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Did the US Macroeconomic Conditions Affect Asian Stock Markets?

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ABSTRACT

The aim of this paper is to examine the impact of US macroeconomic conditions—namely, exchange rate and short-term interest rate—on the stocks of seven Asian countries (China, India, the Philippines, Malaysia, Singapore, Thailand, and South Korea). Using daily data for the period 2000 to 2010, we divide the sample into pre-crisis period (pre-August 2007) and crisis period (post-August 2007) we find that in the short-run interest rate has a statistically insignificant effect on returns for all countries except the Philippines in the crisis period, while except for China, regardless of the crisis, depreciation had a statistically significant negative effect on returns. When the long-run relationship among the variables is considered, for four of the seven countries (India, Malaysia, Philippines, Singapore, and Thailand) while there was cointegration in the pre-crisis period, in the crisis period there was no such relationship, implying that the financial crisis has actually weakened the link between stock prices and economic fundamentals.

Keywords: *Interest Rate; Exchange Rate; Financial Crisis; Depreciation.*

1. Introduction

The link between macroeconomic variables and returns on investments was first established by Ross (1976) as inherent in his proposed arbitrage pricing theory, which basically argued that a range of variables are possible determinants of returns without really identifying these variables. This research gap was addressed, however, by Roll and Ross (1980), who identified four main factors—namely unanticipated changes in the inflation, risk premiums, the term structure of interest rates, and industrial production—as determinants of returns. Subsequently, a large number of studies have empirically examined the relationship between key macroeconomic variables and stock returns; among influential studies, see Chen *et al*. (1986) and Fama (1981).

The aim of this paper is to examine the impact of the US macroeconomic conditions, proxied by exchange rate (US vis-à-vis local currency) and short-term US interest rate on stock returns of seven Asian countries, namely India, China, the Philippines, Malaysia, Thailand, Singapore, and South Korea. The proposed work is different from the literature in two distinct ways. First, we examine whether the impact of these two US macro variables had different effects on returns in these Asian countries in the pre-2007 financial crisis as compared with the crisis period (post-2007 period). One feature of the traditional and voluminous literature alluded to earlier is that they consider only domestic macroeconomic conditions on stock market returns. There are very few studies that consider the impact of foreign macroeconomic factors. The exceptions are Christie-David *et al*. (2002) and Becker *et al*. (1995) who examined the reaction of the US and foreign bond futures prices from US macroeconomic news announcements; Nikkinen and Sahlstrom (2004), who examined both domestic and worldwide (proxied by the US) macroeconomic news in stock valuations on

European stock markets; and Nasseh and Strauss (2000), who used a variance decomposition analysis and unravelled that German short-term interest rates affected stock prices in European countries. Considering the US market in this regard is crucial, for as explained by Dumas and Solnik (1995) given the high degree of integration between emerging economies and the USA. In addition, a sound argument in favour of modelling the influence of the US macroeconomic condition is provided by Nikkinen and Sahlstrom (2004: p. 201-202), who contend that firms operating in several markets are not only concerned about what is happening in one particular market, rather they are interested in the economic conditions in the largest market, for this has implications on their profitability and decision making.

Second, because of the short sample period due to the fact the financial crisis is only a few years old means that unlike the extant literature we cannot use monthly data; rather, to have a reasonable sample period for estimation, we need to use daily data, which we do. Our approach of using daily data for econometric reasons, as well as to provide as an opportunity to for the first time examine the impact of US macro variables in the pre-crisis and crisis period, actually precludes us from using a wide range of macro variables as proposed by, for instance, Roll and Ross (1980). This caveat is a result of the fact that daily data on unemployment, industrial production, and inflation does not exist.

We organise the balance of the paper as follows. In section 2, we discuss the empirical model and the theoretical framework that motivates the empirical model. In section 3, we discuss the data and the findings. In the final section, we provide some concluding remarks.

2. Empirical Model and Theory

In this section, we discuss our proposed model and the theoretical framework that motivates the empirical analysis. As mention earlier, our concern in this paper is on the potential role of the US macro variables—namely the exchange rate (US vis-à-vis China, India, Malaysia, Thailand, the Philippines, Singapore, and South Korea) and US short-term interest rate – on returns from seven Asian markets. Based on this, the functional form of the relationship between returns and US macro variables takes the following form:

$$R = f(ER, IR) \tag{1}$$

This amounts to the following regression model:

$$R_t = \alpha_0 + \alpha_1 RER_t + \alpha_2 RIR_t + \mu_t \tag{2}$$

Where R is the returns calculated as $log(P_t/P_{t-1})$ of each of the seven Asian countries; RER is the return on the bilateral exchange rate – domestic currency per US dollar, calculated as $log(ER_t/ER_{t-1})$, such that an increase in the exchange rate represents an appreciation of the domestic currency; and RIR is the return on the short-term US interest rate proxied by the Federal Funds Target Rate (FDTR) index, calculated as $log(IR_t/IR_{t-1})$. Data is daily and for the period 5 January 2000 – 25 January 2010. All the data are downloaded from BLOOMBERG. Equation (2) is estimated for each of the seven countries based on the ordinary least squares estimator. As a robustness check, we also estimate Equation (2) using a GARCH (1,1) model, which has the following form:

$$R_t = \alpha_0 + \alpha_1 RER_t + \alpha_2 RIR_t + \mu_t \tag{3}$$

$$\sigma_t^2 = \omega + \beta_1 \mu_{t-1}^2 + \beta_2 \sigma_{t-1}^2 + \varepsilon_t \tag{4}$$

Equation (3) represents the mean equation for stock market returns, while equation (2) represents the variance of stock returns as a function of news about volatility from the previous period, represented by β_1 the ARCH terms, and the last period's forecast variance represented by β_2, the GARCH term.

In addition, we also conduct tests for cointegration among the levels of the variables for each of the seven countries and where a cointegration relationship is found, we augmented the mean equation of the GARCH (1,1) model (equation 3) with the one-period lagged error correction term, and call this the ECM-GARCH (1,1) model.

Based on equation (2), we propose two testable hypotheses.

Hypothesis 1: that depreciation reduces returns. This relationship is explained by Markowitz's (1952, 1991) portfolio theory, whereby a depreciation of the domestic currency leads to a portfolio switch, from domestic assets to foreign assets. This results due to the fact that depreciation reduces returns for foreign investors

Hypothesis 2a: that an increase in the US short-term interest rate will have a negative effect on returns. The reason is as follows. When the US interest rate rises, foreign investors (and also well diversified domestic investors) can potentially withdraw their investment from the domestic market and invest in the US money market, provided that the new interest rate is higher than returns from the stock market.

Hypothesis 2b: that an increase in the US short-term interest rate will have a positive effect on returns. This relationship is possible if, as Nasseh and Strauss (2000) argue, short-term interest rates are positively related to stock prices. Because stock prices are positively linked to macroeconomic activity, including economic growth, which in turn has a positive effect on stock market performances (see, *inter alia*, King and Levine, 1993; Liu and Hsu, 2006), an increase in stock prices resulting from a rise in foreign interest rate will lead to a positive effect on returns.

3. Empirical Analysis

3.1. Integrational properties of data

Before conducting the regression analyses, we tested the time series properties of the series by applying the conventional augmented Dickey Fuller (Dickey and Fuller, 1979, Said and Dickey, 1984) test. This tests the unit root null hypothesis against the alternative of mean stationary. The null is rejected if the AFD statistic is less than the critical value.

The ADF test results are presented in Table 1. We were unable to reject the unit root null for the series of all seven countries for all thee different sample periods. As a result, these series appear in the GARCH framework and the short-run OLS regression model in first differenced form.

3.2. Main findings

3.2.1. Short-run results

The OLS and the GARCH results are presented in Table 2. Clearly, both the OLS estimations and GARCH framework have produced consistent results across the three samples. As a

result we concentrate on the GARCH estimated short-term results. The exchange rate variable is found to be the only significant variable at the 5 per cent level or better for all except Philippines. Stock returns in Philippines are also found to be significantly affected by news on US interest rates in the full sample period and the period covering the crisis and beyond.

The exchange rate, which is expressed as local currency per US dollar, is found to have a negative effect on stock returns of all seven countries. This suggests that a depreciation of any of the seven Asian countries' currency against the US dollar leads to a fall in equity returns. India, Singapore, South Korea, Thailand, and Philippines, show a significant relationship between exchange rate and equity returns in all three samples examined. A comparison of these three periods show that stock returns have become much more sensitive to exchange rate movement against the US since the onset of the crisis. The OLS estimations suggest that China's equity market were not significantly affected by the China-US exchange rate but became significant since the Global Financial crisis. In contrast, Malaysian stock returns were more sensitive to exchange rate movements prior to the Global crisis than during the crisis.

The Asian equity markets do not seem to be sensitive to news on changes in the monetary policy stance in the US. Only Philippine's stock market shows a significant link between the US Interest rates. This relationship is positive, which means that an increase in the US interest rates leads to an increase in equity returns in Philippines.

For completeness, we also provide results from the ECM-GARCH model for these countries. These models were estimated for country samples that showed a cointegrating relationship for the equation of interest here. The cointegration test was performed using the Johansen (1991, 1995) test. The results on the Trace test and Maximum Eigenvalue test are presented in Table 3. A summary of these results are displayed in Table 4. For the full sample, we find evidence of a cointegrating relationship between stock returns, the exchange rate (in the US dollars) and the US interest rate for all countries, except India. A long run relationship is apparent in the pre-crisis period for all Asian countries studied. However, there is limited evidence of a long run relationship since the crisis period. Only China and Korea show a cointegrating relationship between stock prices, movements in their currency relative to that of the US and the US interest rates.

On the basis of the Johansen test result, we estimated the ECM-GARCH models. The ECM-GARCH results are presented in Table 5. We find that the results emerging from this class of models are broadly consistent when compared with the GARCH models.

3.2.2 Long-run results

On the basis of the cointegration results, we also estimated the long-run results. These results are presented in Table 6. In the long-run, we find that both the exchange rate and the US interest rate are important determinants of Asian stock prices.

The long-run relationship between exchange rate and share prices are mainly confined to the full sample period. The exchange rate variable has a negative effect on stock prices of Malaysia, the Philippines, Singapore, Thailand and Korea, consistent with the Markowitz theory. For China, we did find a negative long-run relationship. For India, while there is no evidence of a cointegrating equation in the full sample, we do find one in the pre-crisis period. Here, a negative relationship between the exchange rate and Indian stock prices is found.

Only China and Korea show evidence of a cointegrating relationship between exchange rate and their stock prices in the subsample periods. China's stock prices and the China-US exchange rate are significant in the pre-crisis and crisis period. An appreciation of the Chinese currency against the US dollar leads to an increase in their stock prices in both sample periods. In Korea's case, we see a similar relationship in the crisis period but not in the pre-crisis period.

The Asian stock price and the US interest rate nexus are more evident in the long-run than in the short-run. We find a significant relationship between the US interest rate and stock prices for China and Singapore in the full sample period and the crisis period; for India in the pre-crisis period; and for Korea in all three periods examined. The signs on this relationship are mixed. For China, we find this relationship to be negative, indicating that a decrease in the US interest rate has led to an increase in Chinese share prices. In the case of Korea, the relationship is found to be positive during the pre-crisis period and negative during crisis period. The rest of the countries do not show a significant relationship between the US interest rate and stock prices in the crisis period. However, India and Singapore show a

positive long-run relationship in the pre-crisis period while for Malaysia there is a negative relationship in this period.

3.2.3. Discussion of results

In the short-run, changes in exchange rate and interest rate had no statistically significant effects on Chinese stock market returns in both the pre-crisis and crisis periods. The interest rate variable turned out to be statistically insignificant for all countries in the full sample and pre-crisis periods. Only for the Philippines in the crisis period the US short-term interest rate turned out to be positive and significant (see Table 7).

In tables 4 and 5, we summarise the results on evidence for cointegration and the long-run elasticity with respect to exchange rate and interest rate, respectively. The implication of cointegration between stock prices, exchange rate and interest rate is as follows. First, it implies that stock prices are grounded in economic fundamentals—in our case, they are the exchange rate and interest rate. Second, cointegration implies that over the long-run, economic fundamentals impact stock prices. According to our results, the global financial crisis of 2007 weakened the long-run relationship between US macro fundamentals and the Asian stock prices. For example, in the case of India, Malaysia, Philippines, Singapore, and Thailand, in the pre-crisis period there was cointegration between stock prices, exchange rates and interest rates; however, in the crisis period there was no such relationship (see Table 4). A second feature of our results is that in the case of China and South Korea, the cointegration relationship existed in both periods, meaning that the financial crisis did not

disrupt the long-run relationship between the US macro fundamentals and stock prices of China and South Korea.

In the case of China, in both the pre-crisis and crisis periods stock prices declined due to appreciation (table 8), although the decline was substantially less in the crisis period compared with the pre-crisis period. This again implies that the global financial crisis did not necessarily have a detrimental effect on the Chinese stock market. In the case of South Korea, the only other country where cointegration relationship was found in both periods, exchange rate was statistically insignificant in the pre-crisis period, but it became statistically significant in the crisis period—where depreciation reduced stock prices. This implies that the crisis period strengthened the impact of the exchange rate on stock prices.

4. Concluding remarks

In this paper we examine the impact of US macroeconomic fundamentals on the stock market performance of seven Asian countries, namely China, India, the Philippines, Malaysia, Singapore, Thailand, and South Korea. Due to the short time span of the crisis, one problem is the lack of time series observations. To solve this problem, unlike previous studies in this literature which has used monthly data, we use daily data. The use of daily data precludes the usage of macro variables apart from exchange rate and interest rate simply because daily data on economic activity (industrial production mainly), inflation rate, and unemployment rate do not exist.

We use daily data for the period 2000 to 2010, and divide the sample into the pre-crisis period (pre-August 2007) and the crisis period (post-August 2007). Our main findings are as

follows. First, we find that in the short-run changes in the US interest rate has a statistically insignificant effect on returns for all countries except the Philippines, for which interest rate has a statistically significant positive effect on returns in the crisis period. Second, except for China, regardless of the crisis, depreciation had a statistically significant negative effect on returns. Third, when the long-run relationship among the variables is considered, for four of the seven countries (India, Malaysia, Philippines, Singapore, and Thailand) while evidence of cointegration was found in the pre-crisis period, no such evidence was found in the crisis period. This implies that the financial crisis actually weakened the long-run relationship between stock prices and economic fundamentals. Finally, for China and South Korea, the cointegration relationship existed in both periods, meaning that the financial crisis did not disrupt the long-run relationship between the US macro fundamentals and stock prices.

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Table 1: Unit Root Results – ADF test

Variables	Full Sample	Pre-Crisis	Crisis
China	Test Stat. [lag length]	Test Stat. [lag length]	Test Stat. [lag length]
SP	-0.895 [0]	1.603 [0]	-1.137 [0]
GSP	-48.748*** [0]	-41.867*** [0]	-24.539*** [0]
IR	0.209 [0]	-0.629 [0]	-0.984 [0]
GIR	-49.321*** [0]	-42.627*** [0]	-24.759*** [0]
$ER_{US/China}$	2.965 [0]	-0.629 [0]	-1.149 [0]
$GER_{US/China}$	-50.147*** [0]	-40.586*** [0]	-22.641*** [0]
India			
SP	-0.180 [1]	0.808 [1]	-1.149 [0]
GSP	-46.451*** [0]	-25.039*** [8]	-22.641*** [6]
IR	0.240 [0]	-0.628 [0]	-0.948 [0]
GIR	-49.963*** [0]	-43.543*** [0	-24.679*** [7]
$ER_{US/Euro}$	-0.769 [0]	-44.941*** [0]	-25.877*** [0]
$GER_{US/Euro}$	-50.107*** [0]	-24.959*** [8]	-15.909*** [7]
$ER_{US/India}$	-1.598 [1]	0.561 [0]	-1.120 [0]
$GER_{US/India}$	-46.784*** [0]	-42.847*** [0]	-22.446*** [0]
Malaysia			
SP	-0.717 [1]	0.172 [0]	-1.032 [1]
GSP	-41.832*** [0]	-34.931*** [0]	-22.315*** [0]
IR	0.223 [0]	-0.630 [0]	-0.982 [0]
GIR	-49.634*** [0]	-43.128*** [0]	-24.740*** [0]
ER	-0.778 [0]	1.388 [0]	-1.287 [0]
GER	-48.948* [0]	-19.764*** [4]	-24.072 [0]
Philippines			
SP	-0.585 [1]	1.117 [1	-1.388 [1]
GSP	-44.710*** [0]	-40.110*** [0	-20.987*** [0]

IR	0.243	-0.628	-0.963
	[0]	[0]	[0]
GIR	-49.624***	-43.232***	-24.538***
	[0]	[0]	[0]
ER	-2.238	-2.510	-0.998
	[0]	[0]	[0]
GER	-50.726	-24.918***	-24.107***
	[0]	[3]	[7]
Singapore			
SP	-1.062	0.194	-1.260***
	[0]	[0]	[0]
GSP	-49.289***	-42.625	-24.526***
	[0]	[0]	[0]
IR	0.223	-0.629	-0.978
	[0]	[0]	[0]
GIR	-50.112***	-48.543***	-24.979***
	[0]	[0]	[0
ER	-0.037	-0.111	-1.675
	[0]	[0]	[0]
GER	-50.387***	-43.649***	-25.048***
	[0]	[0]	[0
Thailand			
SP	-1.069	0.021	-1.137
	[0]	[0]	[0]
GSP	-32.867***	-28.540***	-23.270***
	[1]	[1]	[0]
IR	0.232	-0.629	-0.962
	[0]	[0]	[0]
GIR	-49.533***	-43.058***	-24.659***
	[0]	[0]	[0]
ER	-0.162	0.077	-1.131
	[0]	[0]	[0]
GER	-48.833***	-42.109***	-24.769***
	[0]	[0]	[0]
Korea			
SP	-0.814	0.048	-1.521
	[0]	[0]	[0]
GSP	-48.742***	-41.972***	-24.579***
	[0]	[0]	[0]
IR	0.213***	-0.655	-2.387
	[0]	[0]	[0]
GIR	-49.714***	-43.163***	-23.826***
	[0]	[0]	[0]
ER	-1.442	0.047	-1.480
	[3]	[0]	[0]
GER	-31.265***	-44.674***	-16.132***
	[2]	[0]	[2]

Notes: The ADF critical values (CVs) at the 5% and 1% levels are -2.863 and -3.434, respectively, for full sample and the sub-sample period 01/2000-07/2007; and for the sub-sample period 07/2007-01/2010, these are -2.866 and -3.441. The DF-GLS critical values at the 5% and 1% levels are -1.941 and -2.566 for the full sample, respectively.

Table 2: Short-term results from OLS and GARCH models

	OLS	OLS	OLS		GARCH	GARCH	GARCH
	Full Sample	Pre-Crisis	Crisis		Pre-Crisis	Crisis	Pre-Crisis
	log (GSP)	log (GSP)	log (GSP)		log (GSP)	log (GSP)	log (GSP)
China							
C	0.030	0.001	-0.052			NA	0.001
	(0.035)	(0.000)	(0.095)		NA		(0.001)
log ($GER_{china/us}$)	0.020	-0.063	0.447***				-0.857
	(0.018)	(0.388)	(0.115)		NA	NA	(0.864)
log (GIR)	-0.353	0.041**	0.023				0.011
	(0.489)	(0.020)	(0.015)		NA	NA	(0.017)
R^2	0.002	0.002	0.026		NA	NA	-0.002
India							
C	0.001	0.001	0.001		0.001***	0.001***	0.001
	(0.000)	(0.000)	(0.001)		(0.000)	(0.000)	(0.001)
log ($GER_{india/us}$)	-1.986***	-1.234***	-2.354***		-1.456***	-0.909***	-2.196***
	(0.175)	(0.205)	(0.230)		(0.115)	(0.148)	(0.190)
log (GIR)	0.007	0.012	0.007		0.000	-0.001	0.007
	(0.010)	(0.021)	(0.011)		(0.008)	(0.013)	(0.014)
R^2	0.130	0.030	0.275		0.119	0.025	0.273
Malaysia							
C	0.000	0.000	0.000		0.000	0.000	0.001
	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
log ($GER_{malay/us}$)	-1.011***	-0.960***	-0.007		-0.767***	-0.783***	-0.096
	(0.107)	(0.134)	(0.105)		(0.069)	(0.128)	(0.092)
log (Gir)	0.006	0.024	0.013		0.003	0.010	0.012
	(0.009)	(0.019)	(0.009)		(0.006)	(0.011)	(0.007)
R^2	0.061	0.018	0.005		0.057	0.017	-0.001
Philippines							
C	0.000	0.001**	0.000		0.001***	0.001***	0.000
	(0.000)	(0.000)	(0.001)		(0.000)	(0.000)	(0.000)
log ($GER_{phili/us}$)	-0.439**	-0.224	-1.063***		-0.448***	-0.295**	-0.915***
	(0.167)	(0.165)	(0.146)		(0.086)	(0.110)	(0.093)
log (Gir)	0.014	0.028	0.011		0.013**	0.015	0.012***

	(0.008)	(0.019)	(0.008)	(0.005)	0.014	(0.003)
R^2	0.030	0.011	0.117	0.030	(0.010)	0.114
Singapore						
C	0.000 (0.000)	0.000 (0.000)	0.000 (0.001)	0.000** (0.000)	0.000** (0.000)	0.000 (0.001)
log ($GER_{singa/us}$)	-0.674*** (0.087)	-0.251** (0.098)	-1.212*** (0.176)	-0.319*** (0.066)	-0.180** (0.074)	-0.885*** (0.142)
log (Gir)	0.014 (0.008)	0.017 (0.015)	0.016 (0.012)	0.014 (0.012)	0.016 (0.016)	0.016 (0.019)
R^2	0.024	0.004	0.071	0.017	0.003	0.065
Thailand						
C	0.000 (0.000)	0.000 (0.000)	0.000 (0.001)	0.001 (0.001)	0.000 (0.000)	0.001 (0.001)
log ($GER_{thai/us}$)	-0.655*** (0.122)	-0.550*** (0.136	-1.058*** (0.256)	-0.802*** (0.211)	-0.749*** (0.203)	-0.682*** (0.183)
log (Gir)	0.006 (0.016)	0.008 (0.023)	0.006 (0.019)	0.002 (0.009)	0.000 (0.014)	0.002 (0.015)
R^2	0.022	0.019	0.036	0.020	0.016	0.029
Korea						
C	0.000 (0.000)	0.000 (0.000)	0.000 (0.001)	0.001*** (0.000)	0.001*** (0.000)	0.001 (0.001)
log ($GER_{thai/us}$)	-0.873*** (0.068)	-0.924*** (0.112)	-0.854*** (0.083)	-0.814*** (0.057)	-0.654*** (0.091)	-0.922*** (0.064)
log (Gir)	0.015 (0.011)	-0.014 (0.027)	0.022 (0.016)	0.012 (0.011)	0.001 (0.019)	0.021 (0.014)
R^2	0.127	0.051	0.315	0.125	0.044	0.312

Notes: The standard errors are in the parenthesis. **(***) denote statistical significance of the variable at the 5%(1%) level

Table 3: Cointegration Test Results – Johansen Test

		Full Sample		Pre-Crisis		Crisis	
	No. of Coint. Eqs	Statistic	Critical Value	Statistic	Critical Value	Statistic	Critical Value
CHINA							
Trace test	None	90.071*	35.193	68.792*	35.193	62.206*	35.193
	At most 1	7.051	20.262	14.764	20.262	21.821	20.262
	At most 2	2.071	9.165	1.303	9.165	7.270	9.165
Max-eigenvalue test	None	83.021*	22.300	54.029*	22.300	40.386*	22.300
	At most 1	4.980	15.892	13.461	15.892	14.550	15.892
	At most 2	2.071	9.165	1.303	9.165	7.270	9.165
INDIA							
Trace test	None	17.836	35.193	35.895*	35.193	29.464	35.193
	At most 1	7.926	20.262	6.401	20.262	12.800	20.262
	At most 2	1.286	9.165	2.028	9.165	1.615	9.165
Max-eigenvalue test	None	9.910	22.300	29.493*	22.300	16.664	22.300
	At most 1	6.640	15.892	4.373	15.892	11.185	15.892
	At most 2	1.286	9.165	2.028	9.165	1.615	9.165
MALAYSIA							
Trace test	None	49.714*	35.193	56.230*	35.193	29.032	35.193
	At most 1	8.185	20.262	12.704	20.262	10.798	20.262
	At most 2	2.762	9.165	5.190	9.165	2.741	9.165
Max-eigenvalue test	None	41.529*	22.300	43.526*	22.300	18.234	22.300
	At most 1	5.423	15.892	7.513	15.892	8.056	15.892
	At most 2	2.762	9.165	5.190	9.165	2.741	9.165
Philippines							
Trace test	None	38.442*	35.193	36.583*	35.193	25.759	35.193
	At most 1	12.764	20.262	9.232	20.262	11.830	20.262
	At most 2	3.814	9.165	2.331	9.165	3.951	9.165
Max-	None	25.679*	22.300	27.350*	22.300	13.929	22.300

eigenvalue test							
	At most 1	8.950	15.892	6.901	15.892	7.879	15.892
	At most 2	3.814	9.165	2.331	9.165	3.951	9.165
Singapore							
Trace test	None	48.493*	35.193	35.814*	35.193	29.669	35.193
	At most 1	7.594	20.262	10.248	20.262	11.979	20.262
	At most 2	3.250	9.165	1.646	9.165	4.588	9.165
Max-eigenvalue test	None	40.898*	22.300	25.566*	22.300	17.690	22.300
	At most 1	4.344	15.892	8.602	15.892	7.391	15.892
	At most 2	3.250	9.165	1.646	9.165	4.588	9.165
Thailand							
Trace test	None	42.157*	35.193	39.193*	35.193	27.829	35.193
	At most 1	11.115	20.262	7.472	20.262	6.942	20.262
	At most 2	2.802	9.165	2.439	9.165	2.684	9.165
Max-eigenvalue test	None	31.041*	22.300	31.721*	22.300	20.888	22.300
	At most 1	8.313	15.892	5.033	15.892	4.257	15.892
	At most 2	2.802	9.165	2.439	9.165	2.684	9.165
Korea							
Trace test	None	36.281*	35.193	39.887*	35.193	36.281*	35.193
	At most 1	16.706	20.262	14.447	20.262	16.706	20.262
	At most 2	2.635	9.165	1.303	9.165	2.635	9.165
Max-eigenvalue test	None	19.575	22.300	25.440	22.300	19.575	22.300
	At most 1	14.071	15.892	13.144	15.892	14.071	15.892
	At most 2	2.635	9.165	1.303	9.165	2.635	9.165

Note: * indicates rejection of the null hypothesis of no cointegration at the 5 per cent level.

Table 4: No. of Cointegrating Equations – A summary from Johansen test

	Full sample	Pre-crisis	Crisis
China	1	1	1
India	0	1	0
Malaysia	1	1	0
Philippines	1	1	0
Singapore	1	1	0
Thailand	1	1	0
Korea	1	1	1

Table 5: Short-term results from the ECM-GARCH results

	ECM-Garch Full Sample	sub-sample 1	sub-sample 2		ECM-Garch Full Sample	ECM-Garch sub-sample 1	ECM-Garch sub-sample 2
China							
C			0.001 (0.001)	C			0.000 (0.000)
log ($GER_{china/us}$)			-0.983 (0.863)	$RESID(-1)^2$			0.069 (0.030)
log (GIR)			0.015 (0.017)	GARCH(-1)			0.916*** (0.040)
ECM(-1)			-0.010 (0.005)				
R^2			-0.001				
India							
C		0.001*** (0.000)		C		0.000 (0.000)	
log ($GER_{india/us}$)		-0.894*** **(0.149)**		$RESID(-1)^2$		0.167 (0.037)	
log (GIR)		-0.002 (0.013)		GARCH(-1)		0.788 (0.042)	
ECM(-1)		0.001 (0.001)					
R^2		0.026					
Malaysia							
C	0.001*** (0.000)	6.632 (0.000)		C	0.000*** (0.000)	0.000** (0.000)	
log ($GER_{malay/us}$)	-0.774*** (0.070)	-0.026 (0.021)		$RESID(-1)^2$	0.105*** (0.019)	0.203*** (0.040)	
log (Gir)	0.004 (0.006)	-0.053 (0.706)		GARCH(-1)	0.893*** (0.015)	0.796*** (0.038)	
ECM(-1)	-0.002 (0.001)	1.033*** (0.003)					
R^2	0.055	0.248					
Philippines							
C	0.001 (0.000)	0.001*** (0.000)		C	0.000*** (0.000)	0.000*** (0.000)	
log ($GER_{phili/us}$)	-0.445** (0.087)	-0.292*** (0.110)		$RESID(-1)^2$	0.110*** (0.018)	0.090*** (0.019)	
log (Gir)	0.013 (0.005)	0.014** (0.014)		GARCH(-1)	0.853*** (0.019)	0.871*** (0.024)	

ECM(-1)	0.000 (0.001)	0.001 (0.001)					
R^2	0.030	0.010					
Singapore							
C	0.001 (0.000)	0.001 (0.000)		C	0.000*** (0.000)	0.000*** (0.000)	
log ($GER_{singa/us}$)	-0.323*** (0.066)	-0.187** (0.074)		$RESID(-1)^2$	0.098*** (0.008)	0.089*** (0.009)	
log (Gir)	0.015 (0.012)	0.017 (0.016)		GARCH(-1)	0.899*** (0.008)	0.905*** (0.008)	
ECM(-1)	-0.002 (0.002)	-0.005** (0.002)					
R^2	0.016	0.003					
Thailand							
C	0.000 (0.000)	0.000 (0.000)		C	0.000 (0.000)	0.000 (0.000)	
log ($GER_{thai/us}$)	-0.810*** (0.216)	-0.753*** (0.203)		$RESID(-1)^2$	0.116*** (0.025)	0.111*** (0.033)	
log (Gir)	-0.001 (0.009)	0.001 (0.014)		GARCH(-1)	0.782*** (0.069)	0.738*** (0.091)	
ECM(-1)	-0.001 (0.001)	-0.001 (0.001)					
R^2	0.020	0.016					
Korea							
C	0.001*** (0.000)	0.001*** (0.000)	0.001** 0.001	C	0.000** (0.000)	0.000** (0.000)	0.000 (0.000)
log ($GER_{thai/us}$)	-0.815*** (0.056)	-0.656*** (0.092)	-0.944*** 0.061	$RESID(-1)^2$	0.075*** (0.013)	0.066*** (0.013)	0.100** (0.038)
log (Gir)	0.011 (0.011)	0.001 (0.019)	0.023 0.014	GARCH(-1)	0.921*** (0.011)	0.931*** (0.011)	0.889*** (0.031)
ECM(-1)	-0.001 (0.001)	-0.001 (0.002)	-0.029** 0.011				
R^2	0.126	0.045	0.326				

Notes: The standard errors are in the parenthesis. **(***) denote statistical significance of the variable at the 5%(1%) level

Table 6: Long Run Results

	Full Sample	Pre-Crisis	Crisis
China			
c	-6.090	0.206***	-5.625
	(-3.660)	(0.155)	(-6.045)
Log (ER)	6.520***	-29.846***	-6.866**
	(1.796)	(-4.766)	(-3.107)
Log (IR)	-0.628***	70.284	-0.247**
	(-0.136)	(10.092)	(-0.089)
India			
c		29.858	
		(19.086)	
Log (ER)	-	-10.546**	-
		(-5.029)	
Log (IR)		0.963**	
		(0.367)	
Malaysia			
c	13.037***	-13.341	
	(0.555)	(-1.023)	
Log (ER)	-4.787***	-5.038***	-
	(-0.428)	(-0.763)	
Log (IR)	0.001	0.031	
	(0.023)	(0.031)	
Philippines			
c	25.136***	12.363**	
	(4.423)	(4.957)	
Log (ER)	-4.564***	-1.420	-
	(-1.126)	(-1.232)	
Log (IR)	-0.132	0.121	
	(-0.108)	(0.152)	
Singapore			
c	9.095***	7.906	

	(0.108)	(0.338)	
Log (ER)	-3.160***	-1.126	
	(-0.224)	(-0.596)	-
Log (IR)	0.146***	0.248***	
	(0.020)	(0.046)	
Thailand			
c	17.351***	10.938***	
	(1.771)	(2.975)	-
Log (ER)	-3.021***	-1.272	
	(-0.486)	(-0.795)	
Log (IR)	0.041	-0.031	
	(0.051)	(-0.084)	
Korea			
c	40.664***	-4.002	41.374***
	(3.600)	(-6.539)	(6.835)
Log (ER)	-4.782***	1.461	-4.877***
	(-0.509)	(0.921)	(-0.974)
Log (IR)	-0.375***	0.456***	-0.521***
	(-0.065)	(0.154)	(-0.122)

Notes: The standard errors are in the parenthesis. **(***) denote statistical significance of the variable at the 5%(1%) level

Table 7: The Impact of an increase in GER or GIR on Equity Returns (GSP): A summary of short-run results

	Full Sample	**Pre-Crisis**	**Crisis**
CHINA			
GER			
GIR			
INDIA			
GER	↓	↓	↓
GIR			
MALAYSIA			
GER	↓	↓	↓
GIR			
PHILIPPINES			
GER	↓	↓	↓
GIR	↑		↑
SINGAPORE			
GER	↓	↓	↓
GIR			
THAILAND			
GER	↓	↓	↓
GIR			
SOUTH KOREA			
GER	↓	↓	↓
GIR			

Notes: Only significant results, at the 5 per cent or better, are reported here.

Table 8: The Impact of an increase in Log (ER) or Log (IR) on log (SP): A summary of long-run results

	Full Sample	Pre-Crisis	Crisis
CHINA			
Log (ER)	↑	↓	↓
Log (IR)	↓		↓
INDIA			
Log (ER)		↓	
Log (IR)		↑	
MALAYSIA			
Log (ER)	↓	↓	
Log (IR)			
PHILIPPINES			
Log (ER)	↓		
Log (IR)			
SINGAPORE			
Log (ER)	↓		
Log (IR)	↑	↑	
THAILAND			
Log (ER)	↓		
Log (IR)			
SOUTH KOREA			
Log (ER)	↓		↓
Log (IR)	↓	↑	↓

Notes: Only significant results, at the 5 per cent or better, are reported here.