXMA	0	-11.88***	–11.91***
XPH	0	-0.71	–0.55	ΔXPH	0	-11.00***	–11.04***
XSI	0	-1.84	–1.83	ΔXSI	0	-10.56***	–10.54***
XTH	0	-0.92	–0.87	ΔXTH	1	-9.21***	–10.05***
Interest Rates							
RHK	1	-3.61***	–4.43***	ΔRHK	1	-11.35***	–19.00***
RIN	0	-2.27	–2.06	ΔRIN	0	-13.38***	–13.60***
RKO	1	-2.16	–2.00	ΔRKO	0	-8.83***	–8.81***
RMA	1	-1.12	–1.79	ΔRMA	0	-17.89***	–17.17***
RPH	1	-2.23	–2.06	ΔRPH	0	-9.50***	–9.44***
RSI	2	-2.49	–2.67	ΔRSI	1	-10.21***	–9.99***
RTH	1	-2.10	–2.74	ΔRTH	0	-15.70***	–16.08***
LIBUS	1	-2.48	–2.02	ΔLIBUS	1	-3.29**	–7.01***

Notes:

1. ADF test lag length is chosen using Schwarz information criterion (SIC). PP test truncated lag is chosen as 4
2. *, **, *** indicate significance at the10%, 5% and 1% respectively
3. HK, IN, KO, MA, PH, SI, TH, TH stand for Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand respectively

Table 2.4 Saving-Investment Regression for East Asia

Country	β	$\overline{R}^2$	ADF Test	Lag Order
East Asia	0.54	0.34	-2.04[b]	3
China	0.96	0.51	-1.52	2
Hong Kong	0.51	0.16	-3.08[a]	3
Indonesia	0.68	0.70	-2.15[b]	2
Korea	0.51	0.71	-2.79[a]	3
Malaysia	0.67	0.33	-2.64[a]	3
Philippines	0.63	0.31	-2.09[b]	3
Singapore	0.07	0.03	-2.66[a]	3
Thailand	0.85	0.47	-1.87[c]	3

Notes:

1. The regression equation is $(I/Y)_t = \alpha + \beta(S/Y)_t + \epsilon_t$ and the sample period is 1965-2002.
2. The Engle-Granger Test results are based on Phillips–Perron unit root test. McKinnon critical values for 1%, 5% and 10% significance levels are -2.63, -1.95, -1.62 for three lags and -2.66, -1.95, -1.62 for two lags; a, b, c indicates that the null hypothesis of no cointegration is rejected at the 1%, 5% and 10% level respectively.
3. Lag order is suggested by Newey-West test.

Table 2.5 Change in Saving-Investment Correlations

Country	Pre-Liberalization[1]	β_1	Post-Liberalization[2]	β_2
East Asia	1965-89	0.53(0.05)	1990-02	0.46(0.14)
China	1979-89	1.06(0.41)	1990-02	0.43(0.21)
Hong Kong	1965-80	0.73(0.28)	1981-02	–0.24(0.30)
Indonesia	1978-88	0.44(0.21)	1989-97	–0.07(0.07)
Korea	1965-90	0.41(0.07)	1991-98	0.28(0.43)
Malaysia	1965-87	0.80(0.25)	1988-97	0.38(0.43)
Philippines	1965-83	0.89(0.19)	1984-97	0.76(0.61)
Singapore	1968-75	1.08(0.45)	1976-97	0.01(0.14)
Thailand	1965-89	0.63(0.15)	1990-97	0.93(0.15)

Notes: 1. the cutoff year is chosen such that it corresponds to the year when there is a major financial liberalization event in that country.
2. The financial crisis period is excluded for those markets that have been most severely hit in order to avoid wider variations in saving and investment and unstable results.
3. Standard errors are in parentheses.

Table 2.6 Descriptive Statistics of CIDs in East Asia

		Full period		Pre-crisis period		Crisis period		Post-crisis period	
Country		*Mean*	*Abs. Mean*	*Mean*	*Abs. Mean*	*Mean*	*Abs. Mean*	*Mean*	*Abs. Mean*
Hong Kong	90:5-03:6	0.02 (0.21)	0.13 (0.16)	-0.03 (0.18)	0.13 (0.12)	0.27 (0.29)	0.29 (0.27)	-0.01 (0.09)	0.06 (0.07)
Indonesia	95:3-03:6	1.26 (0.61)	1.26 (0.62)	0.82 (0.08)	0.82 (0.08)	1.79 (0.68)	1.79 (0.68)	1.20 (0.55)	1.20 (0.55)
Korea	00:2-03:6	0.38 (0.39)	0.45 (0.29)	*n.a.*	*n.a.*	*n.a.*	*n.a.*	0.38 (0.39)	0.45 (0.29)
Malaysia	93:5-03:6	0.38 (0.18)	0.42 (0.49)	0.11 (0.18)	0.16 (0.13)	0.67 (0.59)	0.67 (0.59)	0.49 (0.58)	0.53 (0.55)
Philippines	96:3-03:6	0.81 (0.28)	0.81 (0.28)	0.75 (0.08)	0.75 (0.08)	0.86 (0.24)	0.86 (0.64)	0.80 (0.32)	0.80 (0.32)
Singapore	93:5-03:6	-0.24 (0.42)	0.37 (0.29)	-0.21 (0.22)	0.26 (0.18)	0.12 (0.54)	0.47 (0.28)	-0.42 (0.38)	0.43 (0.37)
Thailand	95:3-03:6	0.03 (0.67)	0.56 (0.37)	0.47 (0.20)	0.47 (0.20)	0.70 (0.48)	0.76 (0.37)	-0.46 (0.45)	0.50 (0.39)

Notes:
1. Pre-crisis period: 1990M1 - 1996M12. Crisis period: 1997M1 - 1998M12. Post-crisis period: 1999M1 - 2003M6.
2. Standard errors are in parentheses.
3. Tests on Korea before and during the crisis have been excluded due to incomplete forward exchange rate data.

Table 2.7 Unit Roots for CIDs

Levels	Lag[1]	ADF	PP Test[2]	Difference	Lag[1]	ADF	PP Test[2]
CIDHK	1	-4.25***	–5.72***	ΔCHK	1	-10.87***	–17.76***
CIDIN	0	-2.56	–2.31	ΔCIN	0	-12.91***	–13.29***
CIDKO	0	-0.92	–1.02	ΔCKO	0	-11.03***	–11.04***
CIDMA	0	-1.03	–1.09	ΔCMA	0	-13.66***	–13.44***
CIDPH	1	-1.99	–1.99	ΔCPH	0	-9.69***	–9.70***
CIDSI	0	-3.05**	–2.89**	ΔCSI	1	-10.39***	–13.09***
CIDTH	0	-1.75	–1.31	ΔCTH	0	-13.34***	–13.94***

Notes:

1. ADF test lag length is chosen using Schwarz information criterion (SIC). PP test truncated lag is chosen as 4
2. *, **, *** indicate significance at the10%, 5% and 1% respectively
3. CIDHK, CIDIN, CIDKO, CIDMA, CIDPH, CIDSI, CIDTH, CIDTH stand for covered interest differentials of Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand respectively

Table 2.8 Estimation of AR Model for CIDs in East Asia

Dependent Variables (y_t)	α_0	α_1	α_2	AIC	$\bar{R}^2$	D.W.	S.E. of regression
CHK	0.03* (0.05)	0.67* (0.08)	-	-1.33	0.64	2.00	0.12
CIN	1.38* (0.38)	0.86* (0.10)	-	-0.11	0.87	1.98	0.22
CKO	1.26* (0.76)	1.44* (0.17)	-	-3.45	0.98	2.03	0.04
CMA	0.41* (0.22)	0.98* (0.09)	-0.31* (0.01)	-1.54	0.78	2.00	0.25
CPH	0.92* (0.25)	0.64* (0.11)	-	-1.03	0.75	1.93	0.14
CSI	0.25* (0.16)	0.75* (0.09)	-	-0.37	0.78	2.01	0.19
CTH	-0.09* (0.49)	0.74* (0.10)	0.33* (0.12)	-0.38	0.92	2.01	0.19

Notes:

1. Dependent variables are differentials from covered interest parity (CID) and follows an AR model: $y_t = \alpha_0 + \alpha_1 y_{t-1} + \ldots + \alpha_p y_{t-h} + \xi_t$
2. Standard errors are reported in parenthesis; * denotes significance at 1 percent critical level
3. CHK, CIN, CKO, CMA, CPH, CSI, CTH stand for covered interest rate differential of Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand respectively.

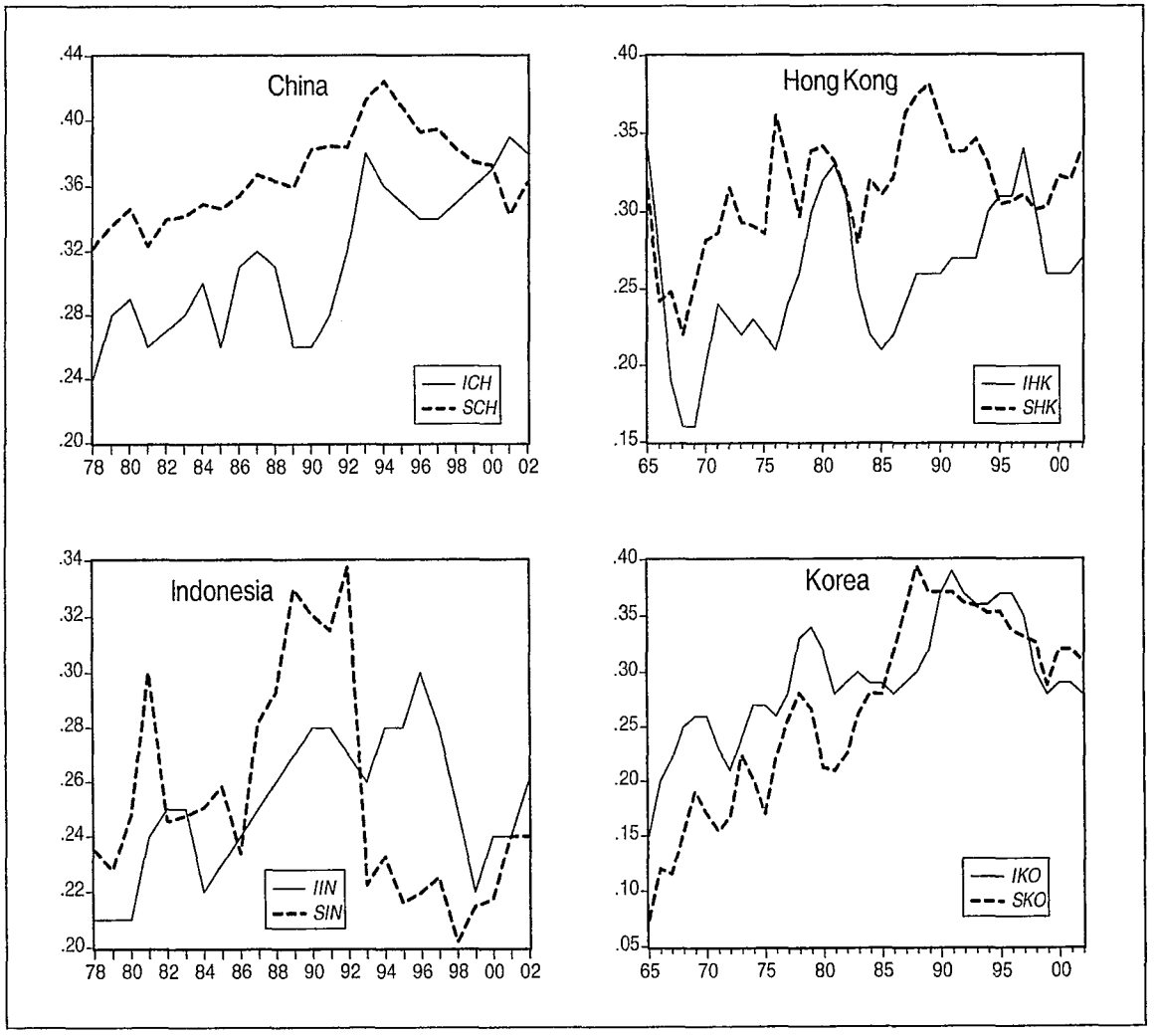
Table 2.9 Estimation Results of GARCH Model

Dependent Variables (σ^2_t)	Parameters β_0	β_1	β_2	$\bar{R}^2$	D.W.	S.E. of Regressions
Hong Kong	0.0015 (0.007)	0.94 (0.22)	0.023 (0.000)	0.02	0.39	0.21
Indonesia	0.05 (0.052)	1.12 (1.36)	-0.08 (1.37)	4.29	0.02	1.42
Korea	0.009 (0.001)	1.44 (0.109)	-0.47 (0.161)	0.95	0.08	0.56
Malaysia	0.013 (0.0002)	1.08 (0.067)	0.02 (0.07)	0.58	0.15	0.61
Philippines	0.002 (0.0006)	1.07 (0.06)	0.04 (1.88)	8.64	0.03	0.87
Singapore	0.001 (0.002)	0.62 (0.127)	0.48 (0.12)	0.35	0.17	0.49
Thailand	0.001 (0.003)	0.19 (0.03)	0.26 (0.03)	0.85	0.08	0.68

Notes:

1. The GARCH (1.1) model is $\sigma^2_t = \beta_0 + \beta_1\zeta^2_{t-1} + \beta_2\sigma^2_{t-1}$, and ζ^2_{t-1} is residual variance from Table 2.8; algorithm developed by Bollerslev (1986).
2. Standard errors are reported in parenthesis.

Figure 2.1 Saving and Investment Ratios



Note: The solid line represents investment ratio and the dotted line represents saving ratio.

Figure 2.1 Saving and Investment Ratios (continued)

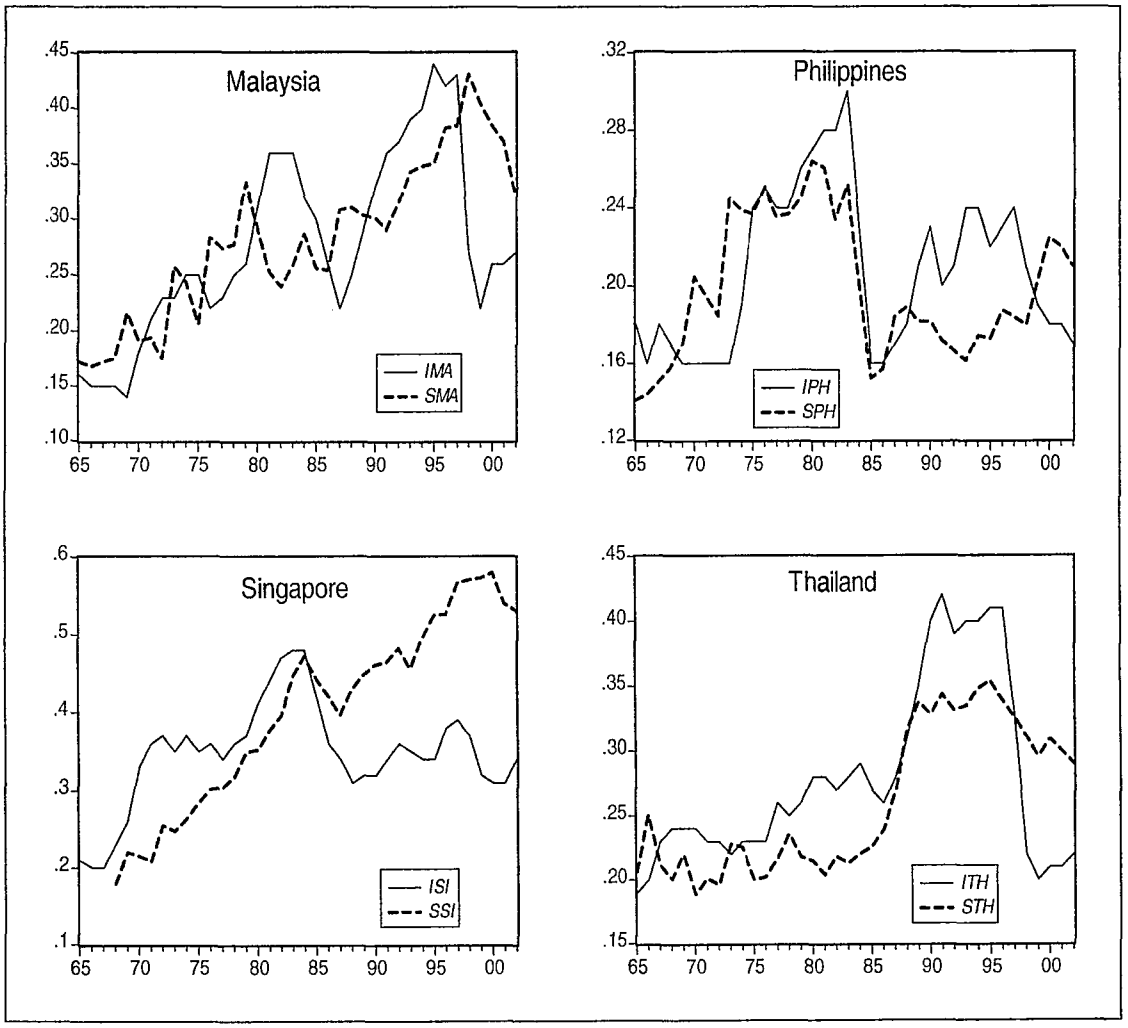
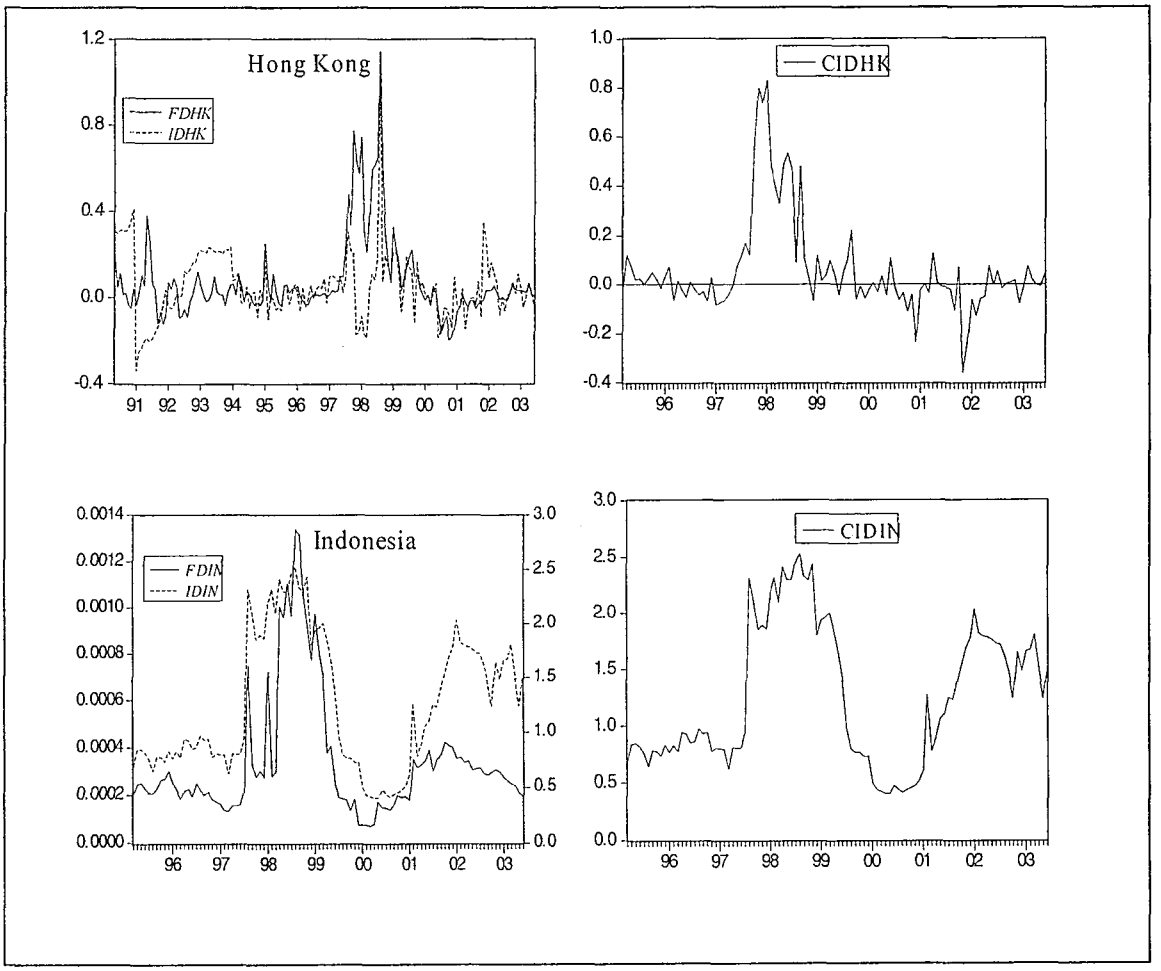
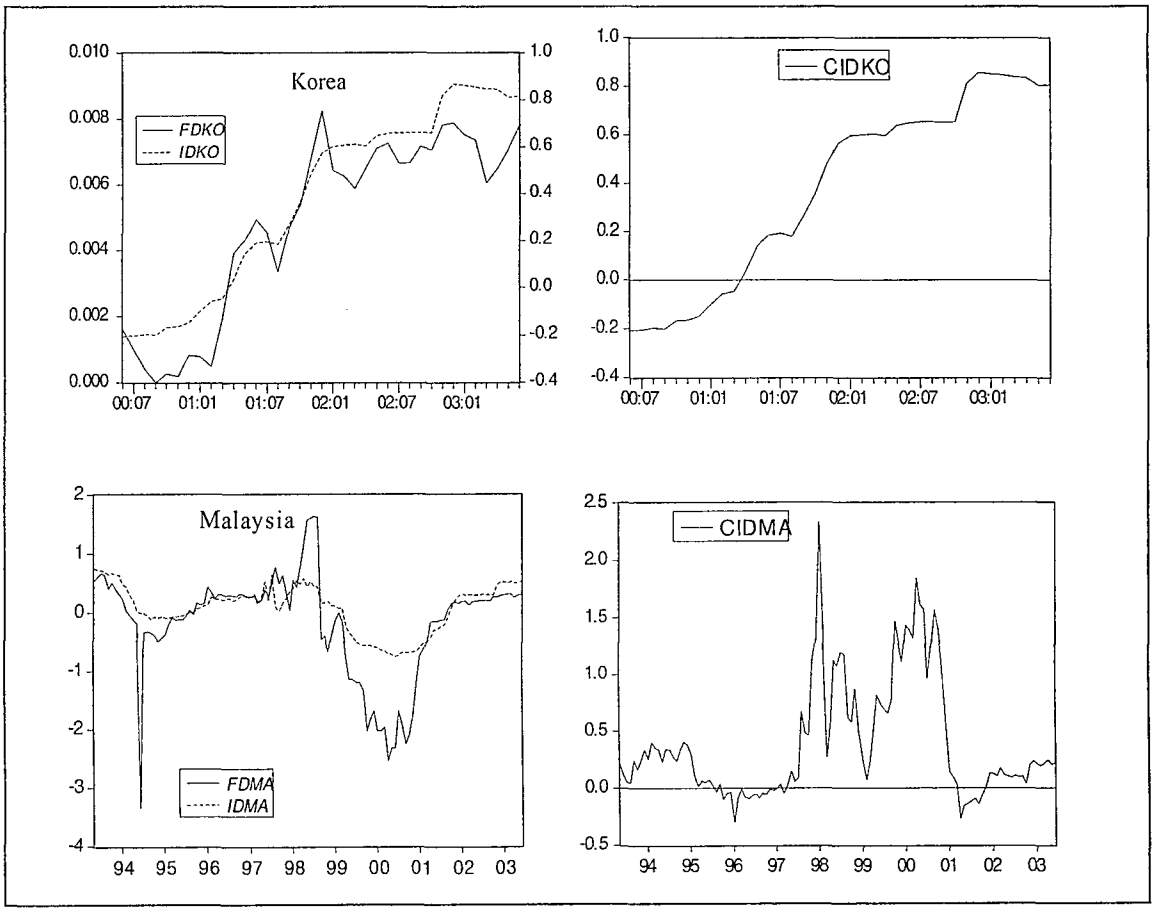


Figure 2.2 Covered Interest Differentials



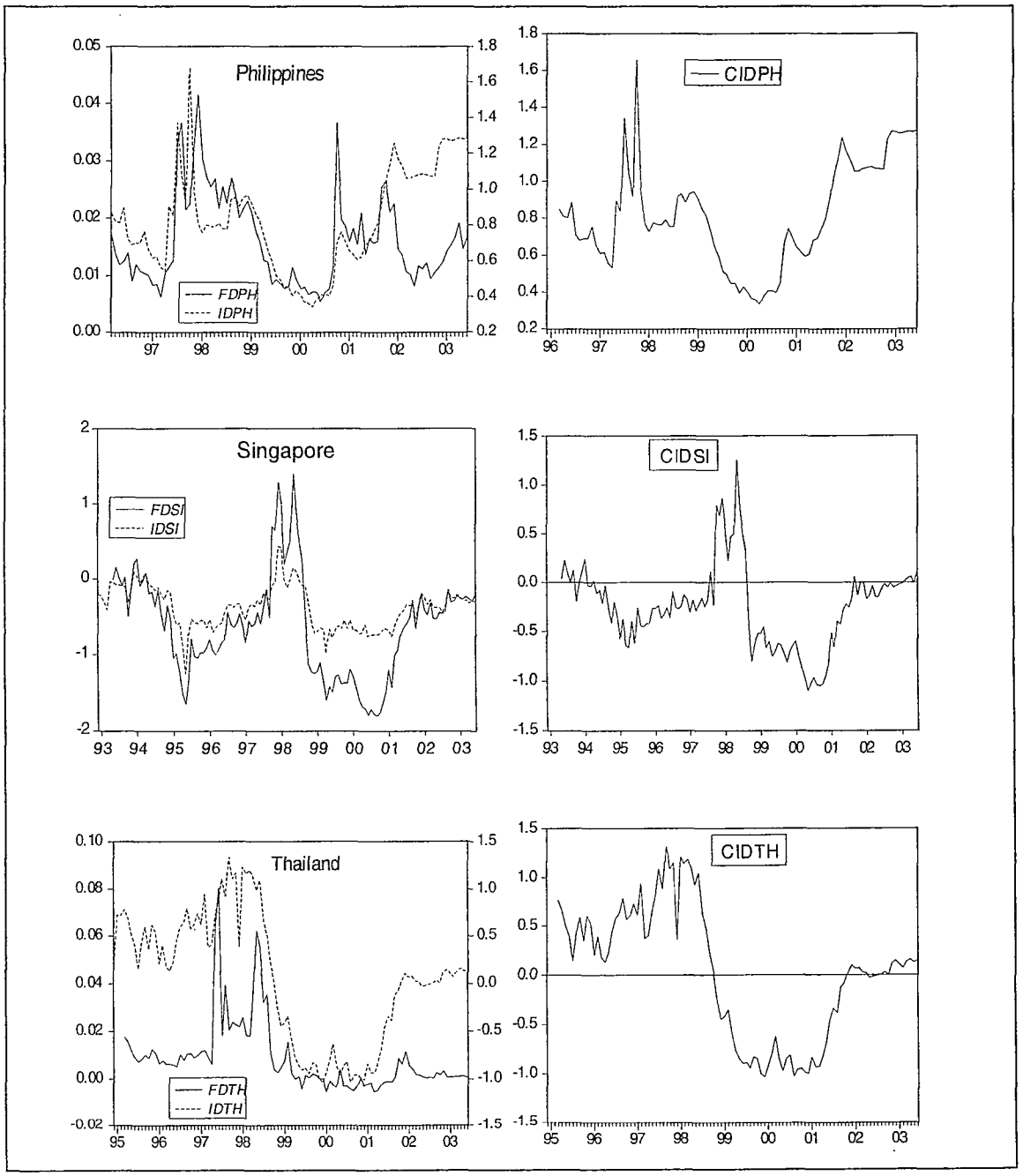
Note: FD represents forward discount and ID represents interest rate differential.

Figure 2.2 Covered Interest Differentials (continued)



Note: FD represents forward discount and ID represents interest rate differential.

Figure 2.2 Covered Interest Differentials (continued)



Note: FD represents forward discount and ID represents interest rate differential.

Figure 2.3 GARCH Conditional Variance (σ^2_t)

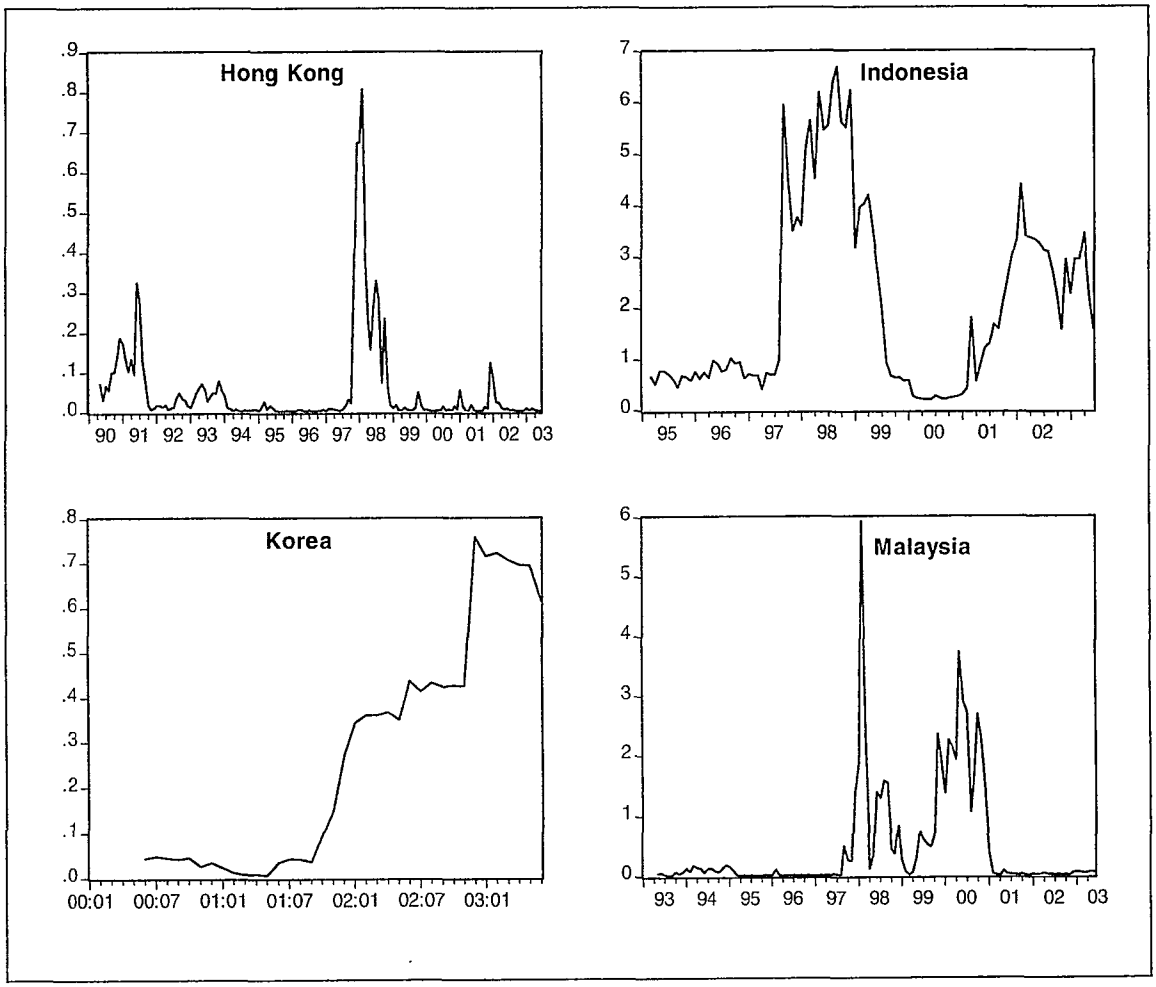
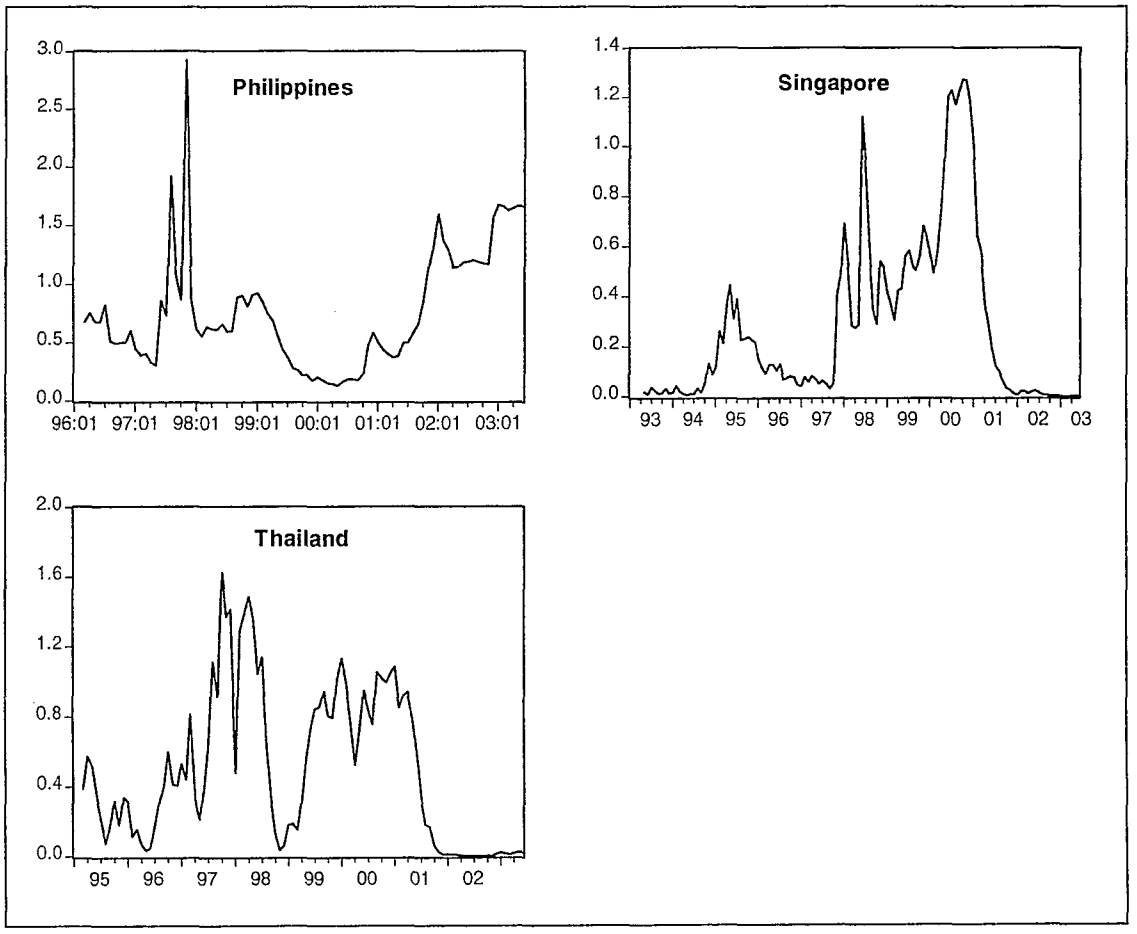


Figure 2.3 GARCH Conditional Variance (σ^2_t)-continued



Chapter 3

Is Currency Union a Feasible Option in East Asia?

–A Multivariate Structural VAR Approach

3.1 Introduction

Before the Asian financial crisis, few people would have seriously advocated for the monetary cooperation in East Asia. In the wake of the financial crisis in 1997 and the successful launch of Euro in 1999, however, the group of "ASEAN plus Three (APT),"[12] became aware of how important it is to keep currency stability in order to ensure sustained economic growth and social stability. The expanding bilateral currency swaps arrangements under the Chiang Mai Initiative (CMI)[13] is now widely perceived as a major step toward strengthening financial cooperation among East Asian countries. In the long run, these swap arrangements are envisioned to provide a basis for regional monetary integration including the creation of a currency bloc in East Asia with the possible formation of a single common currency, similar to the euro in European Monetary Union.

The objective of the chapter is thus to make an assessment of the feasibility and desirability of creating a currency union in East Asia based on the framework of optimum currency area (OCA) criteria, following their monetary cooperation in recent years. The theory of OCA lists many important criteria for adopting it in a region. They include the symmetry of shocks across countries, trade and financial integration, labor mobility and wage flexibility, and coordination of macroeconomic policy. It is generally accepted that a greater degree of financial integration implies

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[12] See Chapter 1 for description.

[13] In May 2000, East Asia's big three - Japan, China, and South Korea - along with the ten members of ASEAN met at the Asian Development Bank's annual meeting in Chiang Mai, Thailand and agreed to expand the existing network of swap arrangements designed to ward off future financial crisis. This plan is called the Chiang Mai Initiative (CMI).

that the regional economies are more likely to be similarly impacted by common external and symmetric shocks, which in turn are largely attributable to financial linkages.

According to Frankel (1999), whenever a country joins an OCA, it moves to the right side of Figure 3.1, which means that it must give up the option of changing or adjusting the price of its currency due to a fixing of the nominal exchange rate. Clearly, it loses effective instruments for stabilization, which could be used for correcting internal or external imbalances. It did not take long for East Asia countries to realize the impossibility of simultaneously attaining all three objectives mentioned in Figure 3.1. Accordingly, in the wake of the financial crisis in 1997, all of them abandoned one of the objectives. East Asian countries moved away from the soft dollar peg to either floating or hard peg. However, in an OCA, the loss of important macroeconomic policy instruments does not impose real and significant costs on the countries comprising the currency area.

Mundell (1961) suggests the correlation of shocks as one of the key criterion for a country deciding to join a currency union. He argues that countries facing positively correlated economic shocks will be better suited for a currency union because it would allow the use of union-wide policies to correct any imbalances. If the economic disturbances are similar across economies in East Asia, then the costs of forming a currency union is likely to be relatively minor in this region. On the other hand, if the underlying shocks are highly idiosyncratic, it is not ideal to adopt a common currency since the costs are likely to be very large.

The chapter contributes to the literature in the following ways. First, I concentrate on the nature and symmetry of various "structural" economic shocks across economies, rather than adopting a straightforward approach customarily used in the related studies for East Asia which is limited basically to the examination of cross-country observable macroeconomic variables, such as real output, CPI and interest rates (See Ito 1994, Taguchi 1994, Goto and Hamada 1994, Kwan 1998). Second, I advance a four-variable structural VAR model instead of earlier two-variable model proposed by Bayoumi and Eichengreen (1993) to identify structural external, supply, demand and monetary shocks from the estimation of a reduced-form VAR model of the economy. In order to evaluate the extent of symmetry of underlying shocks for East Asian export-oriented economic structure, it is crucial to go beyond the typical two-variable model (see Ling 2001), and incorporate an external global shock and a monetary shock into the SVAR model. Third, this chapter takes into account the effects of financial crises and economic contractions during 1997-98. Using up-to-date data can add to our understanding of the underlying forces in East Asia that drive the economic movement across borders before and after the 1997-98 financial crises. Nine "APT" members are selected as the object of analysis: Indonesia, Malaysia, the Philippines, Singapore, Thailand, China, Hong Kong, Korea and Japan.

The remainder of the chapter is organized as follows. Next section discusses the criteria of creating OCA. And then the data and methodology of multivariate SVAR are presented. Section 3 provides the empirical results. Finally, section 4

summarizes the main findings and policy implications.

3.2 Criteria of OCA

3.2.1 Wage Flexibility and Labor Market Mobility

Mundell argues that an OCA is a group of countries, in which labor mobility is relatively high within the group. If, for example, a negative asymmetric demand shock hits one of the members of an OCA, then labor will move from this country to other members, restoring employment to its original level. With high labor mobility, labor will move between members so as to equalize wages. This will lessen the need for an adjustment through the exchange rate. Hence migration is a channel through which adjustment to asymmetric shocks can take place. And flexible exchange rates between the members are no longer necessary in order to restore internal instability.

In order to evaluate the degree of labor mobility, it is necessary to investigate the labor migration figures for the region. Because of limitation of data, I calculate figures based on data provided by labor administration in each country. The degree of labor market integration in East Asia is not as large as that in North America or in Europe, it has been rapidly increasing in the 1990s, at least until the financial crisis. According to the International Labor Organization (1998), intra-Asian migration has increased from one million in the beginning of 1980s to 5.5 million in 1997. Major host countries include Japan, Hong Kong and Singapore while Indonesia and the Philippines are major labor–exporting countries.

Table 3.1 presents number and share of labor migrants from three main labor-exporting countries in ASEAN- Indonesia, Philippines and Thailand, to East Asia, Americas and Europe. The official labor migration figures, however, maybe understate the true magnitude of labor flows because strict immigration regulations have resulted in large numbers of illegal migrants. The table shows a rising trend of workers moving within the region. For example, the number of Indonesia emigrant workers to East Asia in 1997 had five times than that of two years ago. However, the rising number of migrating workers may reflect the high economic growth in East Asia in the 1990s rather than easier immigration policies. East Asia still does not enjoy free mobility of labor. Although there have been substantial movements of labor across the East Asia economies, most of these movements are illegal and of a temporary nature. Language, politics and culture remain strong barriers towards greater integration of the labor market in East Asia.

3.2.2 Openness and Level of Intra-regional Trade Linkages

The openness of countries can be measured by the relative size of their tradable and the non-tradable sectors. As the relative share of the tradable sector increases, the exchange rate becomes a less compelling adjustment tool since prices of tradable goods are being determined on markets at the level of the currency area, which reduces the ability of the exchange rate to alter relative prices.

Openness is defined as export and import (divided by two) in percent of nominal GDP. Table 3.2 presents openness of nine East Asia economies from 1991 to

2000. Hong Kong and Singapore are supposedly very open economies, which the value of total trade exceeds 100 percent of GDP. The Table also shows most East Asian economies have a rising trend of openness since 1991.

Table 3.3 presents intra-regional trade as a percentage of total trade for the East Asia and European economies. East Asia looks quite favorable for an OCA criterion of its substantial degree of regional trade integration. The share of intra-regional trade in total trade was about 51 percent on average in East Asia in 2000. Hong Kong has the highest intra-region trade share of 64 percent, while Japan had the lowest of 38 percent. On average, the intra-region trade in East Asia was somewhat lower than the corresponding value for the European countries which was 66 percent in 2000. One reason for the relatively lower intra-region trade for East Asia is that they trade relatively more with the US than Europe do. The extent of intra-regional trade has shown an upward trend in East Asia. It increased from 42 percent in 1980, to 48 percent in 1990 and 51 percent in 2000.

The more countries trade with each other, especially in a particular region, the more they will value bilateral or regional exchange rate stability. In other words, the greater is intra-regional trade, the greater are the benefits for countries in the region of forming a currency union. This is because in a single currency the potential disruptions to intra-regional trade brought about by the relative price fluctuations and disturbances in the bilateral exchange rate are reduced, if not eliminated. The reduction or elimination in transaction cost is clearly the most visible gain from a monetary union. Thus, economies such as Hong Kong, Singapore, Malaysia and

Indonesia will benefit most from participating in a currency union with major trading partner.

3.2.3 Coordination of Macroeconomic Policy

Any kind of monetary cooperative arrangement requires strong political commitment. Without political commitment, these regional cooperative efforts would not have materialized. Europe has a long tradition of integration thinking with roots that expand for several centuries (Bayoumi, Eichengreen and Mauro 2000). This seems to be lacking in East Asia that it cannot replicate what EU has done. However, the Asian financial crisis in 1997-98 and the successful launch of European single currency in 1999 have greatly increased awareness of the importance and necessity of East Asian financial cooperation. In May 2000, East Asia's big three - Japan, China, and South Korea - along with the ten members of ASEAN, at the Asian Development Bank's annual meeting in Chiang Mai, Thailand, agreed to expand the existing network of swap arrangements designed to head off future financial crisis. The plan, dubbed the "Chiang Mai Initiative (CMI)," called for a network of bilateral currency swap arrangements and the establishment of a system of pooled reserves that central banks could draw upon to buy time when their currencies come under speculative attack. Participating central banks will gain access to a part of their regional partners' foreign reserves. This will enable them to function as a regional lender of last resort. Therefore this plan is now widely perceived as a major step toward strengthening financial cooperation among East Asian countries.

Major countries present different position toward East Asian Monetary cooperation. Japan, South Korea, and ASEAN show very positive attitude whereas China appears cautious. As a result, Asian monetary cooperation should fulfill following prerequisites. East Asian countries should bury their long history of enmity, rivalry, and distrust and recover trust. In this regard, Japan and China should play a leading role in promoting regional monetary cooperation like Germany and France did in formulation of EU monetary integration.

3.3 Methodology and Data

3.3.1 Theoretical Framework of SVAR

One of the first empirical papers to have dealt with the issue of macroeconomics disturbances through an econometric estimate is by Bayoumi and Eichengreen (1993). In a seminal paper, they apply a variant of the VAR methodology proposed by Blanchard and Quan (1989) to assess the nature of macroeconomic disturbances among different groups of countries. Bayoumi and Eichengreen employ a structural VAR model premised on the AD-AS framework: in the long run, a demand shock has no effect on output, while a supply shock has effect on output and price level both in the long run and the short run. They measure the importance of asymmetric demand and supply shocks across members of the European Community (EC) and compare them with the ones prevailing in the United States. And they make a fundamental distinction between the correlations of observed economic variables

(like output and prices) and those of underlying structural shocks (demand and supply disturbances originating from shifts in technology, preferences, policy changes, etc.). They emphasize that from an analytical the underlying disturbances or the responses of the economy to these disturbances, as the symmetry of disturbances is relevant to the decision of whether to fix the exchange rate or adopt a common currency.

In a related study on monetary integration in various parts of the world, Bayoumi and Eichengreen (1994) applied similar way to distinguish between demand and supply shocks statistically and estimate the correlations of underlying shocks among the East Asian countries. They find supply shocks as symmetrical among (1) Hong Kong, Malaysia, Indonesia and Singapore and (2) Japan and Korea. As discussed earlier, countries are better candidates for a currency arrangement if their disturbances are correlated and size is small, they conclude that these two groups of countries are likely to form an OCA prior to other countries.

3.3.2 Methodology

In this section, I extend Bayoumi and Eichengreen's work by improving the methodology of assessing the symmetry of shocks in East Asia economies. The shocks can be global shocks or country-specific shocks. I consider there are one external global shock and three domestic shocks, affecting the economy - a domestic demand shock, a domestic supply shock and a monetary shock, instead of their two - shock model. To incorporate External global shock into the model can allow us to apply to East Asian specific export-oriented economic structure. Monetary shock can

be also important source of assessing how an East Asia economy responds to a change in its real effective exchange rate. Such an assessment is useful in considering an optimal exchange rate policy for East Asia, because a high sensitivity of income, prices to a change in the real effective exchange rate would mean the desirability of a policy of stabilizing the real exchange rate. A positive correlation of monetary shocks would strengthen the case for a monetary union.

First, let me begin with a structural moving average as the following:

$$X_t = A_0 \epsilon_t + A_1 \epsilon_{t-1} + A_2 \epsilon_{t-2} + \ldots$$

$$= \sum_{i=0}^{\infty} A_i \epsilon_{t-i} \qquad (3.1)$$

or in matrix form:

$$X_t = A(L) \epsilon_t \qquad (3.2)$$

Where $X_t = [\Delta y_t^*, \Delta y_t, \Delta e_t, \Delta p_t]'$, comprising of world real GDP (y*), domestic real GDP (y), real exchange rate (e) and domestic price level (p), which are in log-difference form. A_i is a 4x4 matrix that defines the impulse responses of endogenous variables to structural shocks. $\epsilon_t = [\epsilon_t^{s*}, \epsilon_t^{s}, \epsilon_t^{d}, \epsilon_t^{m}]'$, comprising of external world supply shock (ϵ_t^{s*}), domestic supply shock (ϵ_t^{s}), domestic demand shock (ϵ_t^{d}) and monetary shock (ϵ_t^{m}) respectively, which are assumed to be serially uncorrelated, and are orthonormal, *i.e.* have a variance-covariance matrix normalized to the identity matrix. Following the procedure proposed, I decompose world real GDP, domestic

real GDP, real exchange rate and inflation because they are combinations of four types of shock. Specifically, the system of equations can be written as following:

$$\Delta y_t^* = A_{11}(L)\,\epsilon_t^{s*} \tag{3.3}$$

$$\Delta y_t = A_{21}(L)\,\epsilon_t^{s*} + A_{22}(L)\,\epsilon_t^{s} + A_{23}(L)\,\epsilon_t^{d} + A_{24}(L)\,\epsilon_t^{m} \tag{3.4}$$

$$\Delta e_t = A_{31}(L)\,\epsilon_t^{s*} + A_{32}(L)\,\epsilon_t^{s} + A_{33}(L)\,\epsilon_t^{d} + A_{34}(L)\,\epsilon_t^{m} \tag{3.5}$$

$$\Delta p_t = A_{41}(L)\,\epsilon_t^{s*} + A_{42}(L)\,\epsilon_t^{s} + A_{43}(L)\,\epsilon_t^{d} + A_{44}(L)\,\epsilon_t^{m} \tag{3.6}$$

The terms of world output is considered to evolve exogenously as shown by (3.3). Domestic variables are affected by both external shock and three domestic shocks. Regarding the effects of domestic shocks on the domestic variables, I make the following assumptions:

The monetary shock ϵ_t^m is assumed not to have any long-run effect on real effective exchange rate, that is,

$$\sum_{i=0}^{\infty} A_{34\,i} = 0 \tag{3.7}$$

However, domestic supply shocks are allowed to have long-run effects on domestic output levels but neither money ϵ_t^m nor demand ϵ_t^d shock impose long-run effects on output. This would imply the following restrictions:

$$\sum_{i=0}^{\infty} A_{23\,i} = 0 \quad \text{and} \quad \sum_{i=0}^{\infty} A_{24\,i} = 0 \tag{3.8}$$

These restrictions can be rewritten in matrix form:

$$\begin{pmatrix} \Delta y_{t^*} \\ \Delta y_t \\ \Delta e_t \\ \Delta p_t \end{pmatrix} = \sum_{i=0}^{\infty} \begin{pmatrix} A_{11\,i} & 0 & 0 & 0 \\ A_{21\,i} & A_{22\,i} & 0 & 0 \\ A_{31\,i} & A_{32\,i} & A_{33\,i} & 0 \\ A_{41\,i} & A_{42\,i} & A_{43\,i} & A_{44\,i} \end{pmatrix} \begin{pmatrix} \epsilon^*_{s\,t-i} \\ \epsilon_{s\,t-i} \\ \epsilon_{d\,t-i} \\ \epsilon_{m\,t-i} \end{pmatrix} \tag{3.9}$$

Following Amisano and Giannini (1997), I do not directly recover estimates of the structural moving average model (3.1). Instead, I estimate a reduced–form VAR model for the observed variables. In the modified VAR model, the external variable follows an autoregressive (AR) process while the three domestic variables are modeled as functions of their own lags and lags of external variable.

$$\Delta y^*_t = \tau + \sum_{i=1}^{n} \Gamma_i \Delta y^*_{t-i} + \mu^1_t \tag{3.10}$$

$$X_t = \tau + \sum_{i=1}^{n} \Gamma_i X_{t-i} + \sum_{i=1}^{n} \Omega_i \Delta y^*_{t-i} + \mu_t \tag{3.11}$$

Where $X_t = [\Delta y_t, \Delta e_t, \Delta p_t]$ ', Γ_i and Ω_i are coefficient matrix. Here μ^1_t and $\mu_t = [\mu^2_t, \mu^3_t, \mu^4_t]$ ' are reduced (or observed) form residuals and they are a mixture of structural innovations, $\epsilon_t = [\epsilon_t^{s*}, \epsilon_t^{s}, \epsilon_t^{d}, \epsilon_t^{m}]$ '. From the comparison of Equations (3.3) and (3.10), it follows that $\mu^1_t = \epsilon_t^{s*}$. Given that the variables are stationary, in order to get the relationships between reduced form innovations for domestic variables and corresponding structural shocks, I can write (3.11) as a MA representation of the form:

$$X_t = \theta + \sum_{i=1}^{n} G_i \mu_{t-i} \tag{3.12}$$

Where

$$\theta = \left(I - \sum_{i=1}^{n} \Gamma_i \right)^{-1} \left(\tau + \sum_{i=1}^{n} \Omega_i \ \Delta y^*_{t-i} \right) \tag{3.13}$$

The G_i are called the impulse response and obtained as

$$\sum_{j=0}^{\infty} G^j L^j = \left(I - \sum_{i=1}^{n} \Gamma_i L^i \right)^{-1} \tag{3.14}$$

Recovering structural shocks involves a special decomposition of reduced–form innovations, which are obtained by the OLS estimation of (3.11). Since $G_0 \mu_t = A_0 \epsilon_t$ and $G_0 = I$, an identity matrix, it follows that $\mu_t = A_0 \epsilon_t$.

This represents a system of 16 equations. Following the assumption that the structural shocks $\epsilon_t = [\epsilon_t^{s*}, \epsilon_t^{s}, \epsilon_t^{d}, \epsilon_t^{m}]'$ are serially uncorrelated and orthonormal, I can get the flowing: $\Phi = E\mu_t\mu_t' = A_0A_0'$, where Φ is the variance of μ_t, providing 10 restrictions. Those above extra 6 restrictions together over the long–run effects imply that A(L) is unique Choleski lower triangular. Thus it is sufficient to identify the structural A_i matrix and the time series of structural shocks $\epsilon_t = [\epsilon_t^{s*}, \epsilon_t^{s}, \epsilon_t^{d}, \epsilon_t^{m}]'$ by using $\epsilon_t = A_0^{-1}\mu_t$. In other words, structural shocks can be recovered as linear combinations of reduced–form innovations. By comparing the composition of the shocks in East Asia economies to the major European Union countries, I can evaluate the feasibility of a common currency area in East Asia.

3.3.3 Data Description

Annual data are used for ASEAN Plus Three (APT), namely, five members of ASEAN (Thailand, Indonesia, Malaysia, Philippines, Singapore) and three Northeast Asian nations (China including Hong Kong, Japan and Korea). Nine European Monetary Union members are adopted as a benchmark.[14] The sample period covered 1970-2002 and the sub-period of 1979-1998 will be also checked. To do so will allow us to examine whether correlations of four structural shocks among East Asian countries have experienced the similar pattern as EMU countries before the launching of Euro.

The major data sources used in this study are drawn from *International Financial Statistics* CD-ROM by IMF, *World Development Indicators* CD-ROM by World Bank. For the empirical analysis that follows, real world GDP and real individual output were proxied with gross domestic product (GDP) converted to US dollar at constant prices of 1995, the price level by the consumer price index (CPI) which has been set 1995=100. Due to unavailability of Real exchange effective rates (REER) data for East Asian economies, the calculating method of real effective exchange rate is as follows.

I deflate each of the domestic *nominal* exchange rates versus other major currencies by the CPI of the corresponding economy to get the *real* exchange rate. Then I use a trade weighted geometric average of *real* exchange rate against the US dollar (with the weight of 0.4), the Japanese yen (0.3) and European Currency

[14] Austria, Belgium, Finland, France, Germany, Italy, Netherlands, Portugal, Spain.

Unit(0.3),[15] which represent the broad geographical composition of trade and FDI in East Asia. The real effective exchange rate is converted into a single index using 1995 = 100 (see Figure 1). Finally, all series were logarithmized.

The data of consumer price index in China are from *China Statistics Yearly Book* and *Asia Development Bank Statistics Division* while the ones in Hong Kong are from *Hong Kong Monetary Authority.*

3.3.4 Unit Root Test

Before implementing the VAR, it is necessary to check whether the variables are stationary. Table 3.7 presents the Phillips–Perron (PP) test, which corrects, in a non–parametric way, the possible presence of autocorrelation in the standard ADF test. The results of the unit tests conducted on the external variable and three endogenous variables reveal that the natural logs of real world output, real domestic output, real effective exchange rate and price level all contain a unit root in all economies, although the degree of the trend polynomial varied across economies and variables. The null hypothesis of one unit root was not rejected in time series. However, for the test of second unit roots, I can reject the null hypothesis that first difference of each time series has a unit root. Given these test results, I can conclude that these time series are integrated of order one, or $I(1)$.

[15] The value of euro was calculated by taking the weighted average of the currencies of all EU member countries, with the weights given by nominal GDP shares in 1990.

3.3.5 Correlation Analysis

I examine the correlations for real GDP growth, change of real exchange rate and inflation rate as the first approach to investigate the feasibility of creating an optimum currency area in East Asia. As a comparison, the sub-period 1979-98 for both East Asia and Europe Monetary Union are also examined. Table 3.4, 3.5 and 3.6 present the coefficient correlations of output growth, change of real exchange rate and inflation rate in East Asia and EMU respectively. Overall, the East Asia economies with the exception of China display similar patterns as Euro-zone countries, which are significantly correlated in most time series. Especially, there are more strongly correlated in a core of four ASEAN countries consisting of Indonesia, Malaysia, Singapore and Thailand which all exhibit high correlations in all three variables.

The above exploratory analysis of the three variables on the two blocks of economies serves the main purpose of giving an initial feasibility of OCA in East Asia. Noting that exchange rate and inflation convergence are two of the cornerstone pre-conditions for joining the European Monetary Union, and that East Asian economies perform the same level of economic correlations will be advantageous of pursuing a unified monetary policy.

3.4 Empirical Results

Now, I would attempt to estimate the underlying structural shocks and how the shocks impact the observed macroeconomic variables using a structural VAR. The number of lags in VAR system is uniformly set equal to two based on the Schwartz

Bayesian Information Criterion (SBI).

3.4.1 Correlation of Structural Shocks

A natural way of examining the relevant issue regarding the degree of symmetry of shocks among candidate countries to form a currency area is to compute the correlation of the identified disturbances. If the economic disturbances are similar across economies in East Asia, then the costs of forming a currency union is likely to be relatively minor in this region. On the other hand, if the underlying shocks are highly idiosyncratic, it is not ideal to adopt a common currency since the costs are likely to be very large. The correlations of four underlying structural shocks are examined. In assessing the symmetry and asymmetry of correlations of structural shocks, it is assumed that if the correlation is positive, the shocks are categorized as symmetric and if the correlation is negative or not statistically different from zero, the shocks are categorized as asymmetric. Second, I use the Kendall and Stuart (1973) correlation statistics to test whether the correlation is statistically significant at 5 percent level. The statistics (1/2) ln [(1+r)/ (1−r)] has a distribution that approaches normality with a mean of (1/2) ln [(1+ρ)/ (1−ρ)] and a variance of 1/ (N−3), where r is the estimated correlation coefficient, ρ is the null value of the correlation coefficient and N is the number of observations. I estimate the null hypothesis that correlation coefficient equal zero, that is, $\rho = 0$, so the mean is zero.

The results of correlations of the four identified shocks among the East Asian economies for 1970–2002 and 1979–98 are reported in Table 3.8-3.11. To assess

comparison, I apply the same methodology to estimate identified shocks during 1979–98 among nine European Monetary Union members.

3.4.1. a. Correlations of external disturbances

I start by discussing the external shocks. From Table 3.8, it is clear that all East Asian economies exhibit highly significant correlation of external shocks during both full period and sub-period. Part of reason is that most of East Asian economies have employed export-oriented growth strategy in the past thirty years, so an external shock could transmit quickly through the region. The external shocks across EMU are also highly correlated. The higher correlation of shocks from an external source, the greater is the benefit for countries in the region of forming a currency union. This is because in a single currency the potential disruptions brought about by external disturbances in the bilateral exchange rate are reduced, if not eliminated.

3.4.1. b. Correlations of supply disturbances

Table 3.9 displays the cross correlations of the supply disturbances for East Asia and EMU. I find that supply disturbances are correlated significantly only among Hong Kong, Korea and four ASEAN countries (Indonesia, Malaysia, Singapore and Thailand). It is interesting to note that the financial crisis *may* improve significant correlations of supply shocks in the region, because these six economies are those have been hit mostly by the financial crisis. There are no significant correlations among China, Japan and the Philippines with the rest of East Asia during

both sample periods. In contrast to the East Asia, the correlations among EMU show a more coherent picture in the sense that most of correlations are significantly positive. These results suggest that supply shocks are more symmetric in the EMU countries than that in East Asian economies. Since supply disturbances are more likely to be invariant to the management policies, it is more reliable as they tend to be permanent.

3.4.1.c. Correlations of demand disturbances

It is found from Table 3.10 that the correlations of transitory demand shocks in East Asia exhibit the similar pattern as supply shocks discussed above. The ASEAN countries all present highly significant correlation coefficients, with the exception of Singapore that only significantly correlate with Malaysia (0.62). This reflects close economic relationship among the ASEAN countries. On the other hand, China, Hong Kong and Japan show no significant correlation with the rest of economies. In particular, Japan shows negative correlation coefficient, which the shocks are categorized as asymmetric. The reason probably is that Japan is the major source of imports for the rest of East Asia, an increase in Japan's price level driven by its demand shocks would spur a negative impact on the demand of the other East Asian economies. As for the insignificant correlations of Hong Kong and Singapore with the rest of East Asia, these two financial centers within the region specialize in financial activities and services, making them more difficult for demand shocks to be transmitted via intra–regional trade.

The correlations of demand shocks do not have a coherent pattern in supply shocks of EMU countries. They are significantly correlated only within sub-group countries: Austria, Belgium, France, Germany and Netherlands. These five countries can be called as core countries since symmetric demand shocks prevail and the significance of correlations is high, reflecting their close macroeconomic policy coordination.

3.4.1. d. Correlations of monetary disturbances

The correlations of monetary shocks in Table 3.11 show less than supply and demand shocks. However, the cross correlations of monetary shocks among the core of four ASEAN countries consisting of Indonesia, Malaysia, Singapore and Thailand paint a coherent picture, as the overwhelming majority of correlations are positive significant. In addition, Japan shows significant correlations of monetary shocks with the ASEAN countries and Korea, because in the full sample, I cannot reject the null hypothesis that there is no correlation for Japan with these countries at 5 percent significant level. Japan has increased investment in ASEAN and Korea from the mid-1970s, and capital flows between Japan and these economies expanded substantially. The results would support that Japan is the leader in East Asian capital markets.

The symmetric pattern of monetary shocks in the EMU countries is found much less than that of East Asia. The monetary shocks are significantly correlated only within three groups: Belgium and France, Belgium and Portugal, Italy and France.

3.4.2 Size of Disturbances

It is crucial to investigate the size of shocks impacting each economy. That is because larger shocks translate into higher volatility of the endogenous variables, which in turn hampers the feasibility of a unified monetary policy. The size of shocks can be inferred from the impulse response coefficients, which trace out the effect of a one-unit shock in each of the four endogenous variables. In the case of external shocks, the impulse responses are assumed not to be much different between East Asia and EMU based the earlier analysis that all of East Asian economies exhibit very high correlation of external shocks during both full sample period and sub–period. For supply shocks, the average absolute value of the long-run (twenty-year horizon) effect of one unit shock on changes in real GDP is adopted as a measure of size since the supply disturbances have permanent effects on output. On the other hand, the effects of demand and monetary disturbances are supposed to be transitory. The size of demand and monetary shocks is proxied from average absolute value of short–run (two–year horizon) effect of one unit shock on changes in real effective exchange rates and CPI respectively.

Table 5 presents the estimated size of supply shocks, demand shocks and monetary shocks in East Asia and European Monetary Union. It is found that the average size of supply shocks in East Asia is smaller than that in EMU. However, the average size of demand shocks and monetary shocks are both larger in East Asia than in EMU. The average sizes of three underlying shocks in the sub–period are all

smaller than those in the full sample period, suggesting that recent economic developments in East Asia brought it more feasible to form a currency union.

3.4.3 Impulse Response Analysis

The impulse response functions serve the important purpose to assess how structural shocks influence the real effective exchange rate. If there are overall similar response patterns of real effective exchange rate across economies, the exchange rate becomes a less compelling adjustment tool; therefore, the cost of forming a currency union is small in East Asia. The impulse response analysis in Figure 3.3-3.5, which measures the dynamic response of a structural one-standard deviation of a particular shock (external shock, domestic supply shock, domestic demand shock)[16] on real effective exchange rate, employs a range of ten-year period for each East Asian economy under analysis.

What emerges from Figure 3.3 is that external shocks provoke a positive response of the real exchange rate for all East Asian economies except China in long-run, though the path and magnitude of responses somewhat varies. While the responses to external shocks in the case of China are different from that in other economies, this is expected with Chinese fixed exchange rate arrangement conducted throughout the estimation period: the authorities would choose to depreciate the exchange rate to increase the competitiveness over export-driven growth strategy.

Regarding the impact of structural supply shocks on the real exchange rate in

[16] Due to the imposed restriction of SVAR model that monetary shocks do not affect the long-run level of the real exchange rate, the plots are not presented in this section.

Figure 3.4, Hong Kong, Korea, Malaysia, Singapore and Thailand are associated with an immediate negative response and then recover somewhat over the longer time horizon. By contrast, in the case of China, Japan and the Philippines, the response of real exchange rate initially rise and then decline slowly afterwards. The ambiguous effects of supply shocks on the real exchange rates for different economies appear consistent with the theoretical macroeconomics model.[17]

Finally, similar patterns emerge from Figure 3.5 across East Asian economies when the impact of demand shocks is looked at closer. An immediate and significant positive response of real exchange rate in short-run can be observed, and then followed by a downward trend after several years towards zero in long-run. In most economies the short-run reaction overshoots the long-run impact and show similar pattern.

If the shape and magnitude of the responses of the real exchange rate to the structural shocks converge across economies, it will be ideal to land with a one-size-fits-all exchange rate policy through the region. In other words, a currency union in East Asia can only be effective if the response function of real exchange rate is similar. Figure 3.3-3.5 suggest that overall patterns of response are quite alike among Hong Kong, Indonesia, Korea, Malaysia, Singapore and Thailand, signaling that the cost for these economies of relinquishing control over the exchange rate should be, *ceteris paribus*, relatively small.

[17] The short run impact on the real exchange rates is ambiguous, but (see Buiter 1995)

3.5 Concluding Remarks

The objective of this chapter is to examine the feasibility of creating a currency union in East Asia following the monetary cooperation after the 1997-98 financial crisis. A four-variable Structural VAR model is developed to identify various types of shocks based on "shocking" aspect of optimum currency area theory. Our results do not encourage strongly the formation of a currency union in whole region. However, it is recommended that Hong Kong, Indonesia, Korea, Malaysia, Singapore and Thailand may join the currency union first since these economies present (a) significant and positive correlations of underlying disturbances, (b) small size of underlying disturbances and (c) similar impulse response function of real exchange rate.

Monetary integration in East Asia is expected to be an evolutionary process, beginning with a system of policy dialogues and review, while maintaining a variety of exchange rate systems in the region, and then gradually moving onto deeper stages of creating a common currency union.[18]

[18] See Chapter 4 for further details.

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Table 3.1 Labor Migration in East Asia

	Number (1000)	Share (%)	Number (1000)	Share (%)
From Indonesia to (year)	(1995)		(1997)	
East Asia	68.4	56.7	375.4	74.6
Americas	3.5	2.9	7235	9937
Europe	0.0	0.1	0.6	0.1
From Philippines to (year)	(1990)		(1998)	
East Asia	90.8	27.1	221.3	39.3
Americas	9.6	2.9	8.2	1.5
Europe	6.9	2.0	15.7	2.8
From Thailand to (year)	(1993)		(1996)	
East Asia	94.1	82.4	148.8	80.3
Americas and Europe	3.1	2.7	14.2	7.6

Source: Various web sites of government labor department

Table 3.2 Openness in East Asia 1991-2000

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Singapore	146.10	138.12	138.06	142.36	145.45	140.40	136.06	129.44	132.81	134.17
Hong Kong	135.36	140.31	123.59	138.95	151.62	142.84	134.23	128.76	130.69	142.66
Malaysia	79.66	75.31	78.97	89.96	96.06	90.89	92.74	103.46	108.95	115.72
Philippines	31.09	31.58	35.59	36.98	40.27	44.90	54.13	55.20	50.63	52.93
Thailand	39.20	38.98	39.69	41.18	45.08	42.23	47.10	50.78	52.15	62.26
Korea	28.86	28.40	27.52	28.40	30.94	31.56	35.24	43.00	38.91	43.61
Indonesia	27.19	28.24	25.26	25.94	26.98	26.13	28.00	28.10	31.18	34.62
China	27.10	27.20	23.91	21.55	20.19	18.05	18.45	17.24	18.70	18.71
Japan	9.37	8.95	8.16	8.22	8.66	9.67	10.47	10.13	9.55	9.68

Note: Openness is defined as export and import (divided by two) in percent of nominal GDP

Table 3.3 Intra-trade intensity in East Asia and Europe

	Country	1980	1990	2000
East Asia	China	42.4	58.9	48.7
	Hong Kong	46.7	60.4	64.1
	Indonesia	62.6	56.8	54.4
	Japan	23.8	28.0	38.1
	Korea	32.7	34.2	42.2
	Malaysia	49.2	55.1	56.1
	Philippines	37.4	40.0	46.5
	Singapore	49.4	50.7	57.5
	Thailand	40.1	47.5	54.2
	Average	41.9	47.5	51.3
Europe	Austria	69.8	75.6	71.0
	Belgium	74.9	80.4	72.5
	Denmark	74.4	75.5	74.8
	Finland	57.4	66.6	61.7
	France	57.8	67.1	66.7
	Germany	63.9	67.4	59.1
	Italy	56.1	67.3	59.1
	Netherlands	70.5	77.0	67.3
	Portugal	58.7	78.5	78.6
	Spain	43.2	68.2	67.8
	Average	64.4	72.4	66.4

Source: IMF, Direction of Trade Statistics

Notes: The numbers are percentage of total trade; Intra–region trade is measured by the share of an economy's trade with the rest of the economies that belong the same region in total trade.

Table 3.4 Correlation of GDP Growth for East Asia and EMU

Panel A		CH	HK	IN	JP	KO	MA	PH	SI	TH
East Asia	China	1.00								
1970-2001	Hong Kong	-0.14	1.00							
	Indonesia	-0.01	0.52	1.00						
	Japan	-0.11	0.54	0.44	1.00					
	Korea	0.01	0.51	0.56	0.39	1.00				
	Malaysia	-0.13	0.58	0.75	0.38	0.52	1.00			
	Philippines	-0.53	0.38	0.28	0.28	0.22	0.43	1.00		
	Singapore	-0.05	0.55	0.54	0.45	0.33	0.78	0.45	1.00	
	Thailand	0.05	0.48	0.78	0.51	0.70	0.71	0.30	0.50	1.00
Panel B	China	1.00								
East Asia	Hong Kong	0.13	1.00							
1979-1998	Indonesia	0.01	0.61	1.00						
	Japan	-0.26	0.38	0.45	1.00					
	Korea	0.19	0.48	0.64	0.51	1.00				
	Malaysia	0.02	0.47	0.83	0.33	0.49	1.00			
	Philippines	-0.51	0.26	0.24	0.16	0.09	0.44	1.00		
	Singapore	-0.04	0.51	0.61	0.20	0.31	0.84	0.56	1.00	
	Thailand	0.05	0.45	0.81	0.58	0.72	0.75	0.27	0.59	1.00
Panel C		AU	BE	FI	FR	GE	IT	NE	PO	SP
Europe	Austria	1.00								
1979-1998	Belgium	0.51	1.00							
	Finland	0.04	0.49	1.00						
	France	0.52	0.59	0.69	1.00					
	Germany	0.57	0.10	-0.56	-0.08	1.00				
	Italy	0.56	0.50	0.61	0.94	0.04	1.00			
	Netherlands	0.32	0.40	0.09	0.003	0.18	-0.03	1.00		
	Portugal	0.37	0.49	0.33	0.64	0.12	0.63	-0.18	1.00	
	Spain	0.60	0.64	0.53	0.87	0.14	0.86	-0.11	0.84	1.00

Notes: GDP growth rates denote the percentage change over corresponding previous year; Painted figures denote positive correlation at the 5 percent level; Significance levels are assessed using Fisher's variance–stabilizing transformation. See the text for more details.

Table 3.5 Correlation of Change of REER for East Asia and EMU

Panel A		CH	HK	IN	JP	KO	MA	PH	SI	TH
East Asia	China	1.00								
1970-2001	Hong Kong	0.40	1.00							
	Indonesia	0.07	0.09	1.00						
	Japan	-0.49	-0.47	0.03	1.00					
	Korea	0.17	0.04	0.50	-0.17	1.00				
	Malaysia	0.33	0.14	0.57	-0.09	0.25	1.00			
	Philippines	0.21	0.33	0.64	-0.32	0.52	0.55	1.00		
	Singapore	0.37	0.43	0.33	-0.25	0.07	0.69	0.41	1.00	
	Thailand	0.28	0.21	0.65	-0.19	0.52	0.62	0.61	0.53	1.00
Panel B	China	1.00								
East Asia	Hong Kong	0.53	1.00							
1979-1998	Indonesia	0.11	0.47	1.00						
	Japan	-0.64	-0.49	-0.15	1.00					
	Korea	0.34	0.24	0.47	-0.25	1.00				
	Malaysia	0.27	0.23	0.66	-0.27	0.44	1.00			
	Philippines	0.36	0.53	0.67	-0.46	0.50	0.62	1.00		
	Singapore	0.52	0.59	0.62	-0.55	0.47	0.65	0.55	1.00	
	Thailand	0.44	0.31	0.61	-0.28	0.55	0.66	0.47	0.56	1.00
Panel C		AU	BE	FI	FR	GE	IT	NE	PO	SP
Europe	Austria	1.00								
1979-1998	Belgium	0.66	1.00							
	Finland	-0.02	0.02	1.00						
	France	0.69	0.88	-0.05	1.00					
	Germany	0.89	0.61	-0.21	0.67	1.00				
	Italy	-0.21	0.02	0.21	-0.05	-0.15	1.00			
	Netherlands	0.90	0.57	-0.06	0.66	0.93	-0.06	1.00		
	Portugal	-0.12	0.06	0.02	0.13	-0.16	-0.01	-0.14	1.00	
	Spain	0.22	0.34	0.43	0.40	0.09	0.45	0.21	0.48	1.00

Notes: Change of Real Effective Exchange Rate denote the percentage change over corresponding previous year; Painted figures denote positive correlation at the 5 percent level; Significance levels are assessed using Fisher's variance–stabilizing transformation. See the text for more details.

Table 3.6 Correlation of Inflation for East Asia and EMU

Panel A		CH	HK	IN	JP	KO	MA	PH	SI	TH
East Asia	China	1.00								
1970-2001	Hong Kong	0.35	1.00							
	Indonesia	-0.22	-0.15	1.00						
	Japan	-0.25	-0.04	0.46	1.00					
	Korea	-0.16	0.22	0.28	0.69	1.00				
	Malaysia	-0.18	0.18	0.59	0.77	0.53	1.00			
	Philippines	-0.07	0.17	0.20	0.44	0.24	0.42	1.00		
	Singapore	-0.12	0.15	0.44	0.76	0.42	0.90	0.45	1.00	
	Thailand	-0.10	0.32	0.55	0.73	0.67	0.87	0.33	0.86	1.00
Panel B	China	1.00								
East Asia	Hong Kong	-0.005	1.00							
1979-1998	Indonesia	-0.18	-0.20	1.00						
	Japan	-0.19	0.75	0.03	1.00					
	Korea	-0.14	0.70	0.22	0.86	1.00				
	Malaysia	-0.23	0.63	0.33	0.59	0.69	1.00			
	Philippines	-0.12	0.21	0.003	0.36	0.13	0.14	1.00		
	Singapore	-0.08	0.86	-0.06	0.86	0.87	0.77	0.28	1.00	
	Thailand	-0.17	0.62	0.33	0.79	0.95	0.68	0.02	0.79	1.00
Panel C		AU	BE	FI	FR	GE	IT	NE	PO	SP
Europe	Austria	1.00								
1979-1998	Belgium	0.66	1.00							
	Finland	-0.02	0.02	1.00						
	France	0.69	0.87	-0.05	1.00					
	Germany	0.89	0.61	-0.21	0.68	1.00				
	Italy	-0.21	0.02	0.21	-0.04	-0.15	1.00			
	Netherlands	0.90	0.57	-0.06	0.66	0.93	-0.06	1.00		
	Portugal	-0.12	0.06	0.02	0.14	-0.16	-0.009	-0.14	1.00	
	Spain	0.22	0.34	0.43	0.40	0.09	0.45	0.21	0.48	1.00

Notes: Inflation rates denote the percentage change over corresponding previous year; Painted figures denote positive correlation at the 5 percent level; Significance levels are assessed using Fisher's variance–stabilizing transformation. See the text for more details.

Table 3.7 Phillips-Perron Test for Unit Root

	CPI		GDP		REER	
	Levels	*Difference*	*Levels*	*Difference*	*Levels*	*Difference*
China	0.22	-3.71*	1.32	-3.69*	-1.10	-3.53**
Hong Kong	-0.63	-3.76*	-2.81	-4.37*	-1.62	-3.93*
Indonesia	-0.86	-4.06*	-2.28	-3.78*	-0.56	-5.85*
Japan	-1.89	-6.99*	-3.32**	-3.06**	-1.58	-4.85*
Korea	-2.25	-3.57**	-1.54	-5.08*	-2.14	-6.34*
Malaysia	-3.22**	-3.28**	-1.13	-4.32*	-0.81	-3.62**
Philippines	-2.69	-4.70*	-1.86	-2.90**	-1.36	-6.55*
Singapore	-2.93	-9.47*	-1.74	-2.72**	-2.42	-2.75**
Thailand	-2.02	-3.24**	-1.17	-2.96**	-0.49	-4.81*

Notes:
1. Bandwidth is truncated by Newey-west method.
2. *, **, *** indicate significance at the1%, 5% and 10% respectively

Table 3.8 Correlation of External Shocks

Panel A		CH	HK	IN	JP	KO	MA	PH	SI	TH
East Asia	China	1.00								
1970-2002	Hong Kong	0.84	1.00							
	Indonesia	0.81	0.75	1.00						
	Japan	0.78	0.73	0.81	1.00					
	Korea	0.94	0.88	0.83	0.75	1.00				
	Malaysia	0.68	0.67	0.83	0.66	0.69	1.00			
	Philippines	0.81	0.79	0.78	0.74	0.86	0.75	1.00		
	Singapore	0.54	0.53	0.70	0.63	0.51	0.77	0.56	1.00	
	Thailand	0.68	0.74	0.77	0.66	0.72	0.75	0.63	0.77	1.00
Panel B	China	1.00								
East Asia	Hong Kong	0.71	1.00							
1979-1998	Indonesia	0.72	0.91	1.00						
	Japan	0.56	0.82	0.78	1.00					
	Korea	0.69	0.85	0.82	0.71	1.00				
	Malaysia	0.72	0.73	0.84	0.59	0.76	1.00			
	Philippines	0.62	0.95	0.90	0.76	0.76	0.63	1.00		
	Singapore	0.59	0.71	0.78	0.75	0.74	0.78	0.71	1.00	
	Thailand	0.79	0.76	0.79	0.72	0.83	0.74	0.67	0.73	1.00
Panel C		AU	BE	FI	FR	GE	IT	NE	PO	SP
Europe	Austria	1.00								
1979-1998	Belgium	0.95	1.00							
	Finland	0.91	0.84	1.00						
	France	0.93	0.96	0.84	1.00					
	Germany	0.99	0.94	0.88	0.92	1.00				
	Italy	0.77	0.83	0.65	0.77	0.74	1.00			
	Netherlands	0.94	0.95	0.81	0.91	0.93	0.79	1.00		
	Portugal	0.82	0.71	0.79	0.68	0.85	0.57	0.67	1.00	
	Spain	0.86	0.87	0.86	0.78	0.86	0.74	0.84	0.80	1.00

Note: Painted figures denote positive correlation at the 5 percent level

Table 3.9 Correlation of Supply Shocks

Panel A		CH	HK	IN	JP	KO	MA	PH	SI	TH
East Asia	China	1.00								
1970-2002	Hong Kong	–0.10	1.00							
	Indonesia	0.09	0.54	1.00						
	Japan	0.22	0.02	0.18	1.00					
	Korea	0.05	0.54	0.69	0.34	1.00				
	Malaysia	–0.05	0.56	0.71	0.05	0.63	1.00			
	Philippines	–0.31	0.25	0.19	–0.10	0.23	0.14	1.00		
	Singapore	0.03	0.50	0.54	0.05	0.29	0.78	–0.10	1.00	
	Thailand	0.24	0.35	0.66	0.37	0.64	0.66	0.28	0.43	1.00
Panel B	China	1.00								
East Asia	Hong Kong	-0.14	1.00							
1979-1998	Indonesia	-0.01	0.63	1.00						
	Japan	0.37	0.21	0.19	1.00					
	Korea	-0.04	0.45	0.60	0.43	1.00				
	Malaysia	0.07	0.64	0.74	0.29	0.67	1.00			
	Philippines	0.03	0.05	0.13	–0.19	0.12	0.29	1.00		
	Singapore	-0.17	0.51	0.55	0.26	0.49	0.81	–0.06	1.00	
	Thailand	0.26	0.41	0.42	0.01	0.27	0.48	–0.08	0.36	1.00
Panel C		AU	BE	FI	FR	GE	IT	NE	PO	SP
Europe	Austria	1.00								
1979-1998	Belgium	0.86	1.00							
	Finland	0.71	0.52	1.00						
	France	0.81	0.94	0.38	1.00					
	Germany	0.91	0.72	0.77	0.65	1.00				
	Italy	0.71	0.74	0.53	0.80	0.66	1.00			
	Netherlands	0.96	0.87	0.59	0.83	0.86	0.66	1.00		
	Portugal	0.60	0.58	0.45	0.49	0.68	0.43	0.63	1.00	
	Spain	0.81	0.80	0.59	0.84	0.76	0.87	0.78	0.60	1.00

Note: Painted figures denote positive correlation at the 5 percent level.

Table 3.10 Correlation of Demand Shocks

Panel A		CH	HK	IN	JP	KO	MA	PH	SI	TH
East Asia	China	1.00								
1970-2002	Hong Kong	0.39	1.00							
	Indonesia	0.09	0.25	1.00						
	Japan	–0.33	–0.34	0.09	1.00					
	Korea	0.28	0.10	0.53	–0.07	1.00				
	Malaysia	0.32	0.03	0.64	–0.26	0.43	1.00			
	Philippines	0.08	0.13	0.64	–0.20	0.50	0.56	1.00		
	Singapore	0.10	0.03	0.36	–0.22	0.15	0.62	0.35	1.00	
	Thailand	0.24	0.09	0.61	–0.21	0.60	0.68	0.58	0.44	1.00
Panel B	China	1.00								
East Asia	Hong Kong	0.13	1.00							
1979-1998	Indonesia	–0.04	0.35	1.00						
	Japan	–0.36	–0.35	0.14	1.00					
	Korea	0.18	0.003	0.31	–0.02	1.00				
	Malaysia	–0.19	0.20	0.64	–0.07	0.34	1.00			
	Philippines	0.07	0.33	0.54	–0.18	0.43	0.59	1.00		
	Singapore	0.08	0.31	0.19	–0.50	0.33	0.54	0.26	1.00	
	Thailand	0.37	0.13	0.37	–0.15	0.05	0.25	0.28	0.26	1.00
Panel C		AU	BE	FI	FR	GE	IT	NE	PO	SP
Europe	Austria	1.00								
1979-1998	Belgium	0.62	1.00							
	Finland	0.15	0.06	1.00						
	France	0.59	0.87	–0.28	1.00					
	Germany	0.83	0.53	0.32	0.49	1.00				
	Italy	–0.22	–0.15	0.26	–0.07	0.06	1.00			
	Netherlands	0.90	0.56	0.05	0.56	0.79	0.003	1.00		
	Portugal	–0.09	0.04	0.45	–0.16	–0.17	0.26	–0.01	1.00	
	Spain	0.12	0.07	0.32	0.14	0.12	0.64	0.24	0.36	1.00

Note: Painted figures denote positive correlation at the 5 percent level.

Table 3.11 Correlation of Monetary Shocks

Panel A		CH	HK	IN	JP	KO	MA	PH	SI	TH
East Asia	China	1.00								
1970-2002	Hong Kong	0.13	1.00							
	Indonesia	0.11	0.07	1.00						
	Japan	0.08	–0.08	0.25	1.00					
	Korea	0.01	–0.20	0.20	0.39	1.00				
	Malaysia	–0.02	–0.07	0.38	0.59	0.30	1.00			
	Philippines	0.07	–0.03	0.11	0.43	0.27	0.29	1.00		
	Singapore	0.02	0.13	0.19	0.66	0.11	0.72	0.16	1.00	
	Thailand	0.13	0.27	0.38	0.63	0.36	0.67	0.11	0.63	1.00
Panel B	China	1.00								
East Asia	Hong Kong	0.22	1.00							
1979-1998	Indonesia	0.13	–0.52	1.00						
	Japan	0.21	0.35	–0.24	1.00					
	Korea	0.23	0.14	0.13	0.53	1.00				
	Malaysia	0.17	–0.43	0.53	0.12	0.46	1.00			
	Philippines	0.07	0.08	–0.28	0.59	0.36	0.39	1.00		
	Singapore	0.08	0.31	–0.21	0.72	0.49	0.35	0.69	1.00	
	Thailand	0.19	0.04	–0.10	0.42	0.68	0.14	0.17	0.21	1.00
Panel C		AU	BE	FI	FR	GE	IT	NE	PO	SP
Europe	Austria	1.00								
1979-1998	Belgium	–0.10	1.00							
	Finland	–0.14	0.15	1.00						
	France	–0.10	0.88	0.24	1.00					
	Germany	0.002	0.11	0.33	–0.14	1.00				
	Italy	–0.47	0.39	0.36	0.57	–0.17	1.00			
	Netherlands	0.41	0.002	–0.39	0.05	–0.54	–0.21	1.00		
	Portugal	0.07	0.54	0.39	0.31	0.31	0.28	–0.06	1.00	
	Spain	–0.008	–0.04	–0.22	0.09	–0.36	0.27	–0.16	–0.03	1.00

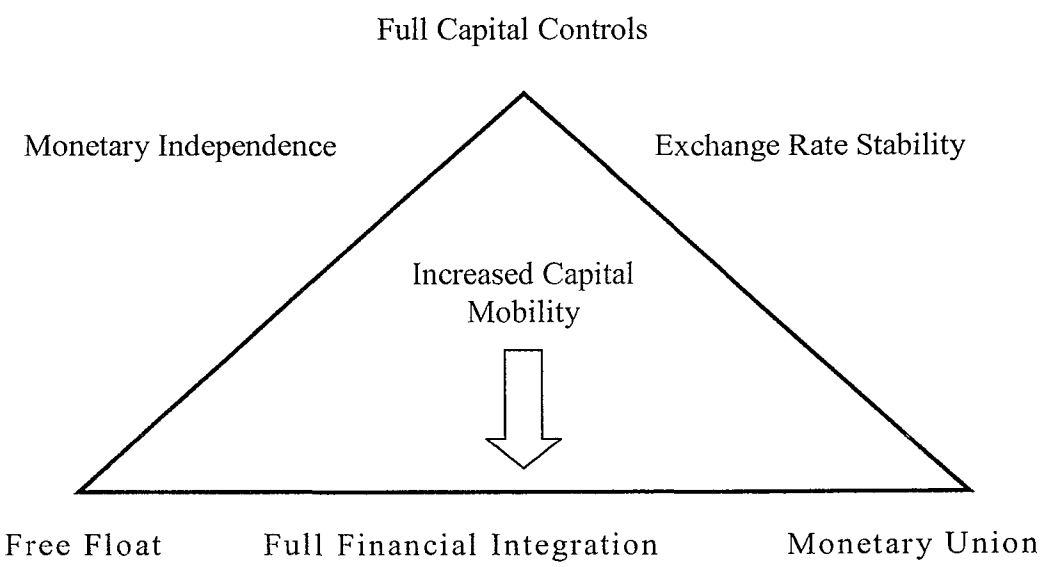
Note: Painted figures denote positive correlation at the 5 percent level.

Table 3.12 The Size of Shocks in East Asia and EMU

	Country	Supply Shocks	Demand Shocks	Monetary Shocks
Panel A	China	0.021	0.055	0.032
East Asia	Hong Kong	0.028	0.036	0.015
1970-2002	Indonesia	0.023	0.088	0.050
	Japan	0.013	0.056	0.013
	Korea	0.021	0.046	0.030
	Malaysia	0.022	0.046	0.015
	Philippines	0.018	0.062	0.040
	Singapore	0.019	0.024	0.019
	Thailand	0.021	0.038	0.019
	Average	**0.021**	**0.050**	**0.026**
Panel B	China	0.016	0.060	0.038
East Asia	Hong Kong	0.021	0.019	0.011
1979-1998	Indonesia	0.026	0.078	0.044
	Japan	0.007	0.061	0.005
	Korea	0.023	0.044	0.013
	Malaysia	0.022	0.033	0.008
	Philippines	0.009	0.058	0.025
	Singapore	0.014	0.016	0.008
	Thailand	0.015	0.027	0.011
	Average	**0.017**	**0.044**	**0.018**
Panel C	Austria	0.073	0.014	0.004
EMU	Belgium	0.064	0.016	0.005
1979–1998	Finland	0.073	0.035	0.006
	France	0.058	0.014	0.003
	Germany	0.061	0.019	0.004
	Italy	0.063	0.032	0.006
	Netherlands	0.064	0.021	0.003
	Portugal	0.050	0.017	0.010
	Spain	0.074	0.029	0.005
	Average	**0.064**	**0.022**	**0.005**

Figure 3.1

The Impossible Trinity



Source: Frankel (1999)

Figure 3.2 Real Effective Exchange Rates in East Asia (1970–2002)

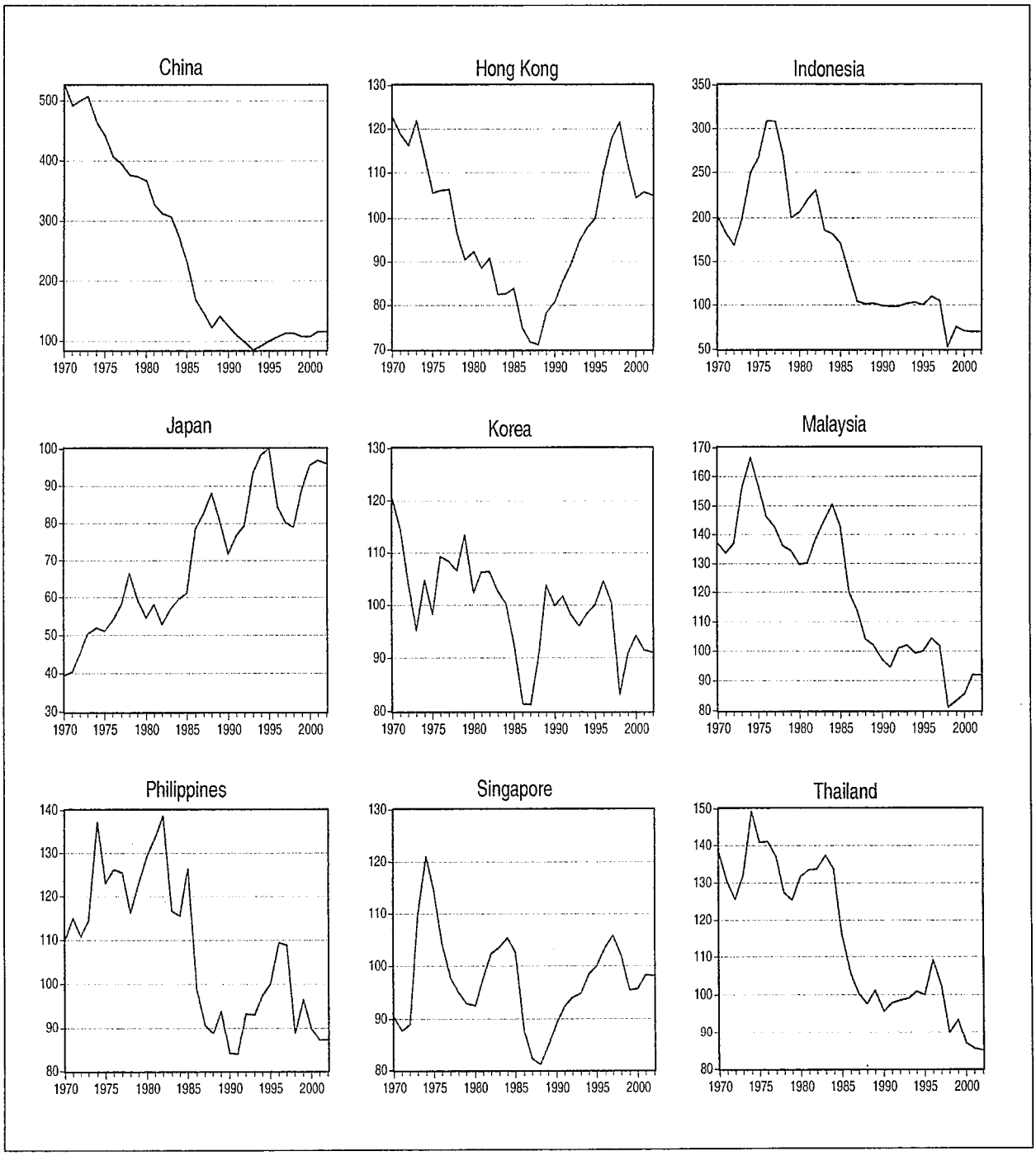


Figure 3.3 Response of REER to External Shocks

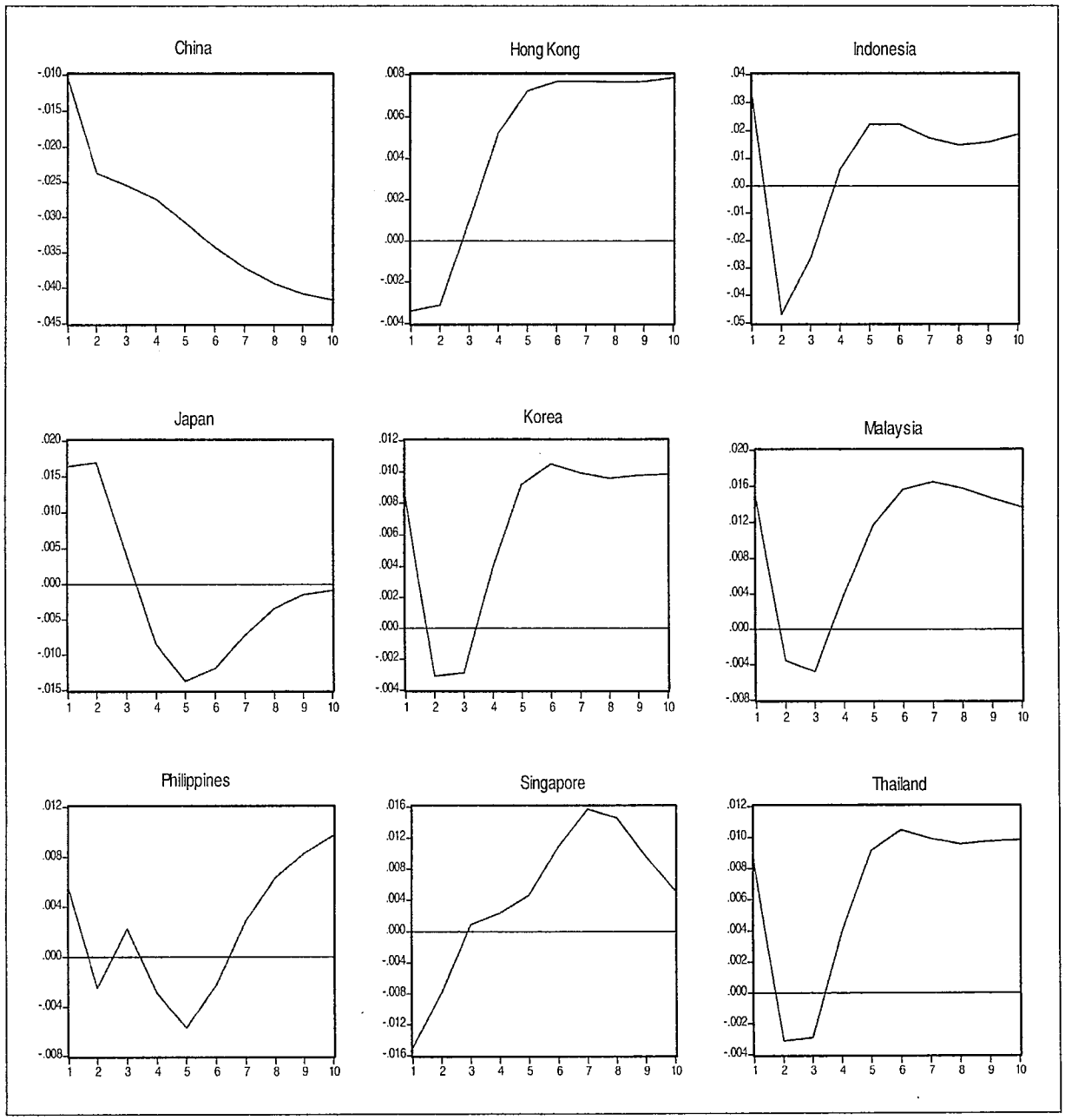


Figure 3.4 Response of REER to Supply Shocks

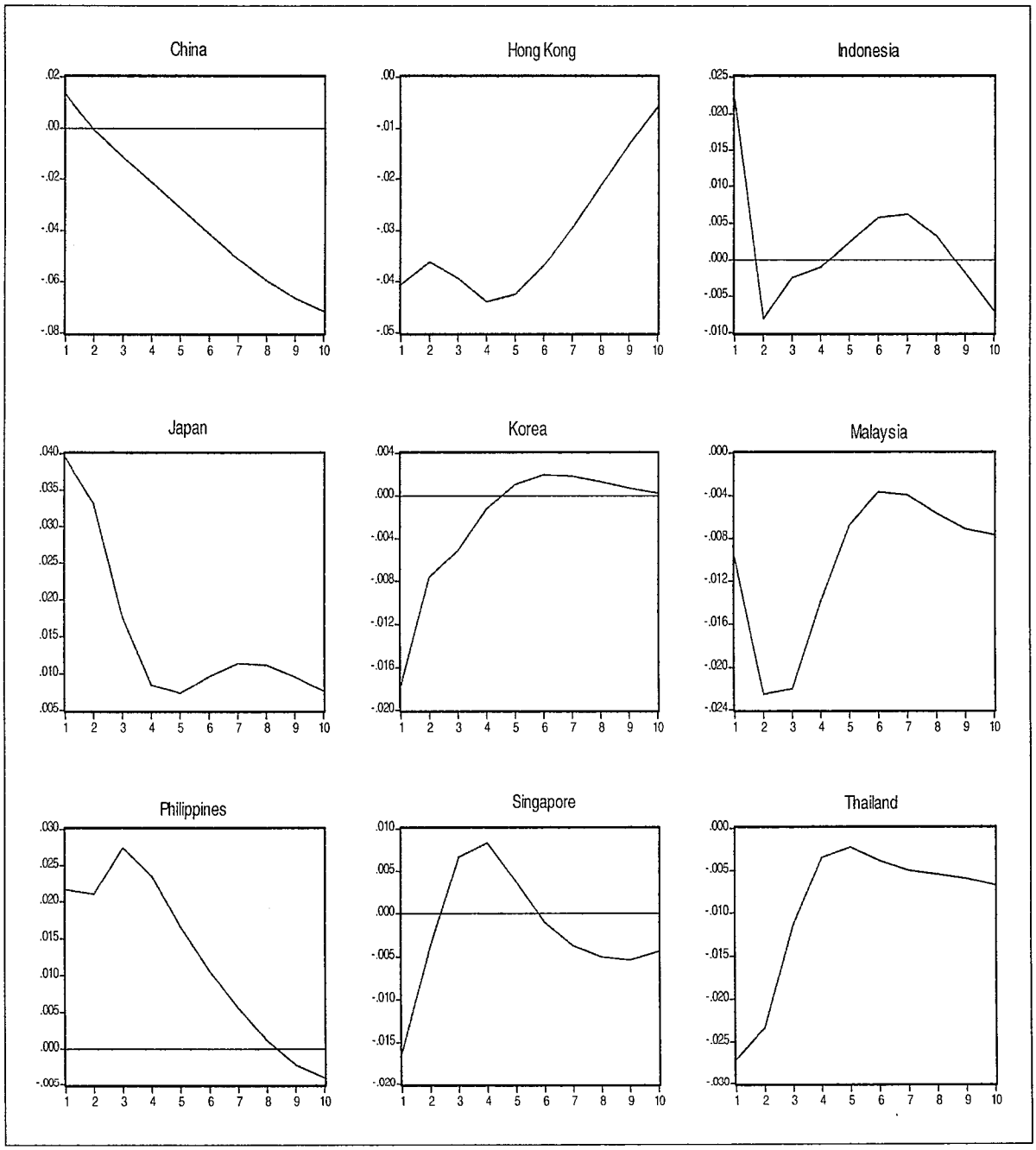
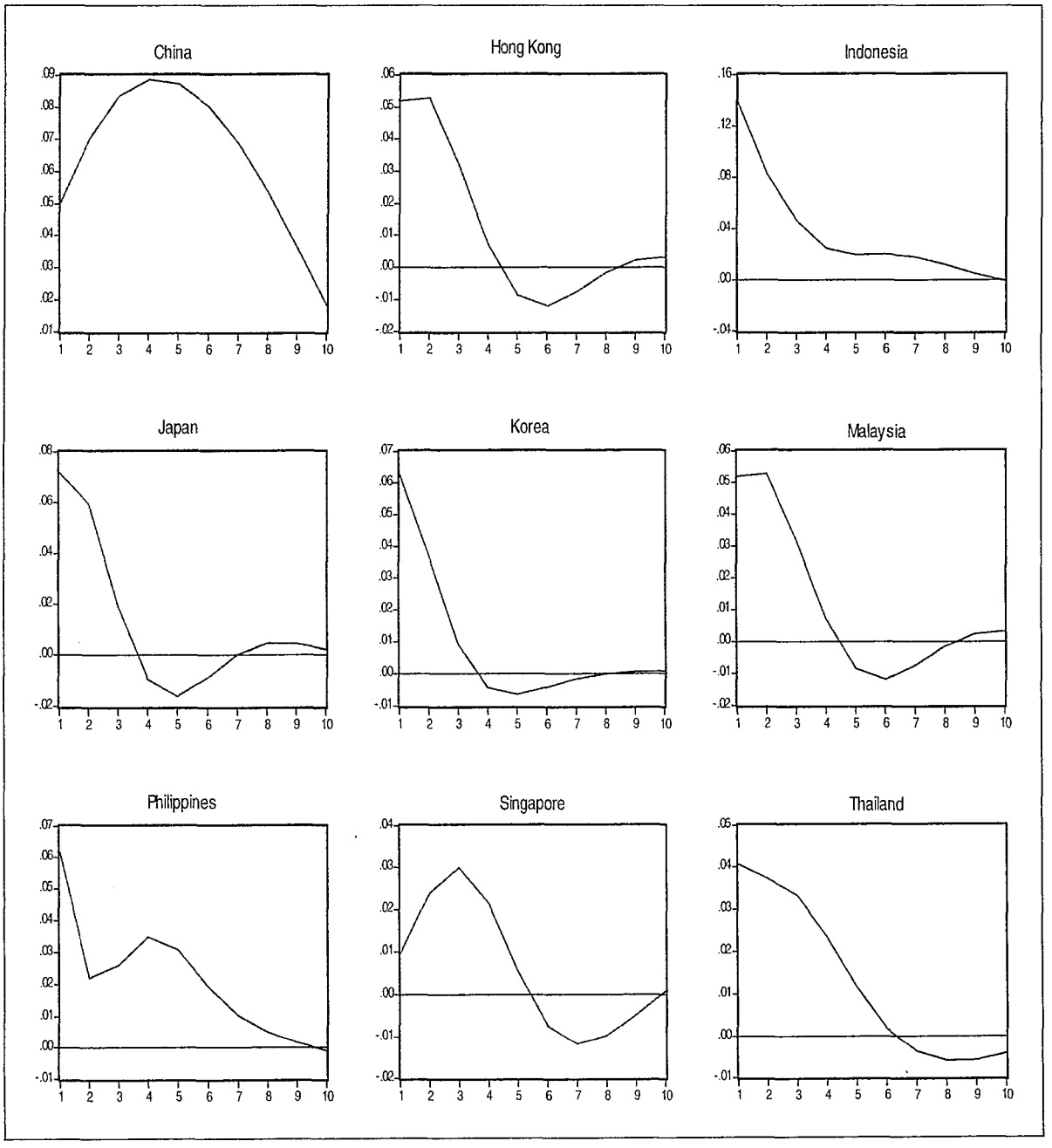


Figure 3.5 Response of REER to Demand Shocks



Chapter 4

Policy Considerations and Prospects

4.1 Policy Considerations

Most studies recognize that the potential benefits of the integration with the world capital market for East Asian economies outweigh the costs, because that is the development course which the developed countries have taken. It is also noted that the use of market-based inflow controls may be necessary to gain monetary policy independence and to increase the long-term share in capital inflows, while controls on capital outflows can be used to help maintain a fixed exchange rate system. In the long run, capital controls could lose their effectiveness and efficiency, therefore should be removed, at least gradually. The issue concerning financial liberalization in East Asia economies is therefore not whether they should open their capital markets, but how they should go about doing it in the future.

On the other hand, there is the widely held view that East Asia does not possess the necessary solidarity for a currency union at present, although Chapter 2 shows that the degree of integrating into global capital markets has increased with the financial liberalizations. There are a number of issues working against a union in the near-term. Firstly, income disparities still exist among Asian economies. For example, in 2004 Japan had a GDP per capita of more than US$30,000 while that of China is only about US$1000, which means Japan's GDP per capita in 2004 was more than 30 times greater than that of China.[19] It is risky that a currency union starts from a position in which members have substantial divergence. Secondly, there is a long history of enmity, rivalry, and distrust in the region. European countries experienced

[19] If we use PPP method, the gap will be smaller. GDP per capita for Japan is $22,000 while China is $4,400 in 2004.

more severe situations after the Second World War but they recover reconciliation for the common prosperity. In this regard, Japan and China should play leading roles in promoting regional monetary cooperation similar to Germany and France did in creating European monetary Union. They should bury the concern that the proposed currency union may lead a battlefield between Japan and China to seize economic dominance in East Asia. At the same time, East Asian economies should keep in mind that if they do not have the firm political will and long-term agendas for regional cooperation, any plan will be at the expense of national sovereignty.

4.2 Prospects of Integration Process

As Mundell (2003) and Park (2002) indicate, the plan towards further financial integration in East Asia can be divided into varying term goals. A "gradual" rather than "shock" approach is recommended. The short-term goal is to achieve exchange rate stability, the medium term goal is to attain greater monetary and economic convergence, which acts as the preconditions for integration, and the long-term goal is the move towards currency union. The achievement of the plan can be carried out in the following stages.

The first stage is to achieve exchange rate stability in East Asia. The growing levels of openness and intra-regional trade linkage in the region presented in Chapter 3 could lead to efforts to coordinate policies so as to create a zone of external monetary stability. It is suggested that East Asian economies agree on a regional currency basket system consisting of the Yen, the Euro and the US Dollar and

stabilize loosely their exchange rates since such baskets can stabilize their nominal effective exchange rates. This avoids the usual problem associated with fixing to a single currency, e.g. US Dollar. Pegging each of the Asian currencies to a common currency basket is a way of reducing the problem of intra-regional exchange rate variability. For example, East Asia currency basket system can put weight of 0.4 for US Dollar and 0.3 each for Yen and Euro, because it represents the broad geographical composition of trade and FDI in East Asia. A plus and minus 15 percent band will afford participating economies with sufficient flexibility to developments in the exchange market.

The second stage for East Asian economies should work on the four pre-conditions outlined by Bayoumi and Paolo (1999), that is to say, strengthening central bank independence, enhancing wage and price flexibility, strengthening the financial sector, and harmonizing monetary policy. The emerging swap arrangement under CMI[20] is a constructive sign that East Asian economies can work together to advance their common interests. There is view that lasting economic convergence is a main prerequisite for a full currency union. Thus, significant degrees of convergence will have to be attained prior to monetary unification. It is also vitally important for the participating economies to pursue a wider web of political agreements that encourage them to cooperate on monetary and financial issues in the process.

With increasing policy harmonization and convergence, the move for a more integrated East Asia is into the final stage, which the regional currency can

[20] See Chapter 3 for further details.

independently float vis-à-vis other currencies in the world. Given the present economic and political realities in East Asia, the "Asian Currency Union" should be considered as a long-term goal which could be accomplished in two or three decades.

4.3 References

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Chapter 5

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