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How Far? How Much Further to Go?**

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CIES DISCUSSION PAPER 0401

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ABSTRACT

This paper offers a selective survey of the recent empirical literature on financial integration, the focus being on alternative definitions of financial integration and measurement issues and results. The literatures to be reviewed have been selected primarily because their analyses have included some East Asian economies. In particular, this study concentrates on the ASEAN-5 plus 3 or APT economic group (i.e. Indonesia, Thailand, Malaysia, Philippines, Singapore, Korea, China and Japan) as well as Hong Kong and Chinese Taipei. These are the economies that have consciously attempted to intensify intraregional monetary and financial cooperation in the last few years, particularly since the East Asian crisis of 1997-98.

Keywords: capital controls, East Asia, equity, financial integration, parity conditions

JEL Classifications: F02, F31, F36

1. Introduction

How financially integrated are the East Asian economies? Despite numerous empirical studies examining various facets of the topic, the degree of intraregional financial integration in East Asia remains a matter of vigorous debate.

This paper offers a selective survey of the recent empirical literature on financial integration, the focus being on alternative definitions of financial integration and measurement issues and results. The literatures to be reviewed have been selected primarily because their analyses have included some East Asian economies. In particular, this study concentrates on the ASEAN-5 plus 3 or APT economic group (i.e. Indonesia, Thailand, Malaysia, Philippines, Singapore, Korea, China and Japan) as well as Hong Kong and Chinese Taipei¹. These are the economies that have consciously attempted to intensify intraregional monetary and financial cooperation in the last few years, particularly since the East Asian crisis of 1997-98 (Bird and Rajan, 2002(a and b), Chang and Rajan, 2001 and Rajan, 2003).

Numerous methods have been employed to measure financial integration. We place them into three broad categories. The first category refers to price conditions involving mainly debt flows. These are largely embodied in the interest parity conditions, viz. the covered interest parity (CIP), the uncovered interest parity (UIP) and the real interest parity (RIP). As will be discussed, the CIP is the narrowest of measures (of capital mobility per se), the UIP being a somewhat broader measure (of financial integration), while the RIP is the broadest of arbitrage measures (incorporating both financial and real integration). The second category involves quantity based measures such as savings-investment correlations, consumption correlations, current account dynamics and gross

¹ We exclude the other five members of ASEAN (Brunei, Cambodia, Laos, Myanmar and Vietnam) for which data are unavailable.

capital flows². The third category can be broadly classified as regulatory or institutional factors (such as capital controls and prudential regulations) as well as non-debt flows such as the co-movement of stock market returns. Figure 1 summarizes the various measures of financial integration. This paper will highlight the intuition as well as main strengths and weaknesses of each of these measures.

2. Price Based Measures of Financial Integration

Price based measures of financial integration or arbitrage conditions seek to equate rates of returns of comparable assets across different markets/economies. In this section, we examine three common interest parity conditions, viz. CIP, UIP and RIP³.

2.1 The Covered Interest Parity (CIP) Condition

The CIP may be formally stated as follows:

$$i_t = i_t^* + f_{t,t+n} \quad (1)$$

² Gross capital flows and current account dynamics will not be covered here. See Montiel (1994) and Rajan and Siregar (2002) for the former and Obstfeld (1998) and Taylor (2002) for the latter. While examination of cross-border capital flows is useful, it is probably of limited use as a measure of financial integration. For instance, a country that is highly integrated with international capital markets - in the sense of there being no significant difference in domestic and international rates of return - will experience little if any international portfolio capital flows (at least debt related flows).

³ Another arbitrage condition is the closed interest parity condition which essentially states that the returns on identical instruments of the same currency but traded in different markets (such as onshore and offshore markets) should be equalized. Any deviation arising from this condition can be interpreted as possible evidence of the existence of capital controls in one of the two countries or the existence of other political or country risks that may prevent interest rate equalization. The measurement of the closed interest differential is difficult for developing economies as it requires that a particular asset is traded sufficiently for there to be a liquid offshore market for it (see Obstfeld, 1998 and Frankel and Okwongu, 1996).

where: i_t is the domestic interest rate, i_t^* is the foreign interest rate (US rate unless otherwise stated) and $f_{t,t+n}$ is the forward margin (discount on the domestic currency) for n periods into the future⁴.

The CIP indicates that the difference between the current spot rate and the forward rate will equal the interest differential between similar assets measured in local currencies. Therefore, in the absence of capital account restrictions and/or transactions costs, the covered interest differential (CID) ought not to differ significantly from zero. A negative differential suggests the existence of capital controls or transactions costs that restrict capital *outflows*. Investors would certainly not tolerate a lower domestic return in the absence of capital controls (Frankel, 1991).

While there have been a number of studies on the CIP involving industrial economies, there have been relatively fewer ones pertaining to developing economies. This is primarily attributable to the fact that many developing economies do not have sufficiently liquid forward foreign exchange markets, or if they do exist, the data on forward rates are not easily available.

Frankel (1991) reports the mean covered interest differentials (CIDs) for the period 1982 to 1987 for a selection of developed and developing economies using monthly observations of the 3-month local money market rate against the equivalent Eurodollar rate. Focusing on the East Asian economies in the sample – Japan, Hong Kong, Malaysia and Singapore – the null of a zero differential is rejected for the first three economies, though only marginally in that the CIDs are very low. The exception is Malaysia, whose mean CID is large and negative, suggesting significant controls on capital outflows. The Frankel estimates are presented in Table 1.

Chinn and Frankel (1992) present two further methods for estimating the CIP using similar time series data for 1982-92. The first method involves estimating the CID by

⁴ Throughout this paper, the exchange rate is quoted as the domestic price of foreign currency.

regressing it on a constant and time trend. The null of the CIP involves the constant and the slope coefficient both equaling zero. Consistent with Frankel (1991), the results indicate that the CIDs were small for Japan, Hong Kong and Singapore, but large for Malaysia.

The second method used by Chinn-Frankel is to calculate the CIP by estimating the following:

$$i_t = \alpha + \beta(i_t^* + f_{t,t+n}) + \varepsilon_t \quad (2)$$

where the null for the CIP is $\alpha = 0$, $\beta = 1$. The β coefficients for the two regional financial centers, Hong Kong and Singapore, are very close to one, while that for Malaysia is significantly different from unity.

de Brouwer (1999) estimates a largely similar equation using monthly data for 3-month assets between 1985 and 1994⁵. The de Brouwer results are shown in Table 2. With the exception of Taiwan, the CIP in the strict sense is rejected due to the non-zero constant⁶. However, focusing on the slope coefficient, Japan appears to be the country that comes closest to the CIP holding, as they do in the cases of Hong Kong and Singapore. Taiwan and Thailand have maintained restrictions on their capital account transactions. Yet there does not appear to be any pattern emerging as a result - Taiwan seems to strongly deviate from the CIP whilst Thailand has a significant constant term but the slope coefficient is close to unity.

⁵ The sample size varies slightly for each country. In de Brouwer's case, the equation estimated is: $f_{t,t+n} = \alpha + \beta(i_t - i_t^*) + \varepsilon_t$. He finds that the CIDs narrowed in East Asia in the 1980s and 1990s.

2.2 The Uncovered Interest Parity (UIP) Condition

The UIP may be represented as follows:

$$i_t = i_t^* + \Delta e_{t,t+n}^e \quad (3)$$

where: $\Delta e_{t,t+n}^e$ is the expected exchange rate change at time t+n.

The nexus between the UIP and the CIP is apparent by decomposing eq. (3) as follows:

$$i_t - i_t^* - \Delta e_{t,t+n}^e = [i_t - i_t^* - (f_{t,t+n} - e_t)] + (f_{t,t+n} - e_{t,t+n}^e) \quad (4)$$

where the first bracketed term on the right hand side is the CIP (sometimes referred to as country or political risk premium) and the second term is the currency risk premium. If the CIP holds but the UIP is rejected, this would imply that forward rates are biased predictors of future exchange rate.

Before formally testing eq. (3), the researcher needs to find a way of measuring the expectation of the future exchange rate. One way to make the leap from theory to empirical operationalization is by using *ex-post* differentials. This may be justified by assuming that Rational Expectations (RE) holds. This assumption - that the actual or *ex-post* spot exchange rate equals the expected spot exchange plus an uncorrelated error term - is a practical way of overcoming the problem of non-observable expected exchange rate changes. Another approach is to use surveys of exchange rate expectations of market agents.

As with Frankel (1991) in the case of the CIDs, Montiel (1994) estimated the uncovered interest differentials (UIDs) assuming RE for 48 industrial and developing

⁶ The nonzero constant may be due to the presence of non-zero risk premia (country or currency).

economies for the period 1985-90 using monthly observations for short-term (0-6 month) deposit rates or 6-month treasury bill (T-Bill) rates. Focusing only on the East Asian economies in his sample, the Philippines and Thailand had significantly positive UIDs, Indonesia and Malaysia had significantly negative UIDs, while Korea and Singapore had UIDs that were not significantly different from zero.

A more recent study is that by de Brouwer (1999). His study covers several East Asian economies from 1985 to 1994. The estimated equation is as follows:

$$\Delta e_{t,t+n}^e = \alpha + \beta(i_t - i_t^*) + \varepsilon_t \quad (5)$$

where the null hypothesis for the UIP is $\alpha = 0$ and $\beta = 1$. Assuming that RE holds, the results are presented in Table 3.

When testing for the null of $\beta = 1$, the results are mixed. Curiously, those economies which would typically be regarded as having open capital accounts are the ones that largely reject parity, while those that are regarded as being quite closed have coefficient values that do not reject the UIP. This may be partially explained by the observing that those economies perceived as closed are also the ones with managed exchange rates. Managed exchange rates are easier to predict than their floating counterparts and as such the expected depreciation are relatively easier to measure (de Brouwer, 1999)⁷. As expected, the UIDs of Hong Kong and Singapore are close to zero. The estimated UIDs show significant deviations for Indonesia, Korea, the Philippines, Taiwan and Thailand. This coincides with the existence of certain restrictions on the capital account for each of these economies.

⁷ Using survey methods, Chinn and Frankel (1992) estimate the following equation: $i_t = \alpha + \beta(i_t^* + \Delta e_{t,t+n}^e) + \varepsilon_t$ for the period 1988-91 and find that the constant is typically quite high and the slope coefficient significantly different from unity.

In another recent paper, Flood and Rose (2001) test for the UIP using daily, weekly and monthly BIS exchange rate and Eurorate data for the 1990s. The regression equation estimated is similar to eq. 5 above. The results are more encouraging in that the estimated β is the correct sign for most of the countries in the sample. Even more encouraging results are obtained when pooling the data, and the results are better for daily data than weekly, monthly or quarterly. Results for East Asia are summarized in Table 4. While the results for Japan appear rather dubious, comparison of Tables 3 and 4 reveals that the extent of openness in Indonesia and Thailand has increased over the latter half of the 1990s. This, however, may be an artifact of the currency crisis in 1997-98, an issue to be explored in more detail at the latter part of the paper.

A recent noteworthy contribution to the UIP literature is by Francis, Hasan and Hunter (2002). They use asset-pricing techniques to calculate excess returns on instruments in different currencies and then test for the integration of these instruments using the UIP⁸. The excess returns are derived as a function of three risk factors – the return on a “market portfolio”, an arbitrage portfolio measuring financial distress, and an arbitrage portfolio constructed to represent an investor being long in high book-to-market stocks and short in low book-to-market stocks. The principal motivation of the paper is to investigate how much of the excess returns can be explained by these risk factors and therefore be attributed to a time-varying risk premia. The authors also run some tests for the UIP for a sample of developing economies including some in East Asia (Korea, Malaysia and Thailand). The time series is split into two sub-samples – pre and post liberalization. The start dates vary from country to country, for Korea, the date is January 1992, for Malaysia, December 1988 and Thailand September 1987. The computed UIs are given in Table 5. The results show that the UIP in general does not hold, but there is

⁸ Their work is inspired by Fama and French (1993) and Morley and Pentecost (1998), among others

some difference between pre- and post-liberalization. Interestingly, the post-liberalization values become positive for Korea and Thailand. This may be indicative of a relaxation of capital outflows.

2.3 Extending the UIP Literature

Given the popularity of the UIP as a measure of financial integration (discussed below), it warrants extending on the existing empirical literature.

It bears repeating that the basic model of the UIP argues that a risk-neutral investor will be indifferent to where an extra dollar is invested when the UIP holds. The UIP condition can be rewritten as follows:

$$UID_t = i_t - i_t^* - \Delta e_{t+n}^e \quad (6)$$

where: i_t is the home country's interest rate. i_t^* is the foreign country's . e_t is the current spot nominal exchange rate of one currency against other regional currencies⁹. e_{t+n}^e is the spot exchange rate expected to prevail in period $t+n$. Thus, $(\Delta e_{t+n}^e = \frac{e_{t+n}^e - e_t}{e_t})$ is the expected proportionate appreciation of the foreign currency (if it is positive) and the UID is the uncovered interest differential. If $UID > 0$, the expected rate of return on home assets is higher than foreign assets, resulting in capital inflows into the home country. Similarly, outflows take place if $UID < 0$.

For our computations of the interest rate spread that prevailed among the East Asian economies (excluding Taiwan) during the period between 1995 and 2002, we have

⁹ For each currency, we calculate its nominal exchange rate against the other regional currencies. For instance, rupiah against the Singapore dollar, the Thai baht, the peso, etc. A rise in e_t implies a depreciation in the nominal exchange rate of the local currency.

adopted the 6-month commercial deposit rate offered by domestic banks of each relevant country. We group the monthly interest rate observations into three sub-periods: (a) the pre-crisis (January 1995 – December 1996); (b) the crisis period and immediate post-crisis period (January 1998 – December 1999); and (c) the period of relative stability (January 2000 – November 2002). Though the turmoil in East Asia began in mid 1997 and reverberated rapidly to the rest of the region by the end of the year, speculative attacks on the Thai baht in particular were felt only since early 1997 (Rajan, 2001). Therefore, we only consider the time up to end 1996 as the period of relative stability (i.e. exclude 1997).

Since we are dealing with the six-month maturity and each of the reported six month deposit rates are for the entire year, we make the necessary adjustment by multiplying each of the rates by 0.50 (so as to ensure that we deal with each individual 6-month maturity term). In addition, given the lack of monthly (or even quarterly) data on the expected spot exchange rate prevailing in $(t+6)$ -- 6 months from period t -- the expected rate is proxied by the currency's actual spot nominal exchange rate at $(t+6)$ ¹⁰. Thus, our UIDs are the actual *ex-post* interest rate differentials received by the investors at the end of the 6 month maturity period.

The UIDs are reported in Table 6. The results reveal the existence of arbitrage opportunities throughout the three different periods among the East Asian countries. Furthermore, the results (on UIDs) suggest that the markets became more segmented during the crisis period (1998) and the period immediately following that (period 2). The continued high degree of foreign exchange volatility may have contributed to the rise in the UIDs during this period. In contrast, the picture for the period of relative calm (2000-2002)

¹⁰ As discussed, this procedure is commonly applied in the case of empirical studies involving developing countries (for instance, see Frankel (1991), Montiel (1994), de Brouwer (1999) and Khalid, 1999). We would have ideally liked to use forward-looking surveys/expectations of expected exchange rate changes. Such information is unavailable to us.

suggests the presence of closer market integration among these economies during the period 3. Only Thailand experienced widening absolute UIDs.

For the five Southeast Asian economies, Indonesia is the only country which has offered substantial and persistent positive interest rate spreads over other regional economies. This is probably due to the country's high interest rate policy to defend the weak local currency -- the 6-month deposit rate of Indonesia has gone up more than 50 percent per annum. Abstracting from problems with our proxy for expected exchange rate depreciation, one might expect that the positive UIDs offered on the rupiah are, to some extent, arguably a reflection of the "peso problem", i.e. a small probability of a large rupiah devaluation as well as high country or currency risk premia.

Excluding Indonesia, Malaysia maintained a positive UID only during period 3. This is probably explained by the strength of the ringgit vis-à-vis respect to most other East Asian currencies. Thailand generally maintained positive UIDs in periods 1 and 2 against most countries except Indonesia and Korea (in period 2). Note that Singapore's commercial banks have generally maintained the lowest returns on their deposit rates. The low inflationary environment, relatively stable currency and overall macroeconomic climate are all contributory factors. With regard to the North Asian economies (Korea, Hong Kong and China), the UIDs are again at the highest during period 2 at the height of the financial crisis. The high interest rate policy adopted in Korea created significant spreads against all other countries except Indonesia. In contrast, Hong Kong and China had negative spreads against all countries save Singapore. Contrasting trends appear during the last two periods (periods 2 and 3).

A combination of weaker won (especially against other crisis-affected currencies) and sharply lower key interest rates in Korea led to its UIDs turning positive only against Singapore, Thailand and the Philippines in period 3. In contrast, the lowering of interest rates in many Southeast Asian countries post crisis, and the recovery of these currencies

vis-à-vis the US dollar (and thus the Hong Kong dollar and China renminbi, both of which are firmly pegged to the US dollar), were responsible for creating positive UIDs in period 3.

2.3 The Real Interest Parity (RIP) Condition

The third arbitrage condition is the RIP. This condition may be derived by first taking the following UIP equation:

$$\Delta e_{t,t+n}^e = i_t - i_t^* \quad (7)$$

and substituting it into an expression for relative purchasing power parity (PPP):

$$e_t = p_t - p_t^* \text{ or } \Delta e_{t,t+n}^e = \pi_{t,t+n}^e - \pi_{t,t+n}^{e*} \quad (8)$$

Combining the two with the Fisher equation, $r_t = i_t - \pi_{t,t+n}^e$ yields the expression for the RIP:

$$r_t = r_t^* \quad (9)$$

Clearly for the RIP to hold, the UIP, PPP and the Fisher hypothesis also need to simultaneously hold. This is no easy task given the lack of empirical success of both the UIP and PPP over the short to medium terms. Thus, the RIP is generally considered a very long-run interest parity condition encompassing both real and financial linkages¹¹.

There have not been many studies on estimated RIPs for the East Asian economies. de Brouwer (1999) provides differentials for the RIP and also sub-divided the estimated RIPs into its constituent parts, i.e. the UIP and PPP (Table 7). The results show

¹¹ The RIP may be thought of as a proxy for the marginal cost of capital.

that Japan, Malaysia and Taiwan have non-divergent real rates against USD rates, whilst the other East Asian economies tested have a lower likelihood of the RIP holding. In general, the RIP does not hold due to lack of empirical success of the UIP and relative PPP, while the condition of exogeneity for the foreign interest rate does not hold as some economies are too large to be exogenous¹².

2.4 Summary of Price Based Measure

The most popular methodology for determining the extent of financial integration is the uncovered interest parity (UIP) which was emphasized above. Indeed, as Flood and Rose (2002) have noted, “the UIP is a classic topic of international finance, a critical building block of most theoretical models..” (p.252). However, it is important to keep a number of caveats in mind when interpreting the findings. One, the test for the UIP is in fact a joint test for the CIP and the currency risk premium. We are unable to test separately for the CIP given lack of data on forward forex markets in developing East Asia. Two, the tests for the UIP generally assume that all agents form expectations rationally. Thus, the failure of the UIP to hold (in the sense that there exists large and persistent UIDs), could be because (a) the Covered Interest Parity (CIP) does not hold (imperfect capital mobility); (b) there may be large and time varying currency risk premia (imperfect asset substitutability); or (c) rational expectations (RE) is an inappropriate assumption for the forex markets (or that the market consists of heterogeneous agents)¹³.

¹² Frankel (1991) also presented some RIP differentials as part for his study. The differentials for Hong Kong, Japan, Malaysia and Singapore (with standard errors) are respectively -2.89 (0.94), -0.58 (0.62), 0.83 (1.00), 0.08 (0.68).

¹³ MacCallum (1994) also believes that deviations from the UIP may be due to monetary policy decisions of central banks and proposes that a monetary policy reaction function be included in an expression for the UID. Bird and Rajan (2001) and Rajan, Siregar and Sugema (2002) offer bank-based explanations for persistent interest rate differentials in East Asia. Also see Edwards and Khan (1985) and Willett, Keil and Ahn (2002). An annex summarizing these issues is available upon request.

While the CIP is a generally preferred measure of financial integration in view of the preceding limitations of operationalizing the UIP (Frankel, 1991), as noted, there needs to be a liquid forward foreign exchange market in the currency pair under investigation. Whilst this is not problematic for industrialized economies, it is definitely a niggling problem for developing economies. In any case, Willett, Keil and Ahn (2002) observe:

(S)ubstantial deviations from covered interest parity are a good indication that capital mobility is less than perfect..(However)..(f)inding that covered interest parity holds..is consistent with either high or low capital mobility, and there is no good reason to presume that the magnitudes of deviations from interest parity will provide a reasonable proxy for the degree of international capital mobility. In terms of modern theory, the appropriate measure of capital mobility is the extent to which uncovered rather than covered interest parity holds (pp.424-5).

With regard to the third price measure of financial integration, the RIP, the conditions for it to be held are quite prohibitive, as both the PPP and the UIP need to simultaneously hold. However, the RIP does provide a useful general condition encapsulating both trade and financial linkages, and thus should not be dismissed as being altogether irrelevant. The RIP is more likely to hold over longer time horizons and acts as a useful proxy for the marginal cost of capital¹⁴.

3. Quantity Based Measures of Financial Integration

Whichever price measure of financial integration is used, there are two important considerations with their use. One, arbitrage conditions are probably a more appropriate way of measuring integration for certain sectors (e.g. the banking sector) rather than the whole economy (Chinn and Dooley, 1997). Two, a perennial problem with using such price measures, especially in developing economies, is what interest rate should be used, and to what extent are the available interest rates comparable across countries. Given these concerns, there is a growing body of literature that has explored quantity based measures

of financial integration. We consider two such measures, viz. savings-investment correlations and consumption correlations.

3.1 Savings-Investment Correlations

Feldstein and Horioka (1980) - henceforth FH - pioneered this line of research. The central premise of this approach is that in a world where there is high capital mobility, a country's savings are effectively part of a world pool that is able to be directed anywhere. While Savings (S) = Investment (I) hold for the world as a whole (i.e. the current account of the global economy should theoretically be in balance), deviations of savings from investment of a particular country is simply a representation of the extent of capital mobility. For the FH conclusion about high capital mobility to hold, the domestic interest rate has to be tied to the world interest rate, i.e. $r = r^*$. If capital markets are open, real interest rates are equalized across economies and savings and investment need not be correlated. If capital mobility is low, real interest differentials will not be equalized, thus making savings and investment ratios similar within national borders (see Frankel, 1991 and Bayoumi 1997). In other words, the FH measure is a quantity/national income accounting corollary of the RIP and should therefore be expected to hold only over the longer-run.

The FH test of capital mobility is based on the following estimating equation:

$$(I/Y)_i = \alpha + \beta(S/Y)_i + \varepsilon \quad (10)$$

The authors estimated this equation for 16 OECD economies for the period 1960-74. For the full sample the value of β was about 0.9 and insignificantly different from one. This led

¹⁴ In fact, the UIP may also be more valid over longer time horizons -- over one year (see Madarassy and Chinn, 2002 and Meredith and Chinn, 1999).

FH to conclude that capital mobility for the sample of OECD economies is not very high. This high correlation of savings and investment – or small size of current account balances – has come to be known as the FH “puzzle”.

The original FH study is a cross-sectional investigation. Another important cross-sectional study by Bayoumi (1997) presents regressions for 22 OECD economies using data from 1960 to 1993 and splits the sample up into a number of sub-samples. There is clearly a reduction in the correlation over a time period that is widely acknowledged to be one where there was a gradual relaxation of capital controls by certain OECD economies. Bayoumi’s results are similar to those found in Obstfeld (1995) where the savings coefficient for the 1980s of 0.64 fell from the 1970’s value of 0.87¹⁵.

The literature on S-I correlations for developing economies and East Asia in particular is not very large. Montiel (1994) performs some FH-type tests for a large sample of economies over the period 1970-90. The estimations presented are simple OLS and 2SLS estimations for the correlations in levels, first differences and an error correction version. As is apparent from Table 8, capital mobility from lowest to highest is: Philippines, Thailand, Indonesia, Korea, Malaysia and Singapore; with the slope coefficient (β) for Singapore being close to zero, suggesting perfect capital mobility.

Two more recent studies of the FH measure for East Asia warrant highlighting. Le (2000) estimates eq. 10 for 15 Asia-Pacific economies (7 for East Asian countries of relevance to this paper) using annual data for the period 1976-96. The main results are summarized in Table 9. The average slope coefficient is 0.73, suggesting relatively limited capital mobility. Examination of individual country coefficients is interesting. The coefficient for Indonesia is effectively 1 and that for China is 0.9 – signifying relative autarky. Malaysia and Korea have very low β coefficients. Somewhat surprisingly, Hong Kong’s and

Singapore's coefficients are rather large at 0.8 and 0.9, respectively, casting serious doubts on the results.

Isaksson (2001) uses FH to measure financial integration for 90 developing economies. The study uses monthly observations for the period 1975 to 1995 and presents two main sets of results, viz. savings and investment rates and savings-investment regressions. The first set of results is for savings and investment rates in developing economies (measured as a percentage of GDP). If the savings-investment correlations are high, those economies with high savings rates are also likely to have high investment rates. The results for the East Asian economies are given in Table 10. It can be seen that the savings and the investment rates appear to be correlated in the sense that the average differential is only 1 percent, indicating that capital mobility may be quite low.

The second set of Isaksson results is panel data estimations of a variation of the traditional FH regressions. The regressions are for the entire Asian sample (including some South Asian ones) and not for individual economies. While a number of estimation procedures are used, since the results are broadly similar, only the OLS results are noted here. The estimated equation is as follows:

$$(I/Y)_{it} = \omega_i + \delta_1(S/Y)_{it} + \delta_2(A/Y)_{it} + \delta_3T(S/Y)_{it} + v_{it} \quad (11)$$

where: A/Y is the proportion of foreign aid to GDP. The third term on the RHS is a time dummy where 1975-84 = 0 and 1985-95 = 1. Therefore, if $\delta_3 < 0$, this implies that the correlation is lower in the second time period which, in turn, implies that capital mobility is higher in the latter sub-sample. The savings rate (δ_1) is around 0.9 for the OLS (and IV) regressions but significantly different from 1. The dummy variable parameter is negative.

¹⁵ There have also been several papers that have examined the time series properties of savings and investment. Feldstein (1983) extended the original work by adding time series regressions as

This may be an indication of rather low capital mobility that is increasing over time. Also, foreign aid does not seem to affect investment in the region. While individual country results are not given, results generally indicate a strongly positive relationship between saving and investment.

There have been many objections, on theoretical and empirical grounds, about the implications of the FH study. We consider two important ones below.

One of the main explanations of the high correlation is that both variables may be endogenous and respond to a third variable (Obstfeld, 1986). More generally, savings and investment are considered pro-cyclical, further encouraging a high degree of correlation. For instance, Bayoumi (1997) performs some time series FH type regressions on a sample of 10 economies but makes a distinction between *total* investment and *fixed* investment. He finds that the correlation involving total investment is higher than those involving fixed investment. As total investment includes inventories, which are driven by cyclical factors, the high correlation between savings and total investment may well be predominantly cyclical. Baxter and Crucini (1993) used a dynamic, stochastic, general equilibrium model to demonstrate that, under certain conditions, a productivity or terms of trade shock is able to produce a high savings-investment correlation in the presence of high capital mobility. Additionally, in the long run one would expect a priori savings and investment to be perfectly correlated due to intertemporal budget constraints¹⁶. Saving and investment might also be highly correlated due to government fiscal and monetary policies aimed at external balance. Bayoumi (1997) points out that the use of *private* and not *total* saving and investment would mitigate that problem and, in fact, those studies using private saving and investment have lower correlations.

did Obstfeld (1986). Both these studies found high correlations.

¹⁶ One would also expect savings and investment to be more highly correlated the more flexible the exchange rate regime.

A second objection to the FH analysis is that the RIP must hold and an exogenous foreign interest rate must exist for the FH analysis to hold. As noted, these conditions do not generally hold over the short and medium run and probably do not hold for larger economies (given the non-applicability of the exogeneity assumption). For instance, Murphy (1994) examined a cross section of 17 economies and found that correlations depended positively on country size.

3.2 Consumption Correlations

While the S-I correlation is the most popular quantity measure of financial integration, a more theoretically elegant measure of financial integration is to examine the time paths of consumption within and across economies. Smoothing of consumption due to expected or unexpected changes in income in a country implies the use of capital markets to finance “excess” consumption. Intuitively, a convergence of consumption between two economies is an indication that each country is using capital markets to choose a time path for consumption that is outside the path implied by available domestic resources, thus implying access or openness to capital flows (Bayoumi, 1997 and de Brouwer, 1999).

The empirical evidence involves observing correlations of consumption growth for individual economies against an average consumption growth for the rest of the sample and against real GDP. Bayoumi reports results for 21 OECD economies between 1973 and 1990. He finds that the correlations are generally quite low, and are at odds with the theoretical predictions of risk sharing.

Based on this measure, Montiel (1994) shows that the East Asian economies he considers, viz. Korea, Malaysia, the Philippines, Singapore and Thailand, have quite high capital mobility. de Brouwer (1999) computes some correlations for private and total consumption and real income for three sub-periods of G7 and East Asian economies. The

sample is split into three sub-samples: 1963-72, 1973-82 and 1983-92. His analysis shows that correlations are low but have risen since the 1960s. Looking particularly at East Asian economies, the correlations for Korea, Malaysia, the Philippines and Thailand do not show any tendency in either direction – the coefficients are low in the first and third sample and high for the second. The other economies in East Asia (Hong Kong, Japan and Singapore) showed a general increase over the entire sample period, suggesting intensified capital mobility.

A more rigorous way of testing for consumption correlation is to run regressions on domestic consumption against consumption for the “rest of the world (ROW)” using a regression like the following:

$$\Delta c_{it} = \alpha + \beta X_{it} + \gamma \Delta c_{A't} + \varepsilon_t \quad (12)$$

where Δc_{it} is the change in domestic consumption between t-1 and t, $\Delta c_{A't}$ is the change in ROW consumption and X_{it} is a vector of domestic explanatory variables. The test for full risk sharing is that $\beta=0$ and $\gamma=1$. If the level of financial integration is high then the consumption smooth activities of domestic agents should resemble that of foreigners.

A closely related test pioneered involves estimating the following regression equation:

$$\Delta c_{it} = \alpha + \beta \Delta(y-i-g)_{it} + \gamma \Delta c_{A't} + \varepsilon_t \quad (13)$$

The variable $(y-i-g)_{it}$ measures the domestic resources available for consumption. The null hypothesis for risk sharing is $\beta=0$ and $\gamma=1$. If a country is closed to international capital

markets then a country's consumption should reflect those resources available for that consumption, $(y-i-g)$.

While Bayoumi (1997) discusses the performance of these tests for OECD countries between 1973 and 1990, to our knowledge, there have been no attempts to apply these tests (i.e. eqs. 12 and 13) to East Asia. Thus, there is vast scope for future empirical research in this area.

4. Regulatory and Institutional Measures

4.1 Capital Controls

Capital controls are often placed under the category of financial *liberalization* - rather than *integration* - but their connection to financial integration is straightforward. Financial liberalization is basically the process that policymakers engage in attempting to achieve greater financial integration. As such, the process of achieving integration involves the removal of capital controls that were imposed in an earlier regime. We can measure the degree of financial integration by observing the extent to which a country has capital controls and we can assess whether a country is becoming more or less integrated by observing whether controls are being imposed or removed over time.

The types of controls that might be in place are numerous (for instance, see Bird and Rajan, 2000 and Rajan, Siregar and Goo, 2003). Park and Bae (2002) specify three general categories that might be imposed: (a) those that relate to financial market regulations such as legislative control over deposit rates; (b) restrictions on capital account transactions such as restrictions on term or currency and (c) regulations relating to the entry and exit of foreign financial services (also see Bird and Rajan, 2001).

How are these restrictions used to measure the extent of financial integration? A well cited paper is that of Grilli and Milesi-Ferretti (1995) who use the restrictions captured by the *IMF Annual Report on Exchange Arrangements and Exchange Restrictions* as

dummy variables to measure their effect on variables such as capital flows. Johnston et al. (1999) does a similar thing using further disaggregated data (forty four categories of capital account transactions) Table 11 reports the results for the Asian sample using the Johnston et al. index. It reveals a marked reduction in capital controls in Korea and an increase in the extent of controls in Malaysia. These observations are consistent with the general observation of policy choices of the two economies in the latter half of the 1990s (see Rajan, Siregar and Goo, 2003 for Malaysia and Park and Choi, 2002 for Korea). The index also indicates a generally stable though gradual decline in capital account barriers in the cases of Indonesia and Thailand.

An alternative to the dummy variable based measure of capital controls is the “restrictions based” one recently developed by Edison and Warnock (2001). By using data on market capitalization, they have constructed a univariate quantitative measure of the degree of capital controls in developing countries. Specifically, the Edison-Warnock measure is constructed using two indices from the Standard & Poor’s/International Finance Corporation (S&P/IFC). The first is a global index (IFCG), which is an index capturing capitalization of the whole market, and the second is the Investable index (IFCI), which is constructed to capture the proportion of the market which is accessible to investors. By taking one minus the ratio of IFCI to IFCG, Edison and Warnock obtain a measure of the degree or the intensity of capital controls based on restrictions to the domestic market. The data used is of monthly frequency from 1988 to 2000.

For their sample of Asian economies, Edison and Warnock find that the initial restrictions were generally quite high but decreased markedly during the 1990s. The exceptions were the Philippines, whose level of controls remained fairly constant over the time period under consideration, and Malaysia, which appeared to have very few restrictions to begin with, but increased them significantly in the aftermath of the crisis as

noted previously. The authors also compare their measure with some of the other techniques for measuring capital controls and find broad concurrence in the results¹⁷.

A fundamental assumption with all such indices of capital controls that the removal of capital controls may, in some way, result in a more financially integrated economy. This may not be the case. There could well exist a situation where a country has very few capital controls and is yet not regarded as being integrated with other economies. This could be due to legal/political factors, cultural variables, business practices or simply that an economy has not been noticed by others as a potential place to export capital flow, i.e. it “escaped the radar” of the international financial community.

4.2 Stock Market Co-movements

Financing involving non-bank and non-debt channels has grown in importance in developing countries. Thus, another measure of integration of regional capital markets would invariably involve examining equity market returns. There have been any number of studies examining the extent of equity market integration in East Asia. In the main, these papers look at the univariate properties of the data and how movements in the equity markets in one country influence the series in another country. Some of the more recent papers extend the analysis by including other variables such as the exchange rate and capital flows, while others have examined the effect of the Asian crisis on their integration results. In general, the methodological applications range from simple correlations and covariances to VAR based approaches such as Granger causality for the short-run analysis and cointegration tests for the long run scenario. In addition, the use of test of asset pricing models has gained popularity. We consider below a few studies using different techniques.

¹⁷ For a more complete comparison of various measures, see Nitithanprapas, Rongala and Willett (2002).

a) *Correlation and Causality Tests*

Hashmi and Liu (2001) examine stock market integration of the major five Southeast Asian economies (Singapore, Malaysia, Thailand, Indonesia and the Philippines). Their particular interest is on investigating the effects of the US and Japanese markets on the East Asian economies as well as the degrees of market interactions among East Asia's listed markets. They use daily stock markets indices taken at closing time and in local currency spanning the period of January 1994 to December 2000. The observation sets are further broken down into: the pre-crisis (January 1994 to July 1997); and the post crisis (August 1997 to December 2000) periods. The correlation tests were performed for the pre- and post-crisis samples. In general they find that the correlation coefficients have increased after the crisis. The statistics also suggest that the Southeast Asian markets are generally more correlated with the US market than with the Japanese market, with the post-crisis Thailand as an exception.

In acknowledgement that correlations do not make any inferences about causation, the authors also conduct Granger causality tests to ascertain whether a change on a lagged value of one country's stock market causes a change in the contemporaneous value of another county's stock market. The results are summarized in Table 12. What is noticeable about the Granger Causality results is that the fluctuations of the US market have significant effects on the Southeast Asian markets. In contrast, they find the performance of the Japanese stock market does not have any significant ramification on the Southeast Asian markets. Another noteworthy observation is that the degree of integration between Southeast Asian markets has increased since the 1997 East Asian financial crisis.

b) *Variance Decomposition Tests*

Another commonly used tool to assess the degree of capital market integration is the variance decomposition test. Hashmi and Liu (2001) present variance decompositions for pre-crisis and post-crisis time periods for the Southeast Asian region. The main conclusion emerging from their results is that the performance of the stock exchange of Singapore strongly influences the returns of the capital markets in the region -- stronger than that of the US. As expected, the forecast error is predominantly generated by volatility within that country. In addition to the internal factor, Singapore is found to be the source of the most influential external contributor in explaining the variance of the market index in each of the main Southeast Asian capital markets (Table 13).

Moon (2001) employs daily observations of national stock price indices from a number of East Asian countries from January 1995 to June 2000. The sample is grouped into 3 sub-samples: pre-crisis, crisis and post-crisis periods. Of a particular interest in the paper is the influence of the US markets on domestic markets. Table 14 reports the proportion (in %) of the forecast errors of the market indices of the East Asian economies explained by the US markets for the three time periods. The results confirm that there is a substantial rise in the influence of the US market on each of these East Asian markets during the post-crisis vis-à-vis the pre-crisis and the crisis period.

c) *Cointegration Tests*

A recent feature of the literature of equity market integration is the use of tests for cointegration and common stochastic trends. These tests investigate a long term relationship between stock markets. A well-cited paper is Kasa (1992), one of the first to use the Johansen cointegration technique for stock prices to assess integration. The study examines market indices of the capital markets of the US, UK, Japan, Germany and Canada, and finds a single common trend, implying that the returns in all of these markets

are highly integrated¹⁸. One of the earlier studies employing cointegration technique on Asian countries is Chung and Liu (1994). Using data for the US, Japan, Hong Kong, Singapore, Taiwan and Korea, they find 2 cointegration relationships and 4 common trends.

In addition to the set of testing discussed before, Moon (2001) also conducts a number of cointegration tests for his sample set of countries for the different sub-periods: before, during and after the 1997 crisis. The study finds significantly more cointegrating relationships for the post crisis sample than for the other two sub-samples, with the US market being involved in most of the cointegration relationships.

d) *Test Based on Asset Pricing Models*

The use of asset pricing models has also become an increasingly popular technique to examine the degree of stock market integration. Phylaktis and Ravazzolo (2002) derive the covariance of excess returns on the stock market for 1980-98. The first step is to establish expressions for the excess returns of the domestic and foreign stock market as a function of the real interest rate, dividends paid and other variables such as lagged returns and the exchange rate. These expressions find the determinants of returns in each country. The next step is to derive the variances and covariances of the excess returns. The model is then estimated as a VAR. The principal idea is to find variables that help explain movements in the stock markets. The countries included in the sample are Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan and Thailand. The authors find that variations in dividends paid are a significant source of variance in stock return. An interesting result that arises is that co-movements in output growth are directly related to stock prices, indicating a connection between real sector integration and

¹⁸ If a common trend is shared by all variables in a system this suggests that cointegration is present in the model. The more common trends that are identified, the less integrated the variables

financial integration (recall the RIP which is a broader price measure of integration). The paper also unearths a close connection between Thailand and the US and a high degree of integration between Korea, Taiwan and Japan.

5. Concluding Remarks

The detailed literature review and empirical analysis undertaken in this paper suggests there is no obvious indication of intensified financial market integration in the region on the whole. Nonetheless, the evidence seems to reveal a close correspondence between measures of financial integration and the extent of the development of financial markets in general. The three East Asian financial centers, and high-income economies of Hong Kong, Japan and Singapore are fairly highly integrated with global capital markets. The recent pace of liberalization in Korea post-crisis is also intensifying the country's extent of international financial integration. The lower middle-income Southeast Asian countries, Thailand and Indonesia as well as the Philippines, are relatively less financially integrated, though evidence suggests a gradual movement towards enhanced integration. The evidence on Malaysia is mixed, while there is limited evidence on Taiwan to offer any firm conclusion at this stage. While not tested here due to data limitations, it is expected that the other smaller economies in Southeast Asia (Brunei, Cambodia, Vietnam, Laos and Myanmar) are relatively segmented from regional let along international capital markets. As these countries continue with their ongoing liberalization efforts, one would expect their effective degree of financial integration to intensify.

Notwithstanding this conclusion, as has been repeatedly emphasized, there is no unambiguous definition or measure of international financial integration in the literature. Given the multiplicity of definitions of financial integration, an important area for future research would be to develop a multivariate methodology (such as Principal components

and, as such, fewer cointegrating relationships are found. (for details, see Stock and Watson, 1988)

analysis) to reduce the multi-dimensionality of the concept of financial integration (i.e. system of several variables) to an operational univariate measure. An initial attempt to do this has been made by Takagi and Hirose (2002). Their measure of financial integration includes five variables: exchange rate volatility, PPP deviations, UIP deviations, trade intensity and consumption correlations¹⁹. The technique allows one to combine the effects of these five components to form a single measure by effectively letting the data tell the researcher how much weight each individual measure has in determining the overall measure. There is much scope to extend this line of research though data constraints remain a constant problem. It is equally important to undertake more detailed studies on the legal, institutional and other barriers that hinder the free movement of cross-border capital.

¹⁹ For the explanations behind the selection of these, see Section 2 of Takagi and Hirose (2002).

References

- Baxter, M. and M. Crucini (1993). "Explaining Saving-Investment Correlations", American Economic Review, 83, pp.416-36.
- Bayoumi, T. (1997). Financial Integration and Real Activity, Manchester: Manchester University Press.
- Bekaert, G, C. Harvey and R. Lumsdaine (2002). "The Dynamics of Emerging Market Equity Flows", Journal of International Money and Finance 21, pp.295-350.
- Bird, G. and R. Rajan (2000). "Restraining International Capital Flows: What does it Mean?", Global Economic Quarterly, 1, pp.57-80.
- Bird, G. and R. Rajan (2001). "Banks, Financial Liberalisation and Financial Crises in Emerging Markets", The World Economy, 24, pp.889-910.
- Bird, G. and R. Rajan (2002a). "The Evolving Asian Financial Architecture", Princeton Essays in International Economics No.226, International Economics Section, Princeton University, March.
- Bird, G. and R. Rajan (2002b). "Regional Arrangements for Providing Liquidity in a Financial Crisis?: Developments in Asia", Pacific Review, 15, pp.359-79.
- Calvo G., L. Leiderman and C. Reinhart (1996). "Inflows of Capital to Developing Countries in the 1990s", Journal of Economic Perspectives, 10, pp.123-39.
- Chang, L.L. and R. Rajan (2001). "The Economics and Politics of Monetary Regionalism in Asia", ASEAN Economic Bulletin, 18, pp.103-18.
- Chinn, M. and M. Dooley (1995). "Asia-Pacific Capital Markets: Integration and Implications for Economic Activity", Working Paper No.5280, NBER.
- Chinn, M. and J. Frankel (1992). "Financial Links Around the Pacific Rim: 1982-1992", in R. Glick (ed.), Exchange Rate Policies in Pacific Basin Countries, Cambridge: Cambridge University Press.
- Chung, P. and D. Liu (2004). "Common Stochastic Trends in Pacific Rim Stock Markets", Quarterly Review of Economics and Finance, 34, pp.241-59.
- de Brower, G. (1999). Financial Integration in East Asia, Cambridge: Cambridge University Press.
- Dooley, M., J. Frankel and J. Mathieson (1987). "International Capital Mobility: What do Saving-Investment Correlations Tell Us?", IMF Staff Papers, 34, pp.871-83.
- Dooley, M. and P. Isard (1980). "Capital Controls, Political Risks, and Deviations from Interest Parity", Journal of Political Economy, 88, pp.370-84.

Dooley, M. and D. Mathieson (1994). "Exchange Rate Policy, International Capital Mobility and Monetary Policy Instruments", in R. Glick and W. Mathieson (eds.), Exchange Rate Policy and Interdependence, Cambridge: Cambridge University Press.

Dungey, M. and D. Zhumabekova (2001). "Testing For Contagion Using Correlations: Some Words of Caution", Working Paper No.PB01-09, Center for Pacific Basin Monetary and Economic Studies, Federal Reserve Bank of San Francisco.

Edison, H and E. Warnock (2001). "A Simple Measure of the Intensity of Capital Controls", International Finance Discussion Papers No.708, Board of Governors of the Federal Reserve. Forthcoming in Journal of Empirical Finance.

Edwards, S. and M. Khan (1985). "Interest Rate Determination in Developing Countries", IMF Staff Papers, 32, pp.377-403.

Fama, E. and K. French (1993). "Common Risk Factors in the Returns on Stocks and Bonds", Journal of Financial Economics, 33, pp.3-56.

Feldstein, M. (1983). "Domestic Savings and International Capital Movements in the Long-run and the Short-run", European Economic Review, 21, pp.129-51.

Feldstein, M. and C. Horioka (1980). "Domestic Saving and International Capital Flows", Economic Journal, 90, pp.314-29.

Flood, R. and A. Rose (2002). "Uncovered Interest Parity in Crisis", IMF Staff Papers, 49, pp.252-65.

Forbes, K. and R. Rigobon (2001). "No Contagion, Only Interdependence: Measuring Stock Market Co-Movements", Working Paper No.7267, NBER.

Francis B., I. Hasan and D. Hunter (2002). "Emerging Market Liberalization and the Impact on Interest Rate Parity", Journal of International Money and Finance, 21, pp.931-56.

Frankel, J. (1991). "Quantifying International Capital Mobility in the 1980s", in B. Bernheim and J. Shoven (ed.), National Saving and Economic Performance, Chicago: University of Chicago Press.

Frankel, J. and C. Okwongu (1996). "Liberalized Portfolio Capital Inflows in Emerging Markets: Sterilization, Expectations and the Incompleteness of Interest Rate Convergence", International Journal of Finance and Economics, 1, pp.1-23.

Frankel J. and S.J. Wei (1994). "Yen Bloc or Dollar Bloc?: Exchange Rate Policies of the East Asian Economies", in T. Ito and A. Krueger (eds.), Macroeconomic Linkage: Savings, Exchange Rates, and Capital Flows, Chicago: University of Chicago Press.

Froot, K. and R. Thaler (1990). "Anomalies: Foreign Exchange", Journal of Economic Perspectives, 4, pp.179-92.

Fujii, E and M. Chinn (2001). "Fin de Siecle Real Interest Parity", Journal of International Financial Markets, Institutions and Money, 11, pp.289-308.

Gerard, B., K. Thanyalakpark and J. Batten (2002). "Are the East Asian Markets Integrated? Evidence from ICAPM", mimeo (May).

Grilli, V and G.M. Milesi-Ferretti (1995). "Economic Effects and Structural Determinants of Capital Controls", IMF Staff Papers, 42, pp.517-51.

Hashimi, A. and X. Liu (2001). "Interlinkages Among Southeast Asian Stock Markets", mimeo (December).

Hernandez L. and P. Montiel (2001). "Post-Crisis Exchange Rate Policy in Five Asian Countries: Filling in the 'Hollow Middle'?", Working Paper No.01/170, IMF.

Isaksson, A. (2001). "Financial Liberalization, Foreign Aid, and Capital Mobility: Evidence from 90 Developing Countries", Journal of International Financial Markets, Institutions and Money, 11, pp.309-38.

Johnston, R., M. Swinburne, A. Kyei, B. Laurens, D. Mitcham, I. Otker, S. Sosa and N. Tamirisa (1999). "Exchange Rate Arrangements and Currency Convertibility: Development and Issues", World Economic and Financial Surveys, Washington DC: IMF, Chapter 7.

Kasa, K. (1992). "Common Stochastic Trends in International Stock Markets", Journal of Monetary Economics 29, pp.95-124.

Khalid, A. (1999). "Modelling Money Demand in Open Economies: The Case of Selected Asian Countries", Applied Economics, 31, pp.1129-35.

Le, H.G. (2000). "Financial Openness and Financial Integration", Working Paper No.00-4, Asia Pacific School of Economics and Management, Australia National University.

Lim Y.S. (2002). "Exchange Rates, Exchange Rate Volatility and Capital Flows for Selected Southeast Asian Countries", Honours Thesis, Department of Economics, National University of Singapore.

MacDonald, R. and M. Taylor (1992). "Exchange Rate Economics", IMF Staff Papers, 39, pp.1-57.

Madarassy, R. and M. Chinn (2002). "Free to Flow? New Results on Capital Mobility Amongst the Developed Countries", mimeo (August).

Manning, N, (2002) "Common Trends and Convergence? South East Asian Equity Markets, 1988-1999", Journal of International Money and Finance 21, pp.183-202.

Mathieson, D. and C. Rojas-Suarez (1993). "Liberalization of the Capital Account", Occasional Paper No.10, IMF.

McCallum, B. (1994). "A Reconsideration of the Uncovered Interest Parity Relationship", Journal of Monetary Economics, 33, pp.105-32.

McKinnon R. (2000). "The East Asian Dollar Standard, Life After Death", Economic Notes 29, pp.31-82.

Meredith, G. and M. Chinn (1999). "Long-Horizon Uncovered Interest Parity", mimeo (May).

Morck, R, B. Yeung and W. Yu (2000). "The Information Content of Stock Markets: Why do Emerging Markets Have Synchronous Stock Price Movements?", Journal of Financial Economics, 58, 215-60.

Montiel, P. (1994). "Capital Mobility in Developing Countries: Some Measurement Issues and Empirical Estimates", World Bank Economic Review, 8, pp.311-50.

Moon, W-S, (2001), "Currency Crisis and Stock Market integration: A Comparison of East Asian and European Experiences", Journal of International and Area Studies, 8, pp.41-56

Morley, B. and E. Pentecost (1998). "Asset Pricing and Foreign Exchange Risk: Econometric Evidence for the G7", Journal of international Money and Finance, 17, pp.317-29.

Nitithanprapas, I., S. Rongala and T. Willett (2002). "The Role of Capital Controls and Currency Regimes in the Asian Crisis", Working Paper No.2002-21, The Claremont Colleges, California.

Obstfeld, M. (1986). "Capital Mobility in the World Economy: Theory and Measurement", Carnegie-Rochester Conference Series on Public Policy, 24, pp.55-104.

Obstfeld, M. (1995). "International Capital Mobility in the 1990s", in P. Kenen (ed.), Understanding Interdependence: The Macroeconomics of the Open Economy, Princeton: Princeton University Press.

Obstfeld, M. (1998). "The Global Capital Market: Benefactor or Menace?", Journal of Economic Perspectives, 12, pp.9-30.

Park, W. and G. Choi (2002). "Assessment of Korea's Financial Liberalization", mimeo (October).

Park, Y.C. and K.H. Bae (2002). "Financial Liberalization and Economic Integration in East Asia", paper presented at the PECC Finance Forum Conference on "Issues and Prospects for Regional Cooperation for Financial Stability and Development" (Hawaii, August 11-13).

Phylaktis, K and F Ravazzolo (2002). "Measuring Financial and Economic Integration with Equity Prices in Emerging Markets", Journal of International Money and Finance, 21, 879-903.

Rajan, R. (2001). "(Ir)relevance of Currency-Crisis Theory to the Devaluation and Collapse of the Thai Baht", Princeton Studies in International Economics No.88, International Economics Section, Princeton University.

Rajan, R. (2003). "Safeguarding Against Capital Account Crises: Unilateral, Regional and Multilateral Options for East Asia", in G. de Brouwer (ed.), Financial Arrangements in East Asia, London: Routledge.

Rajan R. and R. Siregar (2002). "Boom, Bust and Beyond", in G. de Brouwer (ed.), Financial Markets and Policies in East Asia, London: Routledge.

Rajan, R, R. Siregar and G. Bird (2002). "Capital Flows and Regional Financial Interdependencies in the Context of Crises: Evidence From East Asia", Discussion Paper No. 02/19, Center for International Economic Studies, University of Adelaide.

Rajan, R., R. Siregar and S.W. Goo (2003). "How Effective Have Malaysia's Capital Controls Been?: Revisiting the Macroeconomic Evidence", in progress.

Rajan, R., R. Siregar and I. Sugema (2003). "Capital Flows and the Credit Transmission Channel in Southeast Asia", Journal of International Development, 15, pp.265-83.

Stock, J. and M. Watson (1988). "Testing for Common Trends", Journal of the American Statistics Association 83, pp.179-97.

Takagi, S. and K. Hirose (2002). "Grouping Financially Integrated Economies in East Asia and the Pacific: A Multivariate Approach", mimeo (September).

Taylor, A. (2002). "A Century of Current Account Dynamics", Working Paper No.8927, NBER.

Willett, T., M. Keil and Y.S. Ahn (2002). "Capital Mobility for Developing Countries May Not be So High", Journal of Development Economics, 68, pp.421-34.

Table 1: Covered Interest Differentials (CIDs), 1982-87

Country	Mean CID	Std Dev
Hong Kong	0.13	0.03
Japan	0.09	0.03
Malaysia	-1.46	0.16
Singapore	-0.30	0.04

Source: Frankel (1991)

Table 2: Covered Interest Parity (CIP), 1985-94

Country	$\alpha = 0$, (St Dev)	$\beta = 1$, (St Dev)
Hong Kong	-0.04 (0.01)	0.97 (0.05)
Japan	-0.01 (0.002)	1.01 (0.05)
Malaysia	0.14 (0.03)	0.87 (0.03)
Taiwan	0.00 (0.04)	0.59 (0.20)
Thailand	-0.30 (0.16)	0.99 (0.05)
Singapore	0.20 (0.03)	0.96 (0.03)

Source: de Brouwer (1999)

Table 3: Uncovered Interest Parity (UIP) and Uncovered Interest Differentials (UIDs), 1985 - 1994

Country	$\alpha = 0$	$\beta = 1$	UID
Hong Kong	-0.04 (0.03)	-0.29 (0.07)	0.06 (0.05)
Indonesia	0.90 (0.12)	0.02 (0.07)	-0.69 (0.13)
Japan	-2.80 (0.65)	-2.41 (0.75)	-0.71 (0.64)
Korea	-0.10 (0.23)	0.58 (0.15)	-0.59 (0.22)
Malaysia	-0.51 (0.19)	-1.04 (0.20)	0.49 (0.29)
Philippines	0.34 (1.15)	0.23 (0.37)	-1.83 (0.55)
Singapore	2.03 (0.40)	-2.29 (0.47)	0.02 (0.25)
Taiwan	0.14 (0.20)	1.25 (0.22)	-0.58 (0.24)
Thailand	-0.34 (0.20)	0.14 (0.20)	0.71 (0.16)

Note: * = Statistical significance at the 5 percent level.

Source: de Brouwer (1999)

Table 4: Uncovered Interest Parity (UIP), 1990s

Country	$\beta = 1$ (Std. Dev)
Hong Kong	-0.35 (0.18)
Indonesia	0.22 (2.05)
Japan	-0.82 (1.36)
Korea	3.41 (4.12)
Thailand	0.52 (1.86)

Source: Flood and Rose (2001)

Table 5: Uncovered Interest Differentials (UIDs), 1975-95

Country	Pre-Liberalization	Post-liberalization
Korea	-0.068	0.112
Malaysia	-0.353*	-0.141
Thailand	-0.096	0.005

Source: Francis, Hasan and Hunter (2002)

Table 6: Uncovered Interest Differentials (UIDs) (in percent)
(Period 1: January 1995 - December 1996;
Period 2: January 1998 - December 1999;
Period 3: January 2000 - June 2002)

A. Domestic Economy: Indonesia

Foreign Countries	Period 1	Period 2	Period 3
Malaysia	2.98	21.4	0.04
Philippines	2.53	20.6	2.80
Singapore	4.83	24.7	3.30
Thailand	1.98	17.8	3.60
Korea	5.26	13.1	2.04
China	1.02	23.4	0.60
Hong Kong	3.84	22.8	-0.03
Average	3.21	20.54	1.76

B. Domestic Economy: Thailand

Foreign Countries	Period 1	Period 2	Period 3
Malaysia	1.01	2.74	-3.38
Philippines	0.54	1.73	-0.78
Singapore	2.85	5.99	-0.56
Indonesia	-1.98	-17.8	-3.60
Korea	3.27	-4.81	-1.76
China	-0.96	5.09	-2.82
Hong Kong	1.73	4.40	-3.44
Average	0.92	-0.38	-2.33

C. Domestic Economy: Malaysia

Foreign Countries	Period 1	Period 2	Period 3
Indonesia	-2.98	-21.40	-0.04
Philippines	-0.45	-0.65	2.80
Singapore	1.85	3.53	2.44
Thailand	-1.01	-2.74	3.38
Korea	2.41	-7.11	1.37
China	-1.96	2.68	0.56
Hong Kong	0.66	1.99	-0.07
Average	-0.21	-3.39	1.49

D. Domestic Economy: Philippines

Foreign Countries	Period 1	Period 2	Period 3
Indonesia	-2.53	-20.6	-2.80
Malaysia	0.45	0.65	-2.80
Singapore	2.28	4.00	0.02
Thailand	-0.54	-1.73	0.78
Korea	2.87	-6.21	-1.13
China	-1.51	3.08	-2.24
Hong Kong	1.44	2.39	-2.86
Average	0.35	-2.63	-1.58

E. Domestic Economy: Singapore

Foreign Countries	Period 1	Period 2	Period 3
Indonesia	-4.83	-24.70	-3.30
Philippines	-2.28	-4.00	-0.02
Malaysia	-1.85	-3.53	-2.44
Thailand	-2.85	-5.99	0.56
Korea	0.54	-10.44	-0.45
China	-3.79	-0.86	-1.94
Hong Kong	-1.23	-1.55	-2.57
Average	-2.33	-7.30	-1.45

F: Domestic Economy: Korea

Foreign Countries	Period 1	Period 2	Period 3
Indonesia	-5.26	-13.10	-2.04
Philippines	-2.87	6.21	1.13
Malaysia	-2.41	7.11	-1.37
Thailand	-3.27	4.81	1.76
Singapore	-0.54	10.44	0.45
China	-4.37	9.65	-1.31
Hong Kong	-1.92	8.95	-1.94
Average	-2.95	4.87	-0.47

G: Domestic Economy: China

Foreign Countries	Period 1	Period 2	Period 3
Indonesia	-1.02	-23.40	-0.60
Philippines	1.51	-3.08	2.24
Malaysia	1.96	-2.68	-0.56
Thailand	0.96	-5.09	2.82
Singapore	3.79	0.86	1.94
Korea	4.37	-9.65	1.31
Hong Kong	2.68	-0.69	-0.63
Average	2.04	-6.25	0.93

H: Domestic Economy: Hong Kong

Foreign Countries	Period 1	Period 2	Period 3
Indonesia	-3.84	-22.80	0.03
Philippines	-1.44	-2.39	2.86
Malaysia	-0.66	-1.99	0.07
Thailand	-1.73	-4.40	3.44
Singapore	1.23	1.55	2.57
Korea	1.92	-8.95	1.94
China	-2.68	0.69	0.63
Average	-1.03	-5.47	1.65

Source: Authors' own calculation

Table 7: Decomposition of Real Interest Parity Differentials (RIDs), 1980-94

Country	RID	UID	PPP
Hong Kong	1.03* (0.13)	0.05 (0.07)	-0.98* (0.15)
Indonesia	-0.70* (0.29)	-0.81* (0.20)	-0.11 (0.26)
Japan	0.11 (0.11)	-0.94 (0.87)	-1.05 (0.85)
Korea	-0.62* (0.18)	-0.65* (0.27)	-0.03 (0.29)
Malaysia	0.05 (0.14)	0.48 (0.34)	0.43 (0.32)
Philippines	-1.73* (0.35)	-1.97* (0.62)	-0.24 (0.57)
Singapore	0.26* (0.10)	-0.04 (0.31)	-0.30 (0.33)
Taiwan	-0.24 (0.18)	-0.49 (0.36)	-0.25 (0.43)
Thailand	-0.47* (0.20)	-0.93* (0.23)	-0.46 * (0.18)

Note: * = Statistical significance at the 5 percent level.

Source: de Brouwer (1999)

Table 8: Savings-Investment Correlations for East Asia, 1970-90

Country	Ordinary Least Squares (OLS)			Instrumental Variables (IV)		
	Levels	First Difference	Error Correction	Levels	First Difference	Error Correction
Indonesia	0.82 ^a	0.23 ^b	0.20 ^b	1.37 ^a	-0.04 ^b	0.23
Korea	0.35 ^c	0.15 ^b	-0.37 ^b	0.31 ^c	0.50	0.07 ^b
Malaysia	0.24	0.11 ^c	-0.06 ^b	0.41	0.08 ^b	0.08 ^b
Philippines	1.16 ^c	0.56 ^c	0.45 ^c	1.04 ^a	0.49 ^c	0.67 ^c
Singapore	0.06 ^b	0.08 ^b	0.17 ^b	-	-	-
Thailand	0.72 ^c	0.62 ^c	0.55 ^c	-0.53	-0.11	-0.30

Notes: - Not available

a) Different from zero at the 5 percent level.

b) Different from one at the 5 percent level.

c) Different from both zero and one at the 5 percent level.

Source: Montiel (1994)

Table 9: Savings-Investment Correlations for East Asia, 1976-96

Country	F-H Coefficient
China	0.90
Hong Kong	0.80
Indonesia	1.02
Korea	0.20
Malaysia	0.21
Philippines	0.51
Singapore	0.87
Thailand	1.35

Source: Le (2000)

Table 10: Saving and Investment Rates, 1975-1995

Country	Saving Rate	Investment Rate	S-I
China	35.53	36.32	-0.79
Hong Kong	28.32	33.17	-4.85
Indonesia	28.12	25.99	2.13
Korea	32.73	30.58	2.15
Malaysia	33.28	30.56	2.72
Philippines	24.87	22.06	2.81
Singapore	39.69	40.29	-0.60
Thailand	32.51	27.49	5.02
Average	31.88	30.81	1.07

Source: Isaksson (2001)

Table 11: Degree of Capital Controls (Johnston et al. Index)

Year	Indonesia	Korea	Malaysia	Thailand
1995	0.53	0.68	0.71	0.72
1996	0.53	0.67	0.71	0.72
1997	0.51	0.58	0.71	0.70
1998	0.48	0.48	0.76	0.70
1999	0.49	0.42	0.76	0.70

Source: Park and Bae (2002)

Table 12: Granger Causality Test Results
(only those results significant at 5%)

Pre-Crisis	Post-Crisis
US → Japan	US → Japan
US → Singapore	US → Singapore
US → Malaysia	US → Malaysia
US → Thailand	US → Thailand
US → Indonesia	US → Indonesia
Indonesia → US	US → Philippines
US → Philippines	Singapore → Malaysia
Singapore → Thailand	Singapore → Thailand
Singapore → Indonesia	Thailand → Singapore
Singapore → Philippines	Singapore → Philippines
Malaysia → Thailand	Philippines → Singapore
Malaysia → Indonesia	Malaysia → Philippines
Malaysia → Philippines	Philippines → Malaysia
Thailand → Indonesia	Thailand → Indonesia
Thailand → Philippines	Indonesia → Thailand
Indonesia → Philippines	Thailand → Philippines
Philippines → Indonesia	Philippines → Thailand
Singapore → Japan	Indonesia → Philippines
Thailand → Singapore	Philippines → Indonesia
	Indonesia → Singapore
	Indonesia → Malaysia

Note: All of these findings are with 2 lags. Source: Hashmi and Liu (2001)
Source: Authors

Table 13: Variance Decompositions (in %)

	Pre-Crisis		Post-Crisis	
	Domestic	Singapore	Domestic	Singapore
Malaysia	56	39	84	9
Thailand	83	12	71	20
Indonesia	74	14	75	15
Philippines	82	10	67	16

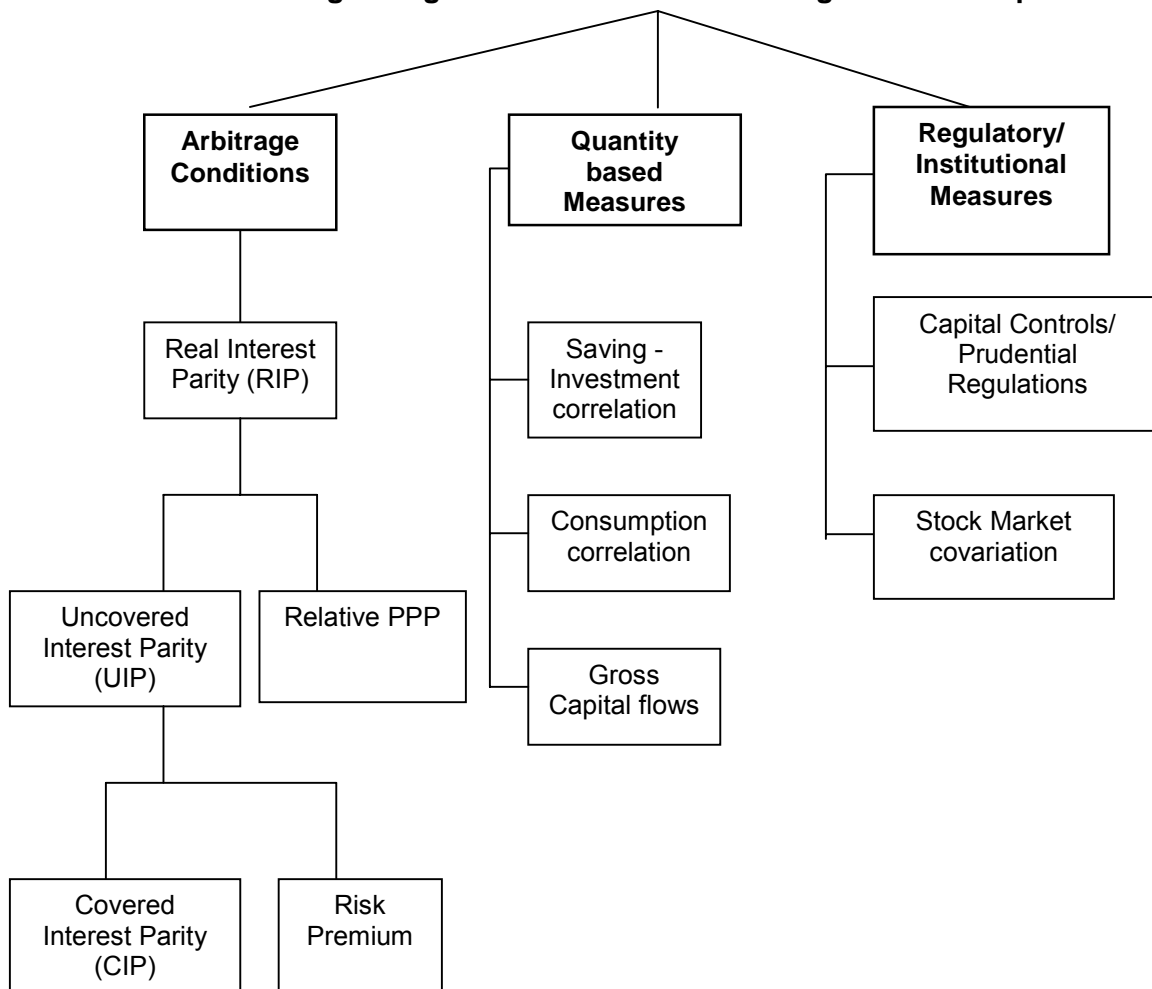
Source: Hashmi and Liu (2001)

Table 14: Variance Decomposition (in %)

Country	Pre-crisis	Crisis	Post-crisis
Japan	5.64	3.62	18.75
Korea	0.07	0.37	14.61
Taiwan	0.50	3.83	6.07
Malaysia	4.32	0.25	14.82
Singapore	2.91	3.69	23.07
Philippines	2.95	3.83	14.46
Hong Kong	3.97	5.14	14.65
Indonesia	2.44	2.56	3.40
Thailand	1.69	1.83	13.58

Source: Moon (2001)

Figure 1
Categorizing Measures of Financial Integration: A Simple Framework



Source: Authors

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