Financial Systems Integration In East-Asia: The Uncovered Interest Parity Condition

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ABSTRACT

The paper investigates financial system integration in selected East-Asian countries (ASEAN5+3) under the Uncovered Interest Parity (UIP) hypothesis. The global vector autoregressive Model (GVAR) is used on the quarterly data of interest rate, exchange rate; real outputs, prices and equity prices over the period of 1979Q2 to 2011Q4 for 33 countries. Contemporaneous effect of foreign variables on domestic counterparts is estimated to identify the level of linkages across the variables. The result shows high linkages in equity prices and real output than on short-term interest rate and inflation rate. On the UIP, restrictions are imposed on the generated cointegration vectors based on the respective long-run theories. The result does not support the holding of UIP and by implication;nofinancial system integration in the ASEAN5+3 countries, thus restriction to capital mobility is still high. Although the analysis does not consider the sensitivity of the term-structure of the interest rate (as only the short-term interest rate is observed), it is advisable for further research to consider long-term interest rate. It is also recommended for the respective policymakers to observe the way their short-term interest rate are related.

Key Words: Financial Integration, Uncovered Interest Parity, ASEAN5, Global VAR

INTRODUCTION

The integration of financial systems became a subject of concern to international

economic observers and policymakers. A well-integrated financial market smoothen country's consumption pattern and attract productivity-enhancing investment from abroad, thereby propelling economic growth. With integration, the financial instruments across countries becomes perfect substitutes of one another at less significant cost, making capital flow across borders in respond to market forces of demand and supply. In such a situation, differences in financial prices for any two identical assets across countries will be arbitrage away by rational agents. Having varieties of assets classes traded, of course the measurement of such kind activity is not going to be straight forward(Kalemli-Ozcan et al., 2008). It is sequel to this reason that measures of financial integrations are done in three broad categories in the empirical literatures(see Frankel, 1992; Rajan, 2003). The first is the price-based measure which includes; the real interest parity approach, uncovered interest parity, covered interest parity and the co-movement of stock market returns . The second category is the quantity-based approach, measuring the saving-investment correlations, consumption correlations, current account dynamics and gross capital flows . The third category is the regulatory approach which observes the extent of country's capital control and prudential regulations on institutions such as cross listing of equities, creation of regional capital market.

Whatever approach one may adopt, financial integration isalldriven by the reduced constraint on factorvariables such as interest rate, exchange rates and government stringent regulations, which eventually eliminate all arbitraging activities in the long run and facilitate easy accessibility of financial resources from surplus areas to scarce location without effective transaction cost. This understanding triggered countries to embrace different policy measures. In East-Asia two fundamental policy approaches were realized over the years; Abolishing con¬straints towards capital mobility and secondly initiating regional ties to better handle the risk of cross-border financial contagions.

I n the first-stage, exchange rates were liberalized and capital accounts were opened. Exchange controls and ceilings on deposits and lending rates were reduced; Japan deregulated its interest rate in 1979; Malaysia had its own in 1978, Singapore 1975, Hong Kong 1973, while Indonesia, Philippines and Sri Lanka deregulated in early 1980s. Taiwan, Thailand and South Korea abolished their interest rate ceiling in the mid-1980s. Similarly, the late 1980s experienced opening up of capital account in the region. Restrictions on foreign asset holding by residents were relaxed and private sectors were allowed to have external finance.The second approach which was the formation ofregional economic unions includes the Asian Bond (AB), Asian Bond Markets Initiative, Asian Monetary Fund (AMF), Chiang Mai Initiative (CM), New Mihazewa (NM) and Asian Free Trade Association (AFTA).

This study investigates the holding of UIP in East-Asia with the mean to identify the extent of financial integration in the region. The Asian financial crisis of 1997 has led to a remarkable restructuring of the countries' economic fundamentals. The crisis which was referred to as a 'capital account crisis' triggered largely by excessive speculations, resulted to a massive movements of

capital out of the region.To avoid similar crisis, intensified efforts at accelerating within regional capital flow at the expense of overreliance of capital from outside the region, is made. Pertinent question now relate towhether the Asian financial crisis has altered the course offinancial integration in the regionandsequel to the apparent reduction in constraints to capital mobility what is the status of the international capital mobility in the region.

More still, this research work intent to be different in approach with other previous studies on UIP especially for the East-Asian countries. This research work uses the GVAR model introduced in Pesaran (2004) to cater for the global dimension of the relationship between the component variables. Financial integration being an international phenomenon requires a consistent and parsimonious model that reflects the fabrics of interdependencies across countries. Unfortunately most econometric models lacked such a coherent global dimension, thereby casting doubt on the plausibility of their resultsPesaran and Smith (2006), even in panel analysis, the countries that composed the panels are often treated as independent units, ignoring cross-country spillovers (Bussie're et al., 2009). On this note, the use of Global Vector Autoregressive (GVAR) becomes primary to the conduct of this study.

The work is structured in to five sections. With introduction in the section one, section two dwelled on the theoretical and empirical literature. While section three discusses the work methodology, results with analysis are presented in section four. Conclusion and recommendation is given in section five.

LITERATURE REVIEW

The Uncovered Interest Parity

Uncovered Interest Parity (UIP) is one of the corner stones of international fi¬nance used in measuring the status of financial integration among countries. The other arbitrage parity conditions are the real interest parity (RIP), Covered In¬terest Parity (CIP) and the Parity purchasing power (PPP). Uncovered Interest Parity hypothesis asserts that the return to investment on a domestic financial asset is equal to the expected return on investment on a comparable foreign finan¬cial asset converted to a domestic currency value. It is an equilibrium condition where exchange rate movement plays a vital adjustment role in equating interest rate differentials and which by extension equilibrates returns to investment in two different countries. If UIP holds it means any differential in interest rates across countries are offsetted by changes in the expected exchange rate and that no room for arbitrage opportunities. Any short-run deviation from the equilibrium condition is considered temporary and will be restored back through exchange rate adjustment. Such deviations, however, may be caused by the transaction cost, risk premium and speculative effects.

The joint assumptions underlying the UIP hypothesis are the rational expec¬tations, risk neutrality, free capital mobility and the absence of taxes on

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capital transfers (Baillie and Bollerslev, 2000). With these assumptions holding, equi¬librium of UIP implies high financial integration among the respective countries. It implies that in international financial market equilibrium, abnormal arbitrage profit is equal to zero.

In essence, for exchange rate adjustment to be effective in restoring UIP con¬dition; capital mobility has to be perfect and domestics and foreign assets easily substitutable with investors that are risk neutral with rationale expectation behaviors. When these occurred then tendency for arbitrage profit will diminished and the economies are said to be financially integrated. This in the context of market efficiency referred to as satisfying the Weak and Semi-Strong form of the Efficient Market Hypothesis where regulation to international financial transac¬tion and capital flow are eliminated, information on exchange rate conditions are freely available. In the contrary, when there are foreign market inefficiencies, with risk-averse investors, behaving in an irrational expectation manner, the scope for abnormal arbitrage profit in the international financial transaction will always be there.

The UIP model can be presented as:

$$(1+R) = (1+R_t^*)\left(\frac{1+E_{t+1}^e - E_t}{E_t}\right) exp(\delta_{uip,t+1}) \qquad (2.1)$$

$$(1+R) = (1+R_t^*)\left(\frac{E_{t+1}^e}{E_{t+1}}\right)\left(1+\frac{\Delta E_{t+1}}{E_t}\right) exp(\delta_{uip,t+1}) \qquad (2.2)$$

Where R and $R_t^*$are nominal interest rates paid on domestic and foreign assets respectively during period $t.\left(1+\frac{\Delta E_{t+1}}{E_t}\right)$is the expected rate of depreciation $\delta_{uip,t+1}$is the risk premium associated with exchange rate uncertainties, political risk, transaction cost etc. it is assumed to be stationary and ergodic. Following the rational expectation hypothesis we assume that the expected errors and the expected rate of depreciation are stationary, the UIP can therefore be derived as follows:

$$(1+R) - (1+R_t^*)\left(\frac{E_{t+1}^e}{E_{t+1}}\right) \sim I(0) \qquad (2.3)$$

Equation 2.3 therefore shows that for uncovered interest parity to be satisfied the foreign and domestic investment returns must be equal, through exchange rate adjustment. Thus, in the long run the domestic and foreign exchange rates are expected to be cointegrated.

Interest Parity Conditions

Numerous empirical investigations are carried out to identify the level of financial integration through the holding of the interest rate parity conditions. This is because of the general believe that financial system integration is a requisite to the holding of such interest parity conditions (real interest, uncovered interest and covered interest parity conditions).The equality between the real interest rate across countries means higher capital mobility and higher differentials signifies absence of perfect capital mobility. The drive to such equality however is

ensured by the adjustment role of respective interest rates, exchange rates and prices. Theoretically, such relationship is defined in the context of interest parity conditions; the real interest parity condition (RIP), the covered interest parity (CIP) and the uncovered interest parity (UIP). Numerous empirical literatures can be found investigating whether these conditions applies to a country or number of countries.

Azali and Chin (2009) investigated the status of financial integration among ASEAN+3 countries with the view to identifying the effect of Asian crisis on the exchange rate convergence on the region. Using cointegration analysis in pre-crisis, crisis and post crisis periods, the result shows no cointegration at the pre-crisis period. However, at the crisis and post crisis times, evidence of cointegration in some of the countries in the region is shown. In a similar study, Baharumshah et al. (2005) conducted panel study on real interest parity for Asian countries, revealing the status of financial integration in both the pre and post financial liberalization pe¬riods. The result shows that, the real interest rate differentials (between each of the country and Japan) show mean reverting behavior and characterized by long-memory dynamics. With the half-life of 6-7 months the study revealed that there is relatively weaker financial integration compared to Europe. However, there is a strong real interest parity (RIP) and indeed financial integration between the respective countries and Japan, suggesting that Japan stands a better chance to stair the group in the event of cooperation. It also revealed that Asian crisis of 1997/98 had no effect on the status of the RIP and upheld the use of Panel unit root test as against single-equation base ADF- test. This work is similar to Holmes (2002) on EU countries where RIP holds with half-life of random shock to parity at 2-3 months. As improvement to Baharumshah et al. (2005), Baharumshah et al. (2011) conducted an in-depth study on the extent of financial integration among the East Asian countries, Japan and the US. The result from the SUADF revealed that real interest parity condition holds for the East Asian countries including China. Reckoning the inherent structural breaks in the analy¬sis, the behavior of the domestic interest-rate of East Asian countries are found to be determined by the powerful countries of Japan and US.

In another development, Cheung et al. (2006) focus on long-term yield to in-vestigate the evidence of RIP across the G-7 countries. Their result show that the evidence of RIP is term-horizon-specific, it holds better in long-time horizon than in the short-term horizons. This study is in congruent with the work of Holmes et al. (2011b) that the longer period maturity of interest rate favours RIP. The work of Lothian and Wu (2011) tries to resolve the puzzle identified with UIP since the advent of the floating exchange rates in early 1970s. Empirical litera¬tures have shown that the assertion of UIP that countries with higher interest rate would have lower expected currency appreciation does not hold. The paper on its resolve identified that the reason for the negative and statistically different from zero- the coefficient of UIP equation might be the results of small sample property and the influence of high inflation expectations that characterized the periods of late 1970s and 1980. The study also found that UIP holds over the long run and reversion

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to parity becomes strong when the deviation is large. In this same line another study Swofford (2000) observed that the majority of the empirical litera¬tures on the UIP were predominantly on the data from the developed economies and that to him might be the cause of the rejection of UIP. To avoid what he belief as a specification error, data on the developing ASEAN-5 were analysed using the heterogeneous panel co integration test. The result points that the gross domestic returns and the uncovered gross foreign returns are co integrated in the long run. The long run cointegrating coefficients are then estimated using the FMOLS and DOLS. The result revealed that only Singapore satisfied the UIP.

Bekaert et al. (2007)also studied on the relationship between the uncovered interest rate parity and the expectation hypothesis (EHTS) of the term structure at different time horizons. Using VAR on exchange rate changes, interest rates and term spreads for three developed economies, four important findings were identified: that evidence against UIP is mixed and it is currency- specific not horizon-dependent, the evidence against EHTS is more pronounced than the evidence against UIP and this applies to both country and horizon differences. The findings also revealed that deviation from EHTS are not economically important, thus analyzing the effect of policy experiment under the null of the EHTS may be useful. In line with the Bekaert et al. (2007), Holmes et al. (2011b)work concen¬trates on the test of expectation hypothesis of the term structure of some of the Asian countries. The study observed the relationship between the long and short term interest rates. Using panel stationarity test on the interest spread the study could not reject the fact that the long term interest is the average of current and expected future short rates, the spread appeared stationary for the countries. The finding shows that influencing short term interest rate through monetary policy by the respective central banks could lead to long term determination of interest rates.

In seeking for the reason behind deviation from real interest parity lot of scholastic explanation have been put forward. One of such explanation is the influence of high transaction cost. Al-Awad and Grennes (2002) conducted a study on the magnitude of transaction cost in various foreign exchange markets. Using the two one-sided t-tests on ten countries the result show that observed transaction cost are too small and could not be a reason for inequality of real interest rate among countries. This is especially true with the increase in the use of information tech¬nology in recent time.

Zurbruegg (2004)used cointegration techniques in identifying the PPP in Asia. The selection of these techniques was informed by the need to determine the structural break inherent in the data. The evidence from the study shows that PPP is robust for most countries even at the period of financial crisis of 1997-1998. The finding also revealed that despite the general results, the countries' respond to the PPP vary with the manner each handled the crisis. More also, Amornthum and Bonham (2011)employed the use of panel data to test for real interest parity (RIP) in the Pacific Basin region and to observe which economy among US and Japan exert more influence on the region. This purpose is simi¬lar

to the study conducted in Baharumshah et al. (2005); Holmes et al. (2002)except that it uses the Panel Analysis of Nonstationarity in Idiosyncratic and Common components (PANIC). The panel according to them is powerful than the univariate country specific counterpart and allows for cross-sectional dependence and the possibility that cross-sectional units are cointegrated. The findings shows that real interest rates difference converged, but unlike in Baharumshah et al. (2005), here the study believed that the convergence is with US rate not with Japan or Europe. Holmes et al. (2011a) study employed the use of Hadri and Rao (2008) Panel approach to test for the validity of RIP for some countries in Asia. According to the study the selection was made for the need to cater for serial correlation, cross-sectional dependency and structural breaks in its stationarity test. The findings of the work revealed that a real interest parity differential in Asia is rejected meaning that no evidence of financial integration in the region. More also, the study warned that assuming cross-sectional independence as done in some panel studies might induce stationarity.

It can easily be seen in the aforementioned literatures that discordant results emerged as to the holding of the interest parity conditions. More also none of the studies considered the interdependencies of the macroeconomic variables in their analysis. This may be a limiting factor considering the important of the country inter-linkages in the individual country decisions. It is one this note that this study applied the GVAR framework in its estimations.

METHODOLOGY

This work uses the Global Vector Autoregressive models of Pesaran et al. (2004) and subsequent improved version in Dees et al. (2007b). The good advantage of the model is that it addresses the problem of structural stability and using average pairwise correlation it accounts for common factor interdependencies among the country-specific variables. The staking of individual augmented country-specific equations in a system reduces the problem of over-parameterizations. Furthermore, the creation of foreign variables out of the trade or financial matrices reduces the problem of parameter instability and at the same time caters for the individual cross-country interdependencies. Above all, the sieve bootstrap procedure developed from the simulation of the model as a whole is used in creating error bounds for the GIRF and serve as critical values in the test of over-identifying restriction and in structural stability test, making inferences from the model more efficient. The model can be specified as follows:
specific variables and w_i is a (k_i+k_i^*)×k link matrix of country-specific weights. Substituting equation (3.4) in to equation (3.3) will therefore yield:

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GVAR model specifications

Following the work of Dees et al. (2007b), consider the following equation

$$\chi_{it} = \theta_{i0} + \phi_{i1t} + \eta_i \chi_{i,t-1} + \Omega_{i0}\chi_{it}^{*} + \Omega_{i1}\chi_{i,t-1}^{*} + \varepsilon_{it} for i = 0,1, \ldots . N;$$

$$t = 1,2, \ldots T \ldots \ldots \quad (3.1)$$

where $\eta_i$is a $k_i \times k_i$ matrix of lagged dependent variables $\chi_{i,t-1}$, Ω_{i0} and Ω_{i1} are $k_i \times ki^{*}$matrices of coefficient of foreign specific variablesχ_{it}^{*} and $\chi_{i,t-1}^{*}$ (contemporaneous and lagged values)[i], and $\varepsilon_{it}$is a $k_i \times 1$ vector of idiosyncratic shocks and is assumed to be serially uncorrelated with zero mean and nonsingular covariance matrix $\varepsilon_{it} \sim iid(0, \Sigma_{ii})$, while $\theta_{i0}\ and\ \phi_{i1t}$ are the coefficient of deterministics; intercept and trend respectively. The stacked foreign and domestic variables can be defined in a vector:

$$H_{it} = \begin{pmatrix} X_{it} \\ \chi_{it}^{*} \end{pmatrix} \quad (3.2)$$

Equation (3.1) can therefore be rewritten as:

$$A_i H_{it} = \theta_{i0} + \phi_{i1t} + B_i H_{i,t-1} + \varepsilon_{it} \quad (3.3)$$

Where$A_i = (I_{ki}, -\Omega_{i0_i})$and $B_i = (\eta_i, \Omega_{i1})$. Combining all the country-specific variables together (both the endogenous and exogenous) in a $k_i \times 1$ global vector yield

$$H_{it} = w_i x_t i = 0,1,2, \ldots \ldots, N \quad (3.4)$$

Where $x_t = (x_{ot}', x_{1t}', x_{2t}', \ldots . x_{Nt}')$ represent all the stacked country specific variables and w_i is a $(k_i + k_i^{*}) \times k$ link matrix of country-specific weights. Substituting equation (3.4) in to equation (3.3) will therefore yield:

$$A_i w_i x_t = \theta_{i0} + \phi_{i1t} + B_i w_i x_{t-1} + \varepsilon_{it} \quad (3.5)$$

Where $A_i w_i$ and $B_i w_i$ are both $k_i + k$- dimensional matrices. Stacking equation (3.5) will therefore yield

$$G x_t = \theta_0 + \phi_{1t} + R x_{t-1} + \varepsilon_t, \quad (3.6)$$

Therefore

$$x_t = G^{-1}\theta_0 + G^{-1}\phi_{1t} + G^{-1} R x_{t-1} + G^{-1}\varepsilon_t, \quad (3.7)$$

As such equation (3.7) can be used for variety of purposes by solving it recursively. For example to obtain a future value of x_t the equation is solved recursively forward.

GVAR Error-Correction Form

From equation (1) since $\chi_{it} = \Delta\chi_{it} - \chi_{it-1}$ we have

$$\Delta\chi_{it} = \theta_{i0} + \phi_{i1t} + (I_{ki} - \eta_i)\chi_{i,t-1} + (\Omega_{i0} + \Omega_{i1})\chi_{i,t-1}^{*} + \Omega_{i0}\Delta\chi_{it}^{*} + \varepsilon_{it}, \quad i = 0,1, \ldots N, \quad (3.8)$$

$$\Delta\chi_{it} = \theta_{i0} + \phi_{i1t} - (A_i - B_i)H_{i,t-1} + \Omega_{i0}\Delta\chi_{it}^{*} + \varepsilon_{it}, \quad (3.9)$$

Therefore, $A_i - B_i$ is the error correction term for country or region i and of the matrix form $k_i \times (k_i + k_i^{*})$ represented as;

$$\Pi_i = A_i - B_i \quad (3.10)$$

where Π_i is the cointegration matrix whose rank order, determines the number of long run relations among the country-specific domestic and foreign variables $\chi_{it} and \chi_{it}^{*}$

Data

The data used in estimation include quarterly variables of real output, rate of inflation, real real exchange rates, equity prices, short term interest rate andoil prices for 33 countries obtaied in GVAR database of Smith and Galesi (2011) for the period 1979Q1 through 2011Q2. The sample countries accounts for over 90% of the global output. Within these sample our analysis focus on the eight East-Asian economies (ASIAN8) including: China Japan South Korea, Malaysia, Singapore, Thailand, Indonesia and Philippines. In line with Dees et al. (2007b), Euro countries, is aggregated and used as a single economy.Trade weight data are also obtained from the GVAR database and are used in the computation of the trade matrix for the creation of foreign variables.

Imposition of Over-identifying Restrictions on Long-run Cointegration Vectors

As has been discussed previously, financial integration is a long run phenomena, we here identify the possible long-run relations that could be generated out of the variables combinations. There are many variables to be estimated in the GVAR model and there are many candidates of long-run relations that the combinations of these variables would give (real output, interest rate, exchange rate, inflation rate and equity prices). Although the selection of the variables are easily done based on the long-run structural relation¬ship from the economic theories, but identifying which among the cointegrating relations that satisfy a particular theory is cumbersome. Thus, over-identifying re¬strictions have to be imposed and tested on the number of estimated cointegrating ranks obtained for each country-specific model. Since the focus of this study is on the uncovered interest parity (UIP) that would exist among the domestic variables and their foreign counterparts, it is important to note that the combination of variables we put in the model would give variety of long-run relations, therefore identification have to be made.

For example UIP for a particular economy is observed when the domestic and foreign interest rates are cointegrated. If for example the cointegrating vector in the estimated equation for that particular country reads one, then restriction on the matrix column of domestic interest rate and its foreign counterpart should be imposed while allowing other variables in the system to bear zero. Using the critical values obtained from the maximum likelihood procedure together with bootstrapping statistics the decision is reached as to whether to accept the hypothesis or not. see(Dees et al., 2007a).

The composition of the included variables in the model would give four possible long-run relations. The first is the Uncovered Interest Parity (UIP) shown in Equation (3.11). It is a condition where the exchange rates adjust to equilibrate rate of returns between countries. The second one is the relative Purchasing Power Parity (PPP) specified in Equation (3.12). It states that, the purchasing power between economies is the same in the long run when compared in the

same basket of commodity, thus their real exchange rates are expected to be stationary. The third long-run theory that our variable combinations would give is the Solow-Swam neoclassical growth model specified in Equation (3.13). Here in the long-run, the growth of per capita income among economies is expected to converge. Lastly is the Fisher equation in Equation (3.14), it posits that in the long-run the real interest rate differentials among countries are stationary.

$$I_{it}^{S} - I_{it}^{S*} - E_t(\Delta e_{i,t+1}^{*}) = \theta_{i0} + \phi_{i1t} \sim I(0) \quad (3.11)$$

$$ee_{it} + p_{it}^{*} - p_{it} - b_i(y_{it} - y_{it}^{*}) = \theta_{i0} + \phi_{i1t} \sim I(0), b_i > 0, \quad (3.12)$$

$$y_{it} - y_{it}^{*} = \theta_{i0} + \phi_{i1t} \sim I(0), \quad (3.13)$$

$$I_{it}^{S} - \Delta p_{it} = \theta_{i0} + \phi_{i1t} \sim I(0) \quad (3.14)$$

Results and Discussion

This section present results for unit-root and cointegration for the GVAR model. At the beginning we present result from the unit-root and cointegration to identify the long-run convergence of the estimated series. Subsequently the result of the estimated error correction models which provide estimates of the contemporaneous correlations are presented.The over-identifying restrictions imposed on the vectors of the cointegration relationships are also presented.

Result for unitroot test shown in Table 1 and 2 for both the domestic and foreign variables indicate that the series are all non-stationary. This satisfied the condition for cointegration. Table 4 show the result for the number of cointegrating vectors estimated from the respective VARX equations.

Table 1: Unit Root Test For The Domestic Variables At 5% Significance Level

	REAL GDP		REAL EQUITY PRICES		REAL EXCHANGE RATE		INTEREST RATE	
	level	F-D	level	F-D	level	F-D	level	F-D
Critical Value	**-3.24**	**-2.55**	**-3.24**	**-2.55**	**-3.24**	**-2.55**	**-3.24**	**-2.55**
China	-2.064	-3.687*	-----	-----	-0.941	-7.160*	-1.672	-6.229*
Indonesia	-1.829	-7.158*	-----	-----	-2.288	-8.218*	-4.171	-6.582*
Japan	-0.435	-4.915*	-1.778	-5.159*	-2.104	-5.378*	-3.181	-5.054*
Korea	-1.073	-5.343*	-2.779	-5.886*	-2.860	-5.852*	-2.666	-7.956*
Malaysia	-1.732	-5.807*	-3.083	-7.524*	-2.400	-7.275*	-2.257	-6.049*
Philippines	-1.969	-3.783*	-1.814	-4.676*	-2.324	-6.129*	-3.416*	-8.151*
Singapore	-1.912	-6.081*	-3.909*	-7.732*	-1.272	-6.313*	-3.179	-4.683*
Thailand	-1.250	-5.616*	-2.174	-5.208*	-2.323	-5.584*	-3.748*	-6.431*
Usa	-1.825	-4.745*	-1.920	-6.520*	------	-----	-3.847*	-3.840*

Note: F-D means first-difference. The Starred value (*) means significance at 5% level.
Inflation ($\pi = p_{it} - p_{it-1}$) is not presented as it is a first differenced series.

Table 2: Unit Root Test For The Foreign Variables At 5% Significance Level

	REAL GDP		REAL EQUITY PRICES		REAL EXCHANGE RATE		INTEREST RATE	
	level	F-D	level	F-D	level	F-D	level	F-D
Critical Value	**-3.24**	**-2.55**	**-3.24**	**-2.55**	**-3.24**	**-2.55**	**-3.24**	**-2.55**
CHINA	-1.28	-5.42*	-2.52	-7.20*	-2.11	-7.30*	-2.20	-10.72*
INDONESIA	-1.49	-5.92*	-2.85	-7.42*	-2.00	-7.40*	-2.49	-5.71*
JAPAN	-3.02	-5.04*	-2.58	-7.35*	-1.74	-6.83*	-2.24	-6.46*
KOREA	-3.28	-4.93*	-2.34	-7.31*	-1.78	-7.46*	-1.72	-10.29*
MALAYSIA	-2.01	-5.86*	-2.71	-7.49*	-1.98	-7.09*	-3.21	-5.13*
PHILIPPINES	-1.93	-5.91*	-2.64	-7.41*	-2.08	-7.49*	-3.04	-4.73*
SINGAPORE	-2.19	-6.02*	-2.69	-7.50*	-2.13	-6.75*	-2.57	-7.57*
THAILAND	-2.19	-5.89*	-2.59	-7.28*	-2.10	-7.57*	-2.26	-6.22*
USA	-4.07*	-5.70*	-3.18	-7.42*	-2.11	-7.66*	-1.13	-12.04*

Contemporaneous Effects of Foreign Variables On Domestic Counterparts

Result of the contemporaneous effects of foreign variables on domestic counterparts is presented in Table 4. The magnitude of the estimates shows the level of linkages of each domestic economy on international economy or rest of the world. High significant value of the estimates shows high level of linkage of the variable with the rest of the variable in the word and low value signifies low correlation with the outside world. They are computed from the estimated VECMX models and are interpreted as impact elasticities.

From the table it can be seen that, the real output and equity prices have higher international linkages as their estimates appeared significant in most of the countries in the model. This is not surprising considering the fact that there is an increased trading relation among countries and there is higher growth in cross-listing of equities. On the other hand, inflation rate and short-term interest rates appeared to command low level of international linkages. Among the focus countries, only China and Malaysia show significance international linkages in their

inflation rate, implying that tendency for importing the variable to these countries exist. Short-term interest rate is significant in China and Singapore indicating that the two countries would be affected by the changes in the global interest rates. With the exception of Indonesia all the focus countries have shown significance in at least one of the variables.

Table 3 : Contemporaneous Effects of Foreign Variables on Domestic Counterparts

	y	Dp	eq	r
Argentina	0.659 (2.461)*	0.61 (0.375)	1.358 (3.282)*	1.35 (0.927)
Australia	0.313 (2.338)*	0.523 (2.824)*	0.822 (5.503)*	0.397 (3.192)*
Brazil	0.684 (2.607)*	1.349 (1.162)	_	0.363 (0.198)
Canada	0.616 (6.079)*	0.569 (5.609)*	0.969 (22.309)*	0.466 (3.073)*
China	0.552 (1.952)*	0.352 (1.387)*	_	0.016 (0.564)*
Chile	0.632 (2.338)*	0.082 (1.313)	0.491 (4.043)*	0.125 (2.636)*
Euro	0.6 (6.884)*	0.232 (3.957)*	1.043 (2 1.825)*	0.046 (2.482)*
India	-0.111 (-0.558)	0.334 (1.495)	0.747 (5.419)*	-0.007 (-0.139)
Indonesia	0.663 (1.847)	0.828 (1.419)	_	0.388 (0.945)
Japan	0.752 (2.982)*	0.041 (0.308)	0.761 (9.227)*	-0.032 (-0.477)
Korea	0.135 (0.43)	0.261 (1.205)	1.048 (4.922)*	-0.102 (-1.09)
Malaysia	1.41 (5.448)*	0.878 (3.258)*	1.201 (6.177)*	-0.004 (-0.05)
Mexico	0.518 (2.942)*	0.55 (1.058)	_	-0.073 (-0.182)
Norway	0.539 (2.809)*	0.878 (4.387)*	1.137 (11.587)*	0.231 (1.462)
New Zealand	0.414 (2.819)*	0.509 (2.542)*	0.825 (8.864)*	0.534 (1.903)
Peru	-0.019 (-0.045)	0.591 (0.243)	_	-2.496 (-1.965)*
Philippines	0.056 (0.193)	-0.079 (-0.21)	1.117 (6.831)*	0.581 (1.329)
South Africa	0.299 (2.215)*	-0.035 (-0.265)	0.932 (6.67)*	0.051 (1.591)
Saudi Arabia	0.521 (2.124)*	0.289 (1.533)	_	
Singapore	1.346 (6.445)*	0.209 (1.326)	1.258 (10.374)*	0.222 (2.109)*
Sweden	1.136 (3.934)*	1.289 (6.951)*	1.196 (16.905)*	0.282 (2.141)*
Switzerland	0.517 (4.213)*	0.317 (2.875)*	0.907 (15.539)*	0.136 (2.264)*
Thailand	0.622 (2.408)*	0.455 (1.782)	1.062 (8.39)*	0.271 (1.332)
Turkey	1.8 (3.421)*	2.495 (2.174)*	_	1.63 (1.626)
UK	0.697 (5.071)*	0.653 (5.513)*	0.835 (12.867)*	0.176 (1.796)
USA	0.614 (5.253)*	0.101 (1.317)	_	_

Note: figures in brackets are White's Adjusted t-ratio, *indicate significance

Testing and Interpreting Long-Term Restrictions

As has been outline in the methodology section the long run relations are identified after imposing restriction on the number of cointegrating vectors determined from each country-specific model of VARX*. The numbers of these cointegratingvectors together with the Lag selections for our focus countries are shown in Table 4 below. With the exception of China and USA having 2 cointegrating relations each the rest of the 8 focus countries have 1 cointegrating relation. Since the focus of this study is on the UIP, we therefore imposed the over-identifying restriction for the UIP alone. The aim is to see if that particular long-run phenomena holds or not for these countries. In line with the Pesaran et al. (2007) the restrictions are tested using the log-likelihood ratio (LR)statistic at the 1% significance level.

The critical values reported are computedby bootstrapping from the solution of the GVAR model. Furthermore the graph of the persistence profile is provided in Figure1 below. For each restricted UIP condition in the cointegrating vector, the graph is drawn to confirm the stability of the model. In the figure it can be seen that all the series converge to zero with the increase in horizons. This confirmed that the estimated GVAR model is stable and the restricted long-run cointegrating vectors are accepted.

Table 4:VARX Order and Cointegrating Relation for Individual Models

Country	p	q	CR
China	1	1	2
Indonesia	1	1	1
Japan	2	1	1
Korea	2	1	1
Malaysia	1	1	1
Philippines	2	1	1
Singapore	2	1	1
Thailand	2	1	1

Note: p and q = lag order for domestic and foreign variables, CR= cointegrating vectors

Table 5 below presents the result for the restricted UIP condition. From the Table one can see that, except for Philippines and Thailand, the likelihood ratio statistics are greater than their bootstrapped critical values in all the restricted focus countries indicating that the imposed restrictions are rejected by the data. This signifies that the imposed UIP condition is not valid for six out of the eight East-Asian countries under investigation. For the case of Japan this finding appeared in line with Pesaran et al. (2007). In general, the finding is not much a surprise considering that the contemporaneous linkages of foreign and domestic variables identified in Table 3 above also show low international linkages in interest rate in most of the study countries. Being an important determinant of the UIP, the low level of short-term interest linkages with the outside world in these countries will result to inability of exchange rate to adjust appropriately to equalize returns to investments across borders.

More also, the result of the study may be a confirmation of the findings of Holmes et al. (2011b) that the UIP is determined to a larger extent by the interest rate term-structure. According to the study, the long-term interest rate will lead to holding of interest parities conditions than the short-term interest rates. However, sequel to unavailability of long-term interest rate in the case of our focus countries, this study concentrated on the short-term interest for the analysis and this limits our ability to verify Holmes et al. (2011a) and Lothian and Wu (2011) assertions.

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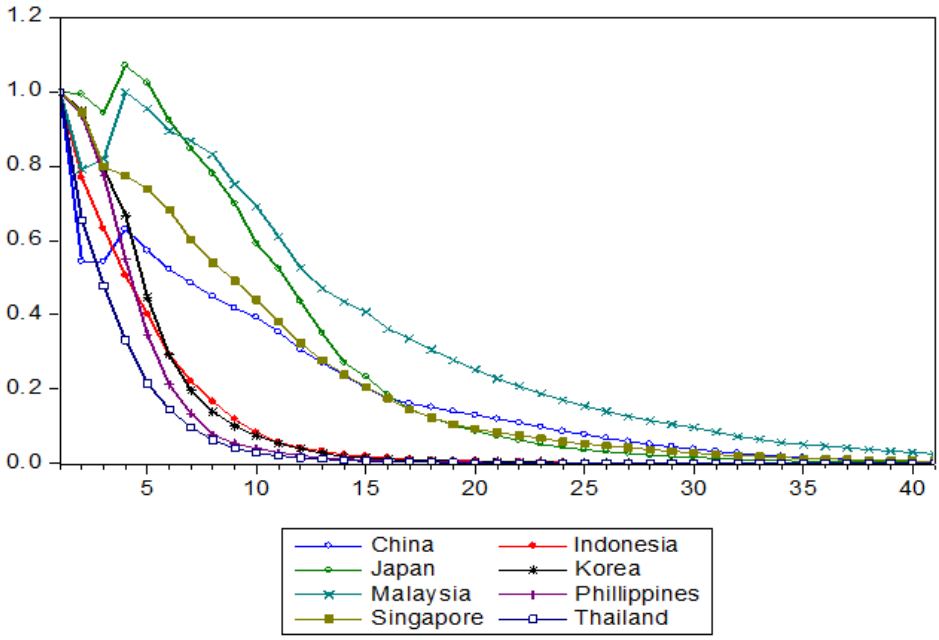
Table 5: Test of Over-identifying Restrictions: Statistics and Bootstrap Critical Values

Country	Likelihood Ratio statistics	Degrees of freedom	95% critical values	99% critical values
China	45.117	16	36.182	41.768
Indonesia	52.535	9	26.762	34.762
Japan	68.056	10	42.395	53.147
Korea	52.479	10	28.375	40.319
Malaysia	68.191	10	44.884	48.643
Philippines	25.290*	10	28.187	39.558*
Singapore	55.114	10	38.967	51.366
Thailand	34.898*	10	34.261	42.473*

Figure 1: Persistence Profile For The Eight East-Asian Countries Imposed Restriction On



Conclusion

The study investigated the holding of uncovered interest parity and implied financial system integration in eight most developed East-Asian countries. The study appeared different from the previous similar studies in its ability to consider country interdependencies in its analysis. In modeling the financial integration, Global Vector Autoregressive model is used to carter for countries linkages through observing the domestic and foreign variables. Result for the 33 countries included in the model revealed that they are more linked to one another through real output and equity prices channels. This applies to the focus countries also. On the holding of the Uncovered Interest Party (UIP) restrictions are imposed on the

obtained cointegration vectors and the result generally show that the UIP does not hold for six out of the eight countries observed. This by implication revealed that the countries are not financially integrated, since the domestic and foreign short-term interest rate are not cointegrated thus making it difficult for the exchange rate adjustment to equilibrate rate of return on identical assets across the countries. Furthermore in support of this finding, result from the contemporaneous effect of foreign variables on domestic counterpart revealed that the short-term interest rate and inflation rate are the least in linkages among the estimated variables.

Based on this finding it is therefore advisable for policymakers in the respective countries to further observe the way their short-term interest rates are inter-related especially now that efforts are made toward removing restriction to capital mobility. However, it is important to note that our analysis does not observe the sensitivity of term-structure of the interest rate and limits the findings to short-term interest rate. The long-term interest rate (which is not used in this study due to its scarcity in most of the focus countries) may have varied result with what is obtained here.

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