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THE IMPACT OF FOREIGN EQUITY INVESTMENT FLOWS ON INTEGRATION OF ASIAN EMERGING EQUITY MARKETS

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THE IMPACT OF FOREIGN EQUITY INVESTMENT FLOWS ON INTEGRATION OF ASIAN EMERGING EQUITY MARKETS

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THE IMPACT OF FOREIGN EQUITY INVESTMENT FLOWS ON INTEGRATION OF ASIAN EMERGING EQUITY MARKETS

Abstract

The paper investigates the impact of foreign equity investment flows on the integration process of emerging markets with the global markets. Daily net foreign equity investment flow and return data for the four Asian emerging markets of India, Korea, Taiwan, and Thailand for 2001-2007 is used in examining the long and short-run relationship with the global markets. The findings show that despite the instability of the correlation structure, there is a general trend towards greater integration. The cointegration analysis results suggest that the four Asian emerging markets are getting integrated with the global markets and the integration process is driven by the activities of the foreign investors. Findings confirm that the global markets have significant causal impact on returns of all four emerging markets and the foreign equity investment flows play a significant role in correcting the short-term deviations in the convergence process. Whilst the results are consistent with previous research, we find stronger evidence for the positive feedback hypothesis for all four markets. The results support the widely held view that foreign investors are high return chasers and extract information from recent returns. Our results also confirm the price pressure hypothesis which suggests that foreign equity investors are mainly responsible for the increase in the stock market valuations in the four Asian emerging markets. If this were to be true, the emerging markets may become increasingly vulnerable to the shocks in the volume of foreign equity investment flows and turn more volatile in future.

Keywords: Foreign equity investors, Asian emerging markets, Cointegration and VEC, Global Linkages and Short-run Dynamics

JEL Classification: G11, G15, F12

1. Introduction

The impressive growth in foreign equity investments in emerging markets and the debate on the likely implications for their integration with the global equity markets has prompted intense research interest in this subject matter. As a consequence, research documenting the impact of foreign equity investment flows on the stock prices in emerging markets has attracted great interest in the recent past. Although there is a growing body of research which suggests that equity markets around the world have become more integrated and globally stock price movements show greater degree of comovements, the research on emerging markets is still evolving.

This paper draws inspiration from two main strands in the literature on international equity market integration. The first strand of the literature deals with integration of emerging equity markets with global markets by investigating the correlation structure and comovements in returns. The evidence on the correlation and integration of emerging equity markets with the developed markets is somewhat mixed. For instance, Chan *et al*. (1992) examine data for the Asian emerging markets and find that the markets are segmented. This finding is further supported by Lamba (2005) who uses data for the period 1997-2003 from the South Asian emerging markets and concludes that most of the markets in his sample are segmented. In another study, Bekaert and Harvey (1995) measure the degree of integration using equity returns and conclude that some countries have become less integrated over time. In contrast to this, there are number of studies which show that emerging equity markets have become more integrated with the developed markets (see, Jong and Roon, 2005 for a comprehensive review). Phylaktis (1999) examines the extent of capital market integration for a group of Pacific Basin countries and finds that the markets are integrated with the world financial markets. In another latest study, Tai (2007) examines Asian emerging market data and concludes that these markets have become integrated into the world capital markets since the time when these markets were first liberalised. The second strand in the literature deals with the dynamics of foreign investment flows and equity returns in emerging markets (see, Froot *et al*., 2001, Bekaert, *et al*., 2002, Richards, 2005). There are two main streams that flow from this body of research. The first seeks to enquire whether foreign equity investors are attracted by higher returns offered by foreign equity markets (see, Bohn and Tesar, 1996). The second attempts to investigate whether the impact of foreign equity flows on stock prices is permanent or just temporary as a consequence of the 'price pressure' exerted by these flows.

Despite extensive research on the subject matter there is a gap in the existing literature. This paper fulfils that gap by bringing together the two strands of the literature, i.e.,

integration of emerging equity markets and the dynamics of foreign equity flows and provides latest empirical evidence on the effect of foreign equity investment flows on the process of integration of the Asian emerging equity markets of India, Korea, Taiwan, and Thailand with the global markets.[1] Most previous studies use foreign equity flow data up to 2002. There is information which suggests that quite a few of the emerging markets, especially those in Asia, have introduced significant changes in the foreign ownership restrictions and have raised the limits on foreign ownership since 2001.[2] Given this, there is a need to investigate what impact foreign equity flows have had on the integration process of emerging markets in more recent period.

One of the reasons for relatively less research on emerging equity markets is that good quality and high frequency data on foreign equity flows is not easily available. Thus previous research studies by Froot *et al*. 2001 uses proprietary data for equity flows from State Street Bank and Trust whilst Bakaert *et al*., 2002 have had to rely on monthly capital flow data for their research that involved 20 emerging markets. The foreign equity flow data in this paper uses the same source as the one used by Richards (2005) but with two significant differences. First, we use more recent data (from 2001 to 2007) so that the impact of significant increase in the foreign equity ownership can be captured in the integration process of emerging equity markets. Second, unlike Richards (2005), instead of measuring integration with the US equity market, we use MSCI World Equity Market returns as a proxy for global markets because the foreign equity flow data from CEIC is aggregated and includes foreign investments from different countries including the US. Thus our paper provides evidence with respect to integration of emerging equity markets globally rather than with the US market.

A study of the main Asian emerging markets has important theoretical and policy implications. The rolling correlation of the Asian emerging market equity returns with the world market returns has grown over the years (see Figures 1, 2, 3 & 4). Further, the interest of foreign investors in these markets has also grown with time (see Table 1). These developments will have significant impact on asset pricing and portfolio allocations. Historically, one of the main motivations for investing in emerging markets was that these markets had low correlations with developed markets and hence offered significant diversification benefits to the international investors. However, if the present magnitude and pace of foreign investments are sustained over time then the emerging markets would become more integrated with the global markets. This would have detrimental effect on diversification of risk since emerging equity market have long been viewed by international investors as segmented markets offering excellent diversification

[1] Our choice of markets is restricted by the lack of availability of good quality daily data on other emerging equity markets.

[2] For instance, Taiwan increased the foreign equity ownership limit from 50% in 1999 to 75% in 2000 before removing any limit towards the end of 2000.

benefits to international investors (see Chatrath *et al*., 1996). Further, the increased foreign equity flows also seems to have caused greater volatility in the emerging equity markets which is a matter of concern to the policy makers.[3] Thus the impact of increasing foreign equity investment flows on the integration of emerging equity markets is of high interest to both academics and policy makers. This is particularly relevant since there is evidence to suggest that foreign investors appear to have short-term investment horizon and at the sign of slightest of trouble, the foreign capital tends to leave at a much greater pace than the pace at which it arrives in emerging markets (see, Bekaert, Harvey and Lumsdaine, 2002).

Our paper makes three important contributions to the existing literature. First, we extend the literature on the dynamic impact of foreign equity investment flows and domestic returns in emerging equity markets by providing fresh empirical evidence using latest and high frequency dataset. Second, we use more recent foreign equity flow and return data to capture the effect of increased foreign investment activity in emerging markets as a result of further relaxation of foreign ownership restrictions. Finally, unlike previous studies we use MSCI world return index that comprise of twenty three stock markets of industrialized countries which is a better proxy for measuring the dynamics of global linkages.

Our findings suggest that the foreign equity investment flows contain significant information in explaining the short-run dynamics and long-run relationship of all Asian emerging equity markets with the global markets. Our results are robust in terms of synchronization and statistical sensitivity of VAR based VEC and Cointegration. We conclude that the rapid growth in the flow of foreign equity flows is leading to greater integration of the Asian emerging equity markets which will have significant implications for pricing of assets and international portfolio allocations.

The paper is organized as follows. The following section provides details of data and methodology used in this study. Section 3 documents the empirical findings, and section 4 concludes the paper.

[3] There are several examples of interventions by policy makers concerned with the negative impact of foreign equity flows. For instance, Malaysia imposed capital controls in 1998 following the Asian financial crisis with an aim to control the excessive volatility that seems to be the result of rapid outflow of foreign capital. In December 2006, the Thai government tried to impose tough controls by requiring investors with more than $20,000 of investment to remain invested for a minimum period of one year or face severe penalties if this investment is removed within a year. However, the government had to reverse this decision following a steep fall in the stock market after shares suffered their worst daily fall in 16 years and closed down 14.8%.

2. Data and Methodology

2.1 Data

We use daily data in our analysis for a sample period of six years beginning 1 January 2001 to 30 March 2007. Daily returns are calculated from the MSCI global total return index which is a composite index of 23 developed markets and the MSCI total return emerging market indices denominated in US$ for India, Korea, Taiwan, and Thailand.[4] The choice of emerging markets was restricted because of lack of availability of daily equity portfolio investment data for other emerging equity markets. A further reason for our choice of emerging markets was that a considerably long period has elapsed since these countries had opened up their equity markets for foreign investments. Therefore, it is both timely and appropriate to investigate the influence of foreign equity investments given the rapid increase in the investment flows in more recent period in the Asian emerging markets included in our sample. The MSCI indexes have been obtained from DataStream international and net daily foreign equity portfolio investment data is obtained from CEIC.

2.2 Methodology

We take a non structural approach for investigating the impact of foreign investment on the short and long run dynamics of Asian equity markets with the global markets. Use of a non-structural approach in linkage studies is advocated by Bekaert and Harvey (2000) who suggest that because of lack of theoretical basis, non-structural approach should be preferred in conducting portfolio flow studies. Further, Tesar and Werner (1995) find that even in the relatively open markets, the substantial increase in cross border flows do not comply with the theoretical foundations of optimal portfolio theory due to home bias effects.

Our analysis utilizes cointegration and vector error correction models. Cointegration approach is widely used for examination of long-run stochastic relationship between equity markets (see Kearney and Lucey, 2004 for a comprehensive review). For short-run dynamics, the use of Vector Autoregression (VAR) analysis is quite widespread (see, Froot *et al*, 2001, Bekaert, Harvey and Lumsdaine, 2002, and Richard, 2005).

[4] Since our Net Foreign Equity Investment (NFEI) data represents total of all foreign portfolio investments, we use the MSCI world index as proxy of global equity returns.

2.2.1 Cointegration

We examine the long run relationship using VAR based cointegration approach proposed by Johansen (1988) and Johansen and Juselius (1990). The method of Johansen-Juselius (JJ) is preferred because their approach is considered superior to regression-based approach suggested by Engle and Granger in 1987 (Cheung and Lai, 1993).[5] The JJ approach uses maximum likelihood estimates and allows testing and estimation of more than one cointegrating vector in the multivariate system without requiring a specific variable to be normalized. This way, the JJ tests overcome the problem of carrying over the errors from first step into the second step commonly encountered in Engle and Granger's (1987) approach. Further, Johansen's method is independent of the choice of endogenous variable within a vector autoregression (VAR) framework. This advantage enables testing for various structural hypotheses involving restricted versions of cointegrating vectors and speed of adjustment parameters using likelihood ratio tests.

The general VAR equation can be rewritten as

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots\ldots\ldots\ldots + A_p y_{t-p} + \varepsilon_t \quad (1)$$

$$\Delta y_t = \Pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \Gamma_1 \Delta y_{t-2} + \ldots\ldots\ldots + \Gamma_{p-1} \Delta y_{t-p+1} + \varepsilon_t \quad (2)$$

$$\Delta y_t = \Pi y_{t-p} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t \quad (3)$$

Where:

$$\Pi = \sum_{i=1}^{p} A_i - I, \text{ and} \quad (4)$$

$$\Gamma_i = -\sum_{j=i+1}^{p} A_j \quad (5)$$

Since our objective is to investigate the long-run relationship, we will focus on the elements of matrix Π. If vector *y* contains m variables, matrix Π will be of the order m x m, with a maximum possible rank of m (or full rank). Equation (3), except for the Πy_{t-p} term, is in the form of the traditional VAR with first difference. The Π term determines whether the system of equations is cointegrated, i.e., whether a long-run equilibrium relationship exists. The feature to note is that the rank of matrix Π is equal to the number

[5] The Johansen-Juselius procedure resolves the problem of endogeneity in that we do not need to normalise the cointegrating vector on one of the variables as required in the Engle and Granger (EG) test.

of independent cointegrating vectors. If rank of matrix Π = 0, the matrix is null, i.e., all the elements in this matrix are zero, which implies no cointegration or lack of a long-run equilibrium relationship and the error correction mechanism, Πy_{t-k}, therefore, does not exist. In determining the rank of matrix Π (number of cointegrating vectors), we calculate the characteristic roots or eigenvalues $\hat{\lambda}_i$ of Π. Johansen (1988) and Johansen and Juselius (1990) propose trace (λ_{trace}) and maximum eigenvalue (λ_{max}) test statistics to establish whether the characteristics roots are significantly different from zero. The likelihood ratio (LR) statistic for the trace test (λ_{trace}) is:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{m} \ln\left(1 - \hat{\lambda}_i\right) \tag{6}$$

Where $\hat{\lambda}_i$ are the estimated values of the characteristic roots (also known as eigenvalues) obtained from estimated Π matrix. The null hypothesis to be tested is that the number of cointegrating vectors is less than or equal to r against the alternative hypothesis that the number of cointegrating vectors is more than r. For example the null hypothesis $r \leq 0$ against alternative $r = 1$, $r \leq 1$ against alternative $r = 2$, and so forth. The 'maximum eigenvalue' test is used to evaluate the null hypothesis of r cointegrating vectors against the r + 1 cointegrating vectors. The LR test statistic is given by:

$$\lambda_{\max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \tag{7}$$

The computed values of λ_{trace} and $\lambda_{\max}$ statistics are evaluated using the critical values provided by Osterwarld-Lenum (1992). The optimal system lag length is determined by using the Schwarz Information Criteria (SIC). Specifically, the appropriate number of lags for each variable is obtained by computing the SIC over different lag schemes in the range from 1 to 20 and by choosing the number of lags that yields the lowest value for the SIC.

2.2.2 Error Correction Representations

Vector Error Correction Model (VECM) is employed on the cointegrated return series as this provides us with an effective way to analyze the short run relationship including causality and the speed at which the error is corrected for establishing the long-run relationship found in the cointegration analysis. If variables are cointegrated they tend to converge in the long run despite the deviations in the short run. VECM examines this equilibrium relationship and provides a feedback mechanism, the error correction term, which gradually moves in tandem with the equilibrium relationship. VECM also provides the mechanism to identify the magnitude and length of information being transmitted

from one series to another through the system, referred as variance decomposition and impulse response function respectively. The VECM is employed on first difference of I(1) variables as shown below.

$$\Delta y_{t-1} = \beta_1 \Delta x_{t-i} + \beta_2 \Delta w_{t-i} + \beta_3 z_{t-1} + \mu_t \quad (8)$$

Equation (8) is a three variable model with y and x being return series and w being the net foreign equity investment. The cointegrating vector z_{t-1} is the error correction term which will be I (0) if the above series in their level term have long-run equilibrium relationship. This term corrects the short term deviations and helps converge the series in the long run equilibrium state. β_3 measures the speed of adjustment in the short term deviations whilst β_1 and β_2 capture the short run causality.

2.2.3 Impulse Response Function

Impulse response function explains the responsiveness of one variable in the VAR framework to the shocks in its own and the other variables. It explains the extent to which a unit shock in one variable in isolation of the others, affects the movement in other variables. In each of the equation, one unit shock is applied to detect the change in the VAR system over time by representing the VAR as VMA (Vector Moving Average) representation:

$$Ri,t = b_{11}^0 \varepsilon_{i,t} + b_{11}^1 \varepsilon_{1,t-1} + b_{12}^1 \varepsilon_{2,t-1} + \ldots\ldots\ldots \quad (9)$$

Where, b_{ij} are unit normalized innovation coefficients of impulse response function following the normalization by the Cholesky factor[6] and b_{11}^0 is the simultaneous effect of a unit shock to $\varepsilon_{i,t}$. The contemporaneous innovation is stated in standard deviation form and have non-unit coefficient in contrast to its unit coefficients in the equation.

2.2.4 Forecast Error Variance Decomposition

Previous research has shown that variance decomposition analysis is an effective way to examine the dynamic interactions amongst economic time series (Lutkepohl and Reimers, 1992). Whilst impulse response function traces the effects of a shock in one endogenous variable on other variables in the VAR, variance decomposition enables further analysis by decomposing the forecast error variance of domestic return index and

[6] See Diebold (2004).

net foreign equity investment that will provide us a quantitative measure of the short run dynamic relationship among the variables. The variance decomposition thus offers greater insights on the relative significance of each random innovation that affects the variables in VAR. Decomposing the variance shows what proportion of the variance is due to a shock in its own lags against the shocks in other variables and also offers information on the magnitude of the effects.

3. Empirical Findings

First we use rolling correlations and JJ cointegration methods for examining the long-run relationship. Subsequently we report the findings on short term feedback dynamics using different variants of the error correction model. With an aim to establish whether the pick up in the foreign equity investments in more recent years following the impressive growth shown by the Asian equity markets provide grater empirical support to our hypothesis, the total sample is split into two parts.[7]

Table 1 provides descriptive statistics for the returns series and the foreign equity investment flow. Over the full sample period, highest daily returns are offered by Korea followed by Thailand, India, and Taiwan. All four Asian markets offer much higher daily returns compared to the returns of the MSCI developed market index. The trend is generally similar across the two sub-sample periods with the exception that returns offered by Thailand and Taiwan in the second sub-period are lower than the returns in developed markets. Higher returns in emerging markets do not come without risk as the standard deviations of returns are much higher for the Asian emerging markets. The returns are not normal with significant kurtosis. The average daily foreign equity investment flows are much higher in the second sub-period. Taiwan leads the other markets in terms of foreign equity investment flows followed by India, Thailand, and Korea.

3.1 Results on Long-run Relationship

Table 3 presents the unconditional correlation coefficient between the domestic returns of the Asian emerging markets and MSCI world index. The results provide an indication of

[7] The first sub-period covers Jan 2001 to Dec. 2003 and the second sub-period uses data for Jan 2004 to March 2007. The growth of foreign equity investment flows is evident from Table 1 which shows that the average equity investment flows more than doubled in the second period of the sample. The average net daily foreign equity investment rose to US$98.33m during the period 2004-07 compared to US$45.57m for the period 2001-03.

a move towards greater correlations from sub period one to sub period two for all markets with India and Thailand in particular demonstrating relatively greater convergence. Several papers have investigated the integration of equity markets using the rolling correlations. Lucey and Kearney, (2004) suggest that the rolling correlations are a good indicator of integration since despite the time varying correlations, if there is indication of a trend towards greater correlation, it signifies increased integration. We present the rolling correlations for the four emerging markets with the global market in Figures 1 to 4. The figures show that though the correlations are not stable over time, a general trend of increasing correlation is evident. The correlations appear to have increased significantly from 2004. If we compare this with descriptive statistics presented in Table 1, the average and volatility figures of equity trading by foreign investors have dramatically increased from sample period 1 to sample period 2. Thus, the observed rise in correlation could be partly explained by the increase in the trading activity of foreign investors. Overall, our findings suggest that despite the instability of the correlation structure, there is a general trend towards greater integration. This result is consistent with those reported by Phylaktis and Ravazzolo (2002) who also find statistically significant correlations amongst the emerging Asian markets and the US.

Next, we employ the Cointegration analysis which is a more robust approach in testing for long-run equilibrium relationship. All the series used in the analysis including the net foreign equity flow series are integrated of order I(1) whilst their first differences are integrated of order I(0). The Augmented Dicky Fuller Test statistics reported in Table 4 are significant for the first differenced series of all markets as well as the foreign equity investment flows. Table 5 reports result of bivariate cointegration between the emerging Asian market returns and MSCI world index returns for the full sample period as well for the two sub-sample periods. For the full sample, one cointegrating vector is found for Taiwan and India whereas no conintegration is reported for Korea and Thailand. However, for the first sample period no cointegration is detected. In contrast, the results for the second sample period are similar to the full sample period and statistically significant cointegrating vectors are found only for India and Taiwan. The results show strong signs of convergence of the Indian and Taiwanese markets with the global markets. The greater degree of integration found for the second sample period coincides with the significant increase in the average foreign equity investment flow for India and Taiwan. The average foreign equity investment flows for India and Taiwan increased to US$36.65 million and US$54.19 million from US$9.841 million and US$33.22 million respectively. In comparison, the foreign equity investment flow did not show any increase in the case of Korea and a relatively small increase in the case of Thailand (see Table 1).

Next, we present the results of the cointegration analysis where we include foreign equity investment flow series with emerging market and world market return series. This analysis will provide us with the relative contribution of the foreign equity investment

flow in the long-run relationship reported in Table 5. The results of the tri-variate cointegration are reported in Table 6. Both the trace and max trace statistics are significant for the full sample period as well as the two sub sample periods. With the inclusion of foreign equity flow, at least one cointegrating vector is reported for all four markets thereby confirming that the integration process is driven by the activities of the foreign investors. For India, Taiwan, and Thailand two significant cointegrating vectors are found for the second sample period confirming the influence of foreign equity flows in the integration process. A summary of the main findings of the cointegration analysis is further provided in Table 7.

3.2 Results on Short-term Dynamics

As previously discussed, the error correction provides feedback mechanism to measure the effect of a shock in one series as a result of a shock in another series in the VAR system. ECM can only be applied on cointegrated series. Since our cointegration analysis results show that all four markets are cointegrated only when foreign equity investment flows are included, the ECM analysis also includes the foreign equity investment flow series. Four variations of the ECM analysis are reported. The first variation is the block exogeneity Wald test that measures the statistical significance of the flow of information between the variables in the form of Granger causality. The second is the error correction term which shows the magnitude and speed of short term adjustment. Third is the decomposition of the error variance which provides a quantitative measure of the short-run dynamic flow of information explaining the h-step ahead error variance in one variable due to transmission of shock in another variable in the VAR system. Finally, the impulse response shows the time and direction of the effect of shocks between the variables.

Table 8 presents the Granger causality and Error Correction Term (ECT) for each market. It is evident that the world market has significant causal impact on the return index of all markets including on the flow of net foreign investments. In contrast, none of the emerging market seems to have any causal effect on the world market returns. These findings are consistent with previous literature that shocks from developed markets have significant impact on the Asian emerging markets (see for example, W Dungey, 2004). Further, we find that net foreign equity investment flows Granger cause returns in India, Taiwan and Thailand but no causality is found for Korea.

Our results are consistent with the price pressure hypothesis suggesting that foreign equity investors are mainly responsible for the increase in the stock market valuations in the Asian emerging markets. If this were to be true, the Asian emerging markets may become increasingly vulnerable to the shocks in the volume of foreign equity investment flows and become more volatile in future. This is a matter of concern to policy makers in

emerging markets and as consequence some countries have attempted to restrict the flow speculative investment flows in their equity markets.[8] Our results concerning the price pressure hypothesis are similar to those reported by Richards (2005) and much more pronounced than the ones documented by Froot *et al* (2001) for the Asian emerging markets. Our results also confirm the positive feedback hypothesis for all four markets because we find that returns from emerging markets Granger cause the foreign equity investment flows (Froot *et al*, 2001 and Bekaert *et al*, 2002). The findings further confirm that foreign investors are high return chasers and extract information from recent returns and are not necessarily concerned about risk diversification.

In Table 8, the Error Correction Term (ECT) for all four markets as well as the foreign equity investment flows are statistically significant implying that the short-term deviations in the integration process of the emerging markets with global markets are being corrected. The significant ECT for net foreign investment flows for all four markets confirms the significant influence of foreign investment flow in correcting the short-term deviations in the convergence process.

Variance decomposition analysis is presented in Table 9 which shows that in the case of India, a significant proportion of error variance is explained by the world market returns and its share of error variance increases over time. In fact, its magnitude of explanation for the 20 day ahead forecast variance is equal to the proportion explained by the variance in its own returns. For Korea and Taiwan, similar results are found which confirm the significant role of world market returns in explaining the returns in the Korean and Taiwanese markets. This clearly demonstrates the influence of the global equity market returns on emerging markets. For India, the proportion of variance explained by the net foreign equity flow is smaller but increases over time from 3% for 1 day ahead forecast to 6% for the 20 day ahead forecast. The foreign equity flows also seem to explain a large proportion of return variance of Taiwanese and the Thai markets. However, they have negligible share in explaining the error variance in the case of Korea. Overall, the variance in net foreign equity flows is significantly explained by world equity market returns which indicate that external shocks may significantly explain the volatility of foreign investments in emerging markets.

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[8] On 16 October 2007, India's stock market regulator proposed restricting the use of offshore participatory notes, known as PNs . PNs are much favoured by foreign investors, especially hedge funds who have been mainly responsible for US$90bn investment in PNs. In reaction to this news, the Indian stock market promptly fell 9 per cent, triggering a temporary halt to trading.

Figures 5 to 8 present the results of impulse response functions. In all cases, a unit cumulative innovation in world market returns has significant and positive impact on the returns for all four emerging markets. Innovations in net foreign investment flows also show strong and instantaneous effect on all markets with more volatile results observed for Thailand. Although not as strong, the influence of foreign investment is significant on the domestic returns of all four markets. The findings are consistent with Richards (2005) in terms of instantaneous effect. However, our results show that the contemporaneous price impact is much stronger than the one documented by Froot *et al*. (2001).

4. Conclusions

The paper investigates the impact of foreign equity investment flows on the integration process of emerging markets with the global markets. We use daily net foreign equity investment flow and return data for the four Asian emerging markets of India, Korea, Taiwan, and Thailand for 2001-2007 and employ a number of econometric methods in examining the long and short-run relationship with the global markets. Our findings confirm that despite the instability of the correlation structure, there is a general trend towards greater integration. The cointegration analysis confirmed that the four Asian emerging markets are getting integrated with the global markets and more significantly, the integration process is driven by the activities of the foreign investors. We find that the world market has significant causal impact on returns of all four emerging markets and the foreign equity investment flows play a significant role in correcting the short-term deviations in the convergence process. Whilst our results are consistent with previous research, we find stronger evidence for the positive feedback hypothesis for all four markets. The results support the widely held view that foreign investors are high return chasers and extract information from recent returns and are not necessarily concerned about the risk diversification of their portfolios. Our results also confirm the price pressure hypothesis which suggests that foreign equity investors are mainly responsible for the increase in the stock market valuations in the Asian emerging markets. If this were to be true, the Asian emerging markets may become increasingly vulnerable to the shocks in the volume of foreign equity investment flows and turn more volatile in future.

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Table 1: Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
Panel A							
Full Sample (01/01/2001 - 30/03/2007)							
Daily Average Net Foreign Equity Portfolio Investment (USD Millions)							
Korea	2.127	0.592	94.176	-91.166	15.180	0.324	8.871
India	23.764	10.387	776.766	-633.596	73.495	1.709	31.506
Thailand	2.965	0.000	394.502	-717.012	38.900	-1.879	92.750
Taiwan	44.109	22.962	654.287	-703.730	147.909	0.062	5.397
Daily Total Return (%)							
Korea	0.115	0.098	9.587	-11.457	1.834	-0.091	5.831
India	0.091	0.124	8.615	-11.264	1.442	-0.580	8.264
Thailand	0.100	0.038	11.094	-16.544	1.636	-0.318	11.988
Taiwan	0.043	0.000	6.524	-6.616	1.602	0.107	4.666
MSCI World	0.025	0.050	4.713	-3.620	0.859	0.065	5.782
Panel B							
First Sample (01/01/2001 - 31/12/2003)							
Daily Average Net Foreign Equity Portfolio Investment (USD Millions)							
Korea	2.160	0.592	64.639	-91.166	13.428	-0.384	11.335
India	9.841	5.183	262.340	-86.639	25.256	2.157	17.828
Thailand	0.350	-0.111	78.135	-102.278	13.441	0.038	11.343
Taiwan	33.222	12.701	524.051	-295.647	100.496	0.802	5.087
Daily Total Return (%)							
Korea	0.117	0.086	9.587	-11.457	2.089	-0.059	5.117
India	0.070	0.084	8.615	-11.264	1.433	-0.690	9.405
Thailand	0.127	0.047	7.813	-5.585	1.674	0.244	4.365
Taiwan	0.042	-0.029	6.524	-6.616	1.817	0.168	4.024
MSCI World	0.008	0.045	4.713	-3.620	0.983	0.120	5.013
Panel C							
Second Sample (01/01/2004 - 30/03/2007)							
Daily Average Net Foreign Equity Portfolio Investment (USD Million)							
Korea	2.10	0.56	94.18	-65.26	16.65	0.66	7.39
India	36.65	27.84	776.77	-633.60	97.32	1.01	19.05
Thailand	5.39	0.94	394.50	-717.01	52.31	-1.62	54.93
Taiwan	54.19	36.35	654.29	-703.73	180.53	-0.18	4.28
Daily Total Return (%)							
Korea	0.107	0.153	6.370	-7.065	1.420	-0.377	4.933
India	0.113	0.197	8.615	-11.264	1.517	-0.693	9.867
Thailand	0.038	0.012	11.094	-16.544	1.580	-1.059	20.949
Taiwan	0.046	0.021	6.524	-6.616	1.307	-0.313	6.280
MSCI World	0.055	0.067	2.095	-2.477	0.584	-0.222	4.009

Table 2: Data Description

Country	Foreign Equity Investment	Coverage	Source
Korea	Net Foreign Investment (Buy-Sales)	KOSDAQ	Korea Exchange
India	Net Foreign Investment (Buy-Sales)	All India	Security Exchange Board of India
Thailand	Net Foreign Investment (Buy-Sales)	SET	Stock Exchange of Thailand
Taiwan	Net Foreign Investment (Buy-Sales)	TSEC	Taiwan Stock Exchange Corporation

Table 3: Unconditional correlation between domestic return and world return

	Full Sample	First Sample	Second Sample	Percent Change in Correlation between Two Sub Samples
Korea	0.248	0.221	0.325	47%
India	0.192	0.158	0.273	73%
Thailand	0.173	0.140	0.254	81%
Taiwan	0.199	0.171	0.272	60%

Table 4: ADF Test Statistics

	Full Sample - 01/01/2001 - 30/03/2007	
	Level Data	First Difference
World-Return Index	-0.2083	-24.123

	Total Return Index	Net Foreign Equity Investment	Total Return Index	Net Foreign Equity Investment
India	0.920	1.997	-36.450	-16.500
Korea	0.092	-0.336	-27.139	-31.215
Thailand	-1.081	0.976	-37.907	-5.381
Taiwan	-1.281	0.591	-38.704	-15.713

Critical Value (1%)= -3.434275

Critical Value (5%)= -2.863161

Table 5: Bivariate Cointegration Test (Domestic and World Return Index)

	Eigenvalues		λ_{trace} test		λ_{max} test	
	r = 0	r ≤ 1	r = 0	r ≤ 1	r = 0	r =1
Full Sample						
India	0.015	0.000	24.070*	0.017	24.057*	0.017
Korea	0.007	0.000	11.805	0.007	11.798	0.007
Taiwan	0.008	0.003	17.160*	3.378	14.781*	2.378
Thailand	0.006	0.000	10.847	0.715	10.132	0.715
First Sample						
India	0.006	0.001	5.067	0.686	4.381	0.686
Korea	0.009	0.002	8.380	1.491	6.889	1.491
Taiwan	0.007	0.005	8.906	3.671	5.235	3.671
Thailand	0.006	0.002	6.619	1.891	4.728	1.891
Second Sample						
India	0.021	0.000	17.905*	0.004	17.901*	0.004
Korea	0.004	0.000	3.015	0.010	3.005	0.010
Taiwan	0.019	0.000	16.544*	0.000	16.544*	0.000
Thailand	0.010	0.000	8.876	0.056	8.819	0.056
	Critical Value at		15.495	3.841	14.265	3.841

Table 6: Trivariate Cointegration Test (Net Foreign Equity Trading, Domestic and World Return Index)

	Eigenvalues			λ_{trace} Test			λ_{max} Test		
	r = 0	r ≤ 1	r ≤ 3	r = 0	r ≤ 1	r ≤ 3	r = 0	r = 1	r = 3
Full Sample									
India	0.022	0.004	0.000	43.864*	7.332	0.009	36.533*	7.323	0.009
Korea	0.015	0.004	0.000	30.695*	6.511	0.569	24.184*	5.942	0.569
Taiwan	0.037	0.007	0.000	72.363*	11.842	0.033	60.521*	11.809	0.033
Thailand	0.022	0.005	0.000	44.575*	8.493	0.536	36.082*	7.956	0.536
First Sample									
India	0.0788	0.0119	0.0041	76.332*	12.4826	3.1876	63.849*	9.2949	3.1876
Korea	0.0355	0.0221	0.0000	45.845*	14.5636	0.0482	28.281*	17.5155	0.0482
Taiwan	0.0340	0.0082	0.0013	34.336*	7.4521	1.0375	26.884*	6.4146	1.0375
Thailand	0.0321	0.0087	0.0022	33.914*	8.5023	1.6744	25.411*	6.8278	1.6744
Second Sample									
India	0.0270	0.0206	0.0006	41.188*	18.047*	0.4747	23.140*	17.573*	0.4747
Korea	0.0340	0.0036	0.0000	32.347*	3.0590	0.0401	29.287*	3.0180	0.0401
Taiwan	0.0272	0.0215	0.0002	41.854*	18.537*	0.1380	23.317*	18.398*	0.1380
Thailand	0.0822	0.0231	0.0003	92.567*	19.961*	0.2199	72.605*	19.741*	0.2199
	Critical values at 95%			29.80	15.49	3.84	21.13162	14.2646	3.841466

Table 7: Final Cointegration Result

	Full Sample - 01/01/2001 - 30/03/2007	
	World Return Index	World Return Index and Net Foreign Equity Purchase
India	One	One
Korea	None	One
Taiwan	One	One
Thailand	None	One
	First Sample - 01/01/2001 - 31/12/2003	
	World Return Index	World Return Index and Net Foreign Equity Purchase
India	None	One
Korea	None	One
Taiwan	None	One
Thailand	None	One
	Second Sample - 01/01/2004 - 30/03/2007	
	World Return Index	World Return Index and Net Foreign Equity Purchase
India	One	Two
Korea	None	One
Taiwan	One	Two
Thailand	None	Two

Table 8: Granger Causality and ECM Result (Full Sample)

		Total Return Index				Net Foreign Equity Investment				
	World	India	Korea	Taiwan	Thailand	India	Korea	Taiwan	Thailand	ECT_{t-I}
World Return Index		62.97*	211.39*	186.12*	70.79*	35.32*	82.52*	196.92*	73.19*	
India Return Index	1.42					62.43*				-0.0007*
Korea Return Index	3.51						37.43*			1.46
Taiwan Return Index	4.23							25.16*		0.00
Thailand Return Index	3.15								40.35*	0.0027*
India - Foreign Investment	0.84	8.20*								0.0004*
Korea - Foreign Investment	0.59		4.5							5.48*
Taiwan - Foreign Investment	2.55			12.57*						0.0118*
Thailand - Foreign	0.01				5.55**					-0.045

** (**) Indicates Significance of the Chi-Square (t-for ECT) Statistic at 95% (90%)*

Table 9: Variance Decomposition

Period	World Return	Domestic Return	Net Equity Investment	World Return	Domestic Return	Net Equity Investment
	India			Korea		
	Domestic Return			Domestic Return		
1	5.665	90.691	3.644	8.192	91.808	0.000
5	33.461	61.493	5.047	39.096	60.790	0.114
10	40.398	53.706	5.896	42.391	57.525	0.084
15	44.113	49.748	6.139	43.403	56.527	0.069
20	46.911	46.872	6.218	43.871	56.069	0.059
	Net Foreign Equity Investment			Net Foreign Equity Investment		
1	0.144	0.000	99.856	0.161	0.509	99.330
5	11.176	1.521	87.302	12.296	8.885	78.819
10	14.241	2.192	83.567	16.894	10.473	72.633
15	14.681	2.865	82.454	18.457	11.770	69.773
20	14.583	3.549	81.867	19.373	13.043	67.584
	World Return			World Return		
1	100.000	0.000	0.000	100.000	0.000	0.000
5	99.932	0.020	0.048	99.931	0.030	0.039
10	99.904	0.071	0.025	99.912	0.027	0.061
15	99.813	0.170	0.017	99.907	0.025	0.067
20	99.684	0.303	0.013	99.906	0.024	0.070
	Taiwan			Thailand		
	Domestic Return			Domestic Return		
1	3.086	83.380	13.534	2.343	76.666	20.991
5	24.010	60.100	15.890	12.156	71.207	16.637
10	26.701	57.000	16.299	13.779	69.641	16.580
15	27.561	56.002	16.437	14.411	69.039	16.551
20	27.982	55.511	16.508	14.803	68.700	16.497
	Net Foreign Equity Investment			Net Foreign Equity Investment		
1	0.577	0.000	99.423	0.140	0.000	99.860
5	15.172	0.873	83.955	4.573	1.329	94.098
10	18.767	1.093	80.140	5.396	1.553	93.051
15	20.948	1.241	77.811	5.613	1.650	92.738
20	22.836	1.375	75.789	5.688	1.717	92.595
	World Return			World Return		
1	100.000	0.000	0.000	100.000	0.000	0.000
5	99.939	0.014	0.046	99.727	0.260	0.013
10	99.954	0.020	0.026	99.722	0.270	0.008
15	99.950	0.026	0.024	99.756	0.237	0.006
20	99.938	0.032	0.030	99.790	0.201	0.009

Figure 1: Rolling Correlation between Indian Domestic Return and World Return

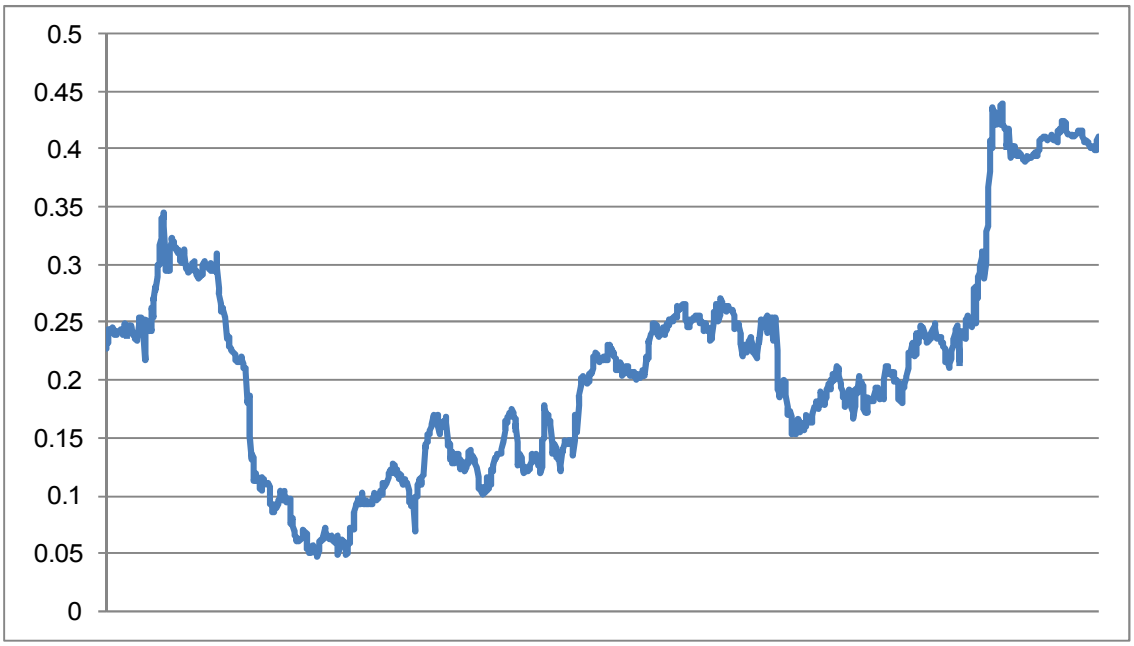

Figure 2: Rolling Correlation between Korean Domestic Return and World Return

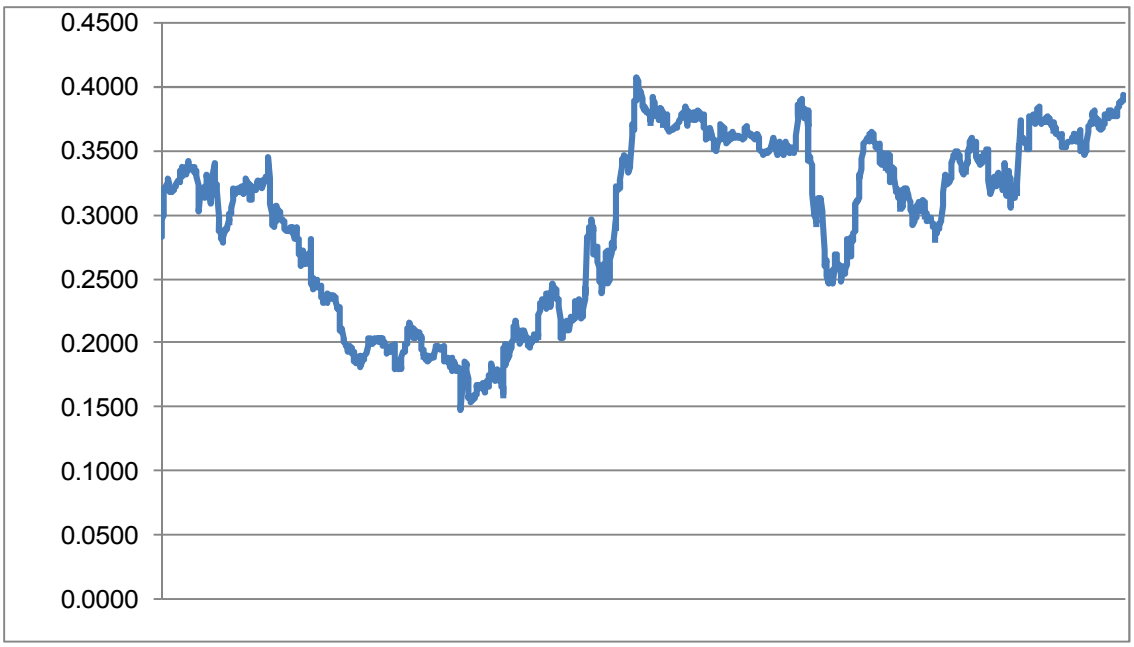

Figure 3: Rolling Correlation between Taiwanese Domestic Return and World Return

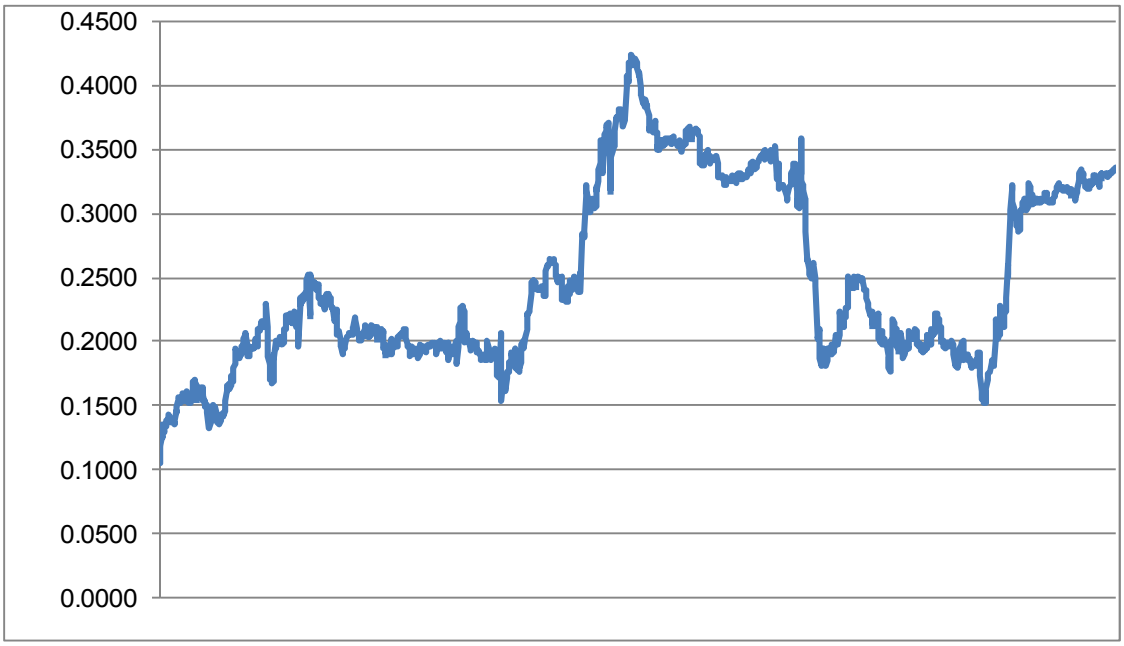

Figure 4: Rolling Correlation between Thai Domestic Return and World Return

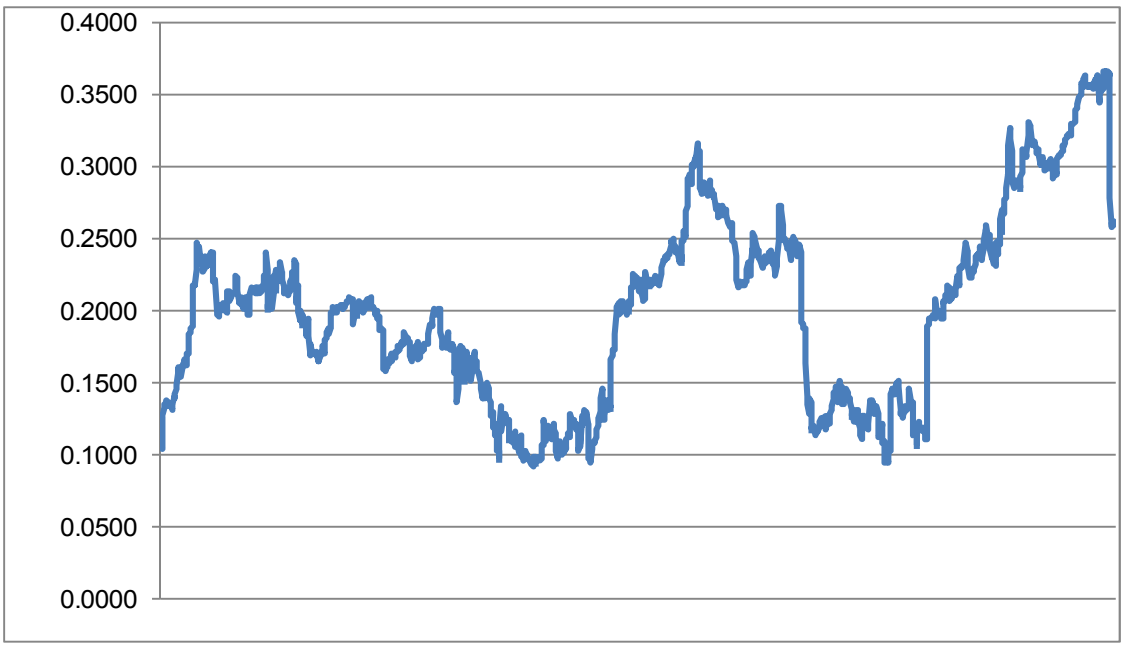

Figure 5: Impulse Response Function – India

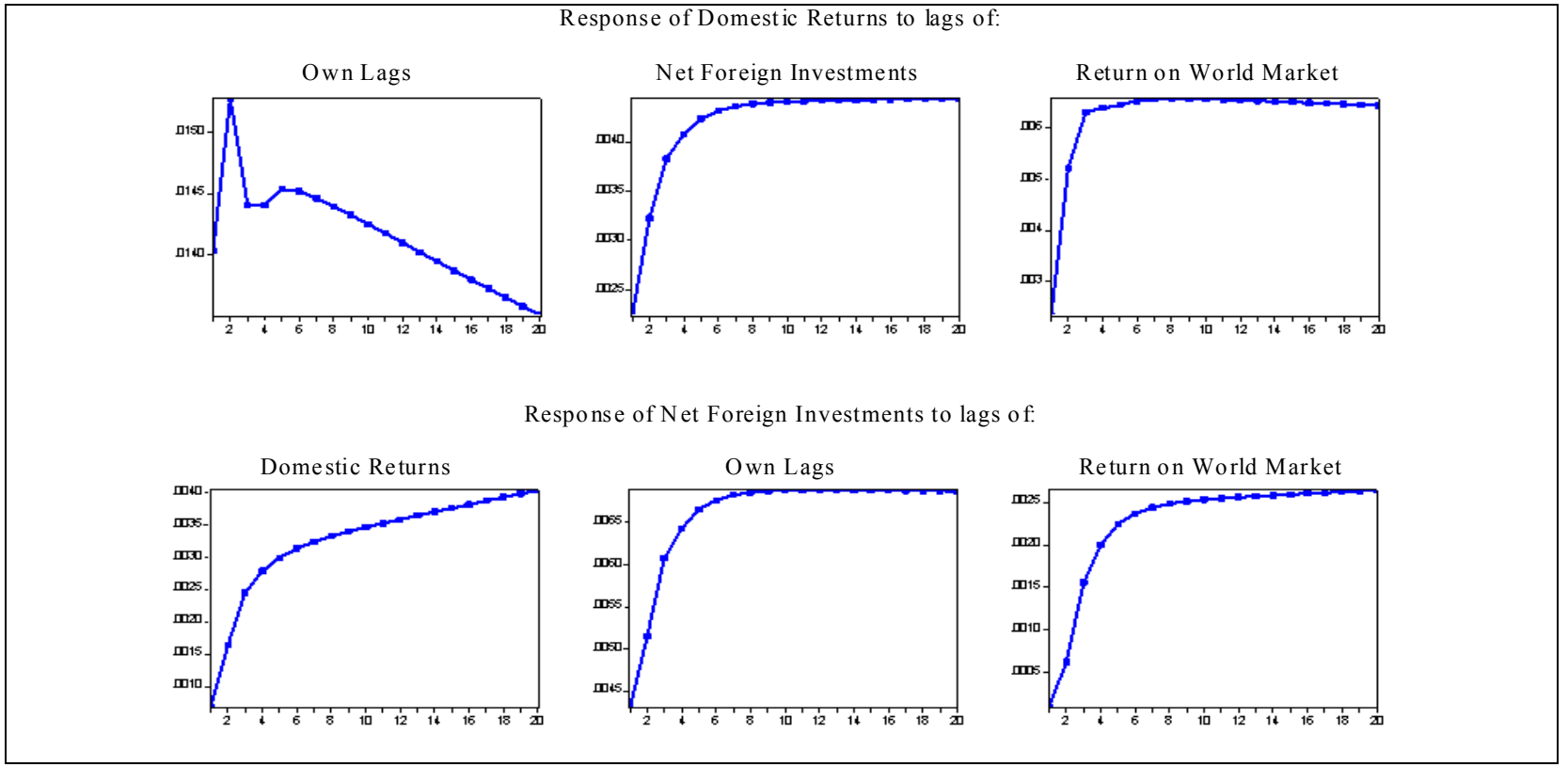

Figure 6: Impulse Response Function – South Korea

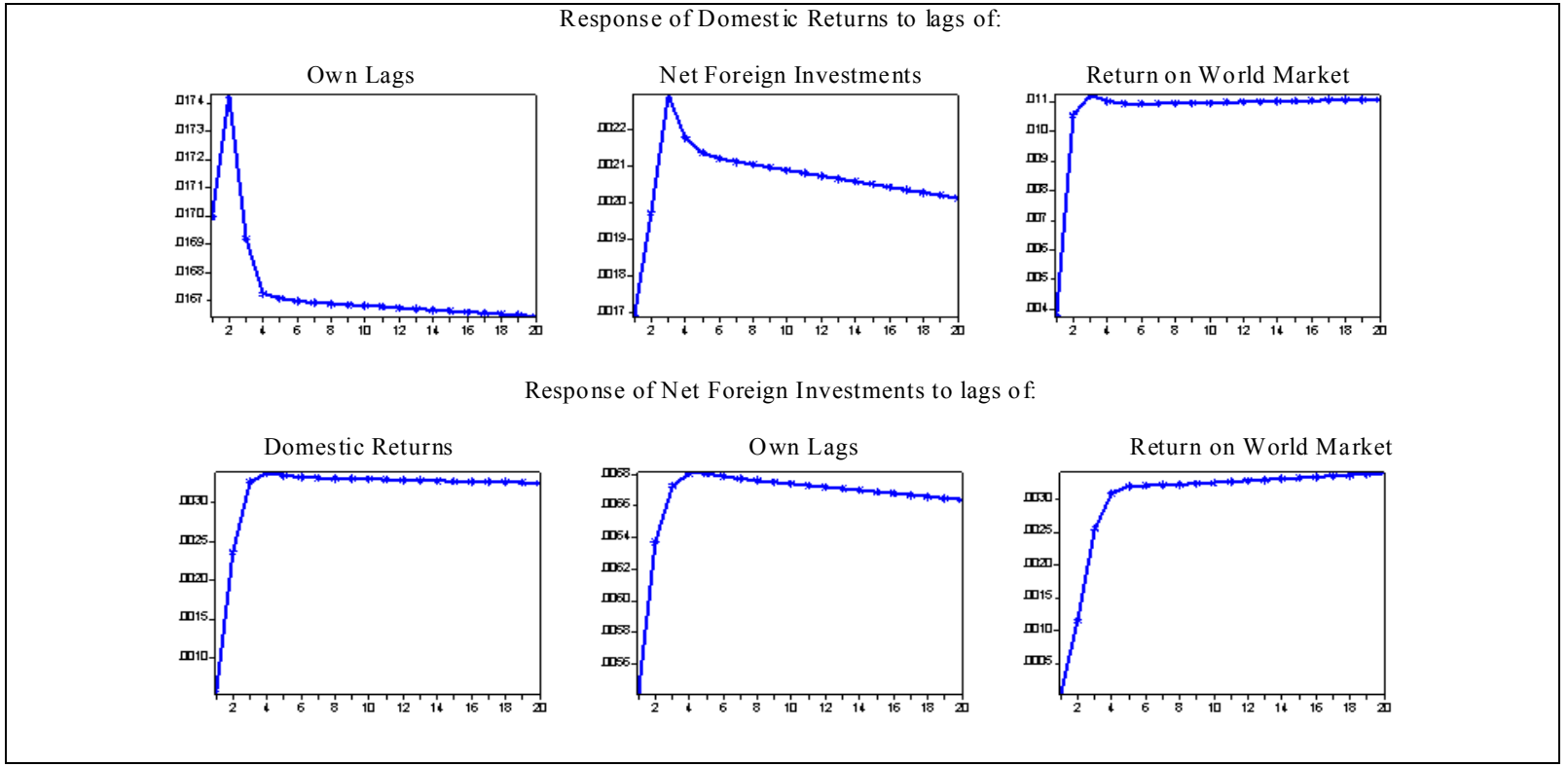

Figure 7: Impulse Response Function – Thailand

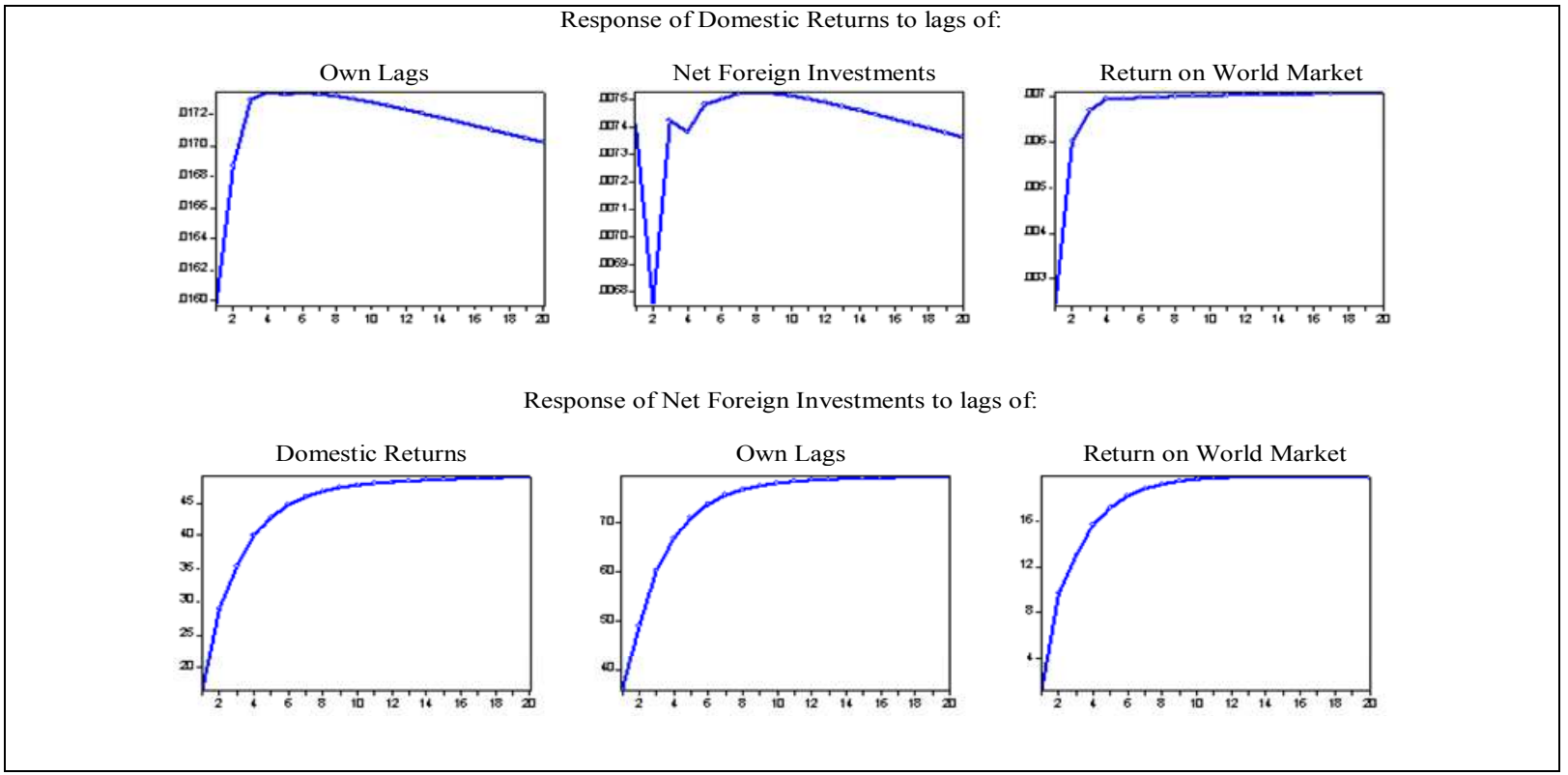

Figure 8: Impulse Response Function – Taiwan