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STOCK MARKET AND ECONOMIC GROWTH IN SELECTED ASIAN COUNTRIES

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Abstract

This study investigates the relationship between stock markets and economic growth in twelve Asian countries from 1980 to 2004. In this study, we utilize the Johansen cointegration and Granger causality tests using quarterly data. Results from cointegration test suggest that there is long run relationship between stock markets and economic growth in four countries namely, China, the Philippines, Singapore and Taiwan. The results of Granger causality test indicate that there is a bi-directional feedback relationship between stock markets and economic growth in China, Hong Kong, Indonesia, Malaysia and Thailand. Whereas in Japan and Korea, we found that there exists a unidirectional short run causal effect running from stock markets to economic growth. On the contrary, we found short run causal effect running from economic growth to stock markets in the case of India and Singapore. In addition, there is no evidence of causality among the variables under study in Sri Lanka.

Keywords: Stock markets, economic growth, Asian economies

JEL Classification: G10, O10, 053

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INTRODUCTION

In the past two decades, the emerging stock markets have experienced explosive growth. World stock market capitalization grew from $2 trillion in 1982 to $4.7 trillion in 1986. After one decade, the world stock market capitalization rose from $4.7 trillion to $15.2 trillion, implying an average annual growth rate of 15 percent; while emerging markets jumped from less than 4 percent to 13 percent of total world capitalization during the same period (Levine and Zervos, 1996). As a result of the rapid booming, trading activities in these markets dashed ahead at vast pace accordingly. The value of shares traded in emerging markets raised an amazing $8 trillion from less than 3 percent of the $1.6 trillion world total in 1985 to 17 percent of the $9.6 trillion shares traded in all world's exchanges in 1994.

Considerable debate exists on the relationship between stock markets and economic growth. Basically, the debate has been centered on whether it is the stock market that leads to the economic growth or *vice versa*. In recent years, stock market development is a common feature of financial and economic development in the developing countries. Nevertheless, some analysts discover that the emerging stock markets have little positive and potentially a large negative impact on economic growth. Other analysts argue that, because not much corporate investment is financed through the issuance of equity (Mayer, 1988), stock markets are unimportant for economic growth. In contrast, Levine (1991) and Bencivenga *et al*. (1996) show that stock markets can give a big boost to economic growth through the creation of liquidity.

Changes in stock markets performance play an important role in attaining strong economic fundamentals in the long run. The magnitude dependency of the performance of stock market on economic growth is valuable information to policy makers. Asian stock markets have been reputed to be susceptible to economic shocks. Being vulnerable to external shocks, the strength of Asian stock markets is therefore in jeopardy. The linkage between each country's measures of stock prices and economic activity is an important area to study in order to obtain meaningful findings. Thus far, empirical studies on the relationship between stock markets and economic growth have not been carried

out to the extent that certain conclusion can be achieved and agreed most; this is particularly true in Asian countries. Therefore, not only that this study will contribute in bolstering the research methodology, it seeks to provide some useful insights in designing more appropriate policy for Asian countries.

A thorough understanding of the relationship between stock market and economic growth is vital to investors in such a way that it could help them foresee upcoming market movement in accordance to stock market activities. This will lead to a more credible investment verdict. It also benefits both the government and private sectors greatly as the empirical facts would serve as a useful guidance and reminder for them to always scrutinize the effectives of each policy they implement. With high regard to Asian countries, which are economic wise somewhat unsound; this step is vital to stabilize the financial markets.

The principle objective of this study is to examine the dynamic relationship between stock markets and economic growth in twelve Asian countries using quarterly data from 1980 to 2004. The twelve Asian countries selected in this study are China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Pakistan, the Philippines, Sri Lanka, Taiwan and Thailand. It is interesting to investigate how the stock market performance spurs economic growth in these countries in order to understand the interrelationship between stock market and real output in different Asian economies context. More specifically, we intend to examine the long run equilibrium relationship and both the long run and short run dynamic causal linkage between stock markets and economic growth in these Asian countries using time series methods.

In this study, we focus on the inherent dynamic affiliation between the Shanghai Stock Exchange (SSE), Stock Exchange of Hong Kong (HKEx), Jakarta Stock Exchange (JSX), Bombay Stock Exchange (BSE), Tokyo Stock Exchange (TSE), Korea Stock Exchange (KSE), Kuala Lumpur Stock Exchange (KLSE), Stock Exchange of Thailand (SET), Stock Exchange of Singapore (SGX), Philippines Stock Exchange (PSE), Colombo Stock

Exchange (CSE) and Taiwan Stock Exchange (TSE) with the economic growth by examining the causal effect of the twelve Asian countries.

REVIEW ON STOCK MARKET AND ECONOMIC GROWTH NEXUS

From economic point of view, issue on whether or not stock markets promote economic growth has been an interesting topic that has prompted tremendous empirical studies to be carried out on this subject. The discussion, however, is still inconclusive as recent empirical evidences on this issue still remain ambiguous. While many believe that alterations of stock market orbits around their underlying role in economic fluctuation, there is almost equal number of doubters that suggest otherwise.

Atje and Jovanovic (1993) examine a cross-country study of stock markets and economic growth for 39 countries. The most notable detection, they claim, is the existence of a noteworthy relationship between level and growth rate of stock market towards the economic growth over the period 1980 to 1988. However, the equal effect anticipated for the banking lending is absent. Levine and Zervos (1996) employ pooled cross-country, time series regression analysis to examine the data compiled from 41 countries over the period of 1976-1993. The outcome reflects the existence of a strong bond between stock market development and economic growth. Furthermore, the instrumental variables procedures reveal that economic growth in the long run is heavily inclined towards the predetermined component of stock market development.

In contrast, the arguments of Singh (1997) and Harris (1997) suggest otherwise. Singh (1997) focuses his research on developing countries and seeks to understand the role of stock markets towards long run economic growth in the 1980s and 1990s. He concludes that in developing countries, long run economic growth does not show dependency towards the stock market. One of the main reasons for this scenario is that the volatility and arbitraging process will deficient investment allocation. Also, the reaction between stock market and currency markets in the wake of negative economic shocks will alter the

constancy macroeconomic variables. Consequently, long run economic growth would be hindered.

A study by Harris (1997) on 49 countries from the year of 1980-1991, found out that there is no significant relationship between stock market and economic growth. He utilizes two stages least squares technique whereby the sample size is divided into two sectors: developed and less developed countries. Empirical results suggest that stock market has some explanatory power in developed countries whereas in developing countries, stock market and economic growth do not appear to be robustly correlated.

Singh and Weisse (1998) dispute that stock market are in fact likely to destruct economic expansion due to their vulnerability to market breakdown. They assert that stock market developments are not likely to assist developing countries in attaining faster industrialization and long-term economic growth in the 80s and 90s due to several reasons. First, the high unpredictability of share prices in rising markets renders the prices inefficient as signals for resource allocation. Second, rather than allowing corporate managers to take a long-term view of investment, stock markets in fact habitually promote short-term profits. Third, the supremacy of stock markets may weaken the role of banking system to facilitate the economy in developing countries, particularly those in the East and South-east Asia countries.

Levine and Zervos (1998) seek to measure and evaluate how stock market, banks and economic growth interact with one another using data on 47 countries from 1976 to 1993. They provide empirical evidence that stock market liquidity and banking development are both positively and robustly correlated with future economic growth. By employing Sims' causality test, Tuncer and Alovsat (2000) investigate the causal relationship between stock markets and economic growth in 20 countries from 1981 to 1994. The panel data analysis indicates that there is a bi-directional causation between stock market development and economic growth. Although a concrete conclusion cannot be reached on the country base analysis, they do claim that there is a rather strong linkage among the variables under study in developing countries.

Choong *et al*. (2003) utilize the autoregressive distributed lag (ARDL) bounds test and the Granger causality test based on vector error correction model (VECM) to study the finance-led growth hypothesis in Malaysia for the period of 1978 to 2000. They suggest that stock market development posses a noteworthy constructive long run impact on economic growth. In the short run, on the other hand, the stock market is identified as a foremost segment in stipulating domestic growth. They also state that in circumstances where the market is more stable and liberalize as well as there is an improvement in the size and the regulations of the stock market, the evolution of financial sector in particular the stock market has the inclination towards stimulating and promoting economic growth.

Caporale *et al*. (2005) re-examine the dynamic interactions between investment, stock market development and economic growth in Chile, Korea, Malaysia and the Philippines from 1977:1 to 1998:4. They employ the Granger non-causality techniques recently developed by Toda and Yamamoto (1995) to test the hypothesis that stock markets can enhance economic growth through investment productivity. Their findings are supporting to Leigh's (1997) argument in which a well-developed stock market can promote economic growth in the long run.

SOURCE OF DATA

This study employed quarterly data spanning from 1980 to 2004. Due to availability of data, the sample period for each country used in the analysis are as follows: China (1994:1-2004:4), Hong Kong (1980:4-2004:4), India (1985:1-2004:4), Indonesia (1983:2-2004:4), Japan (1980:1-2004:4), Korea (1980:1-2004:4), Malaysia (1980:1-2004:4), Philippines (1987:1-2004:4), Singapore (1985:1-2004:4), Sri Lanka (1985:1-2004:4), Taiwan (1987:1-2004:4) and Thailand (1987:3-2004:4).

The data set consists of two variables for each of the Asian countries, which are real gross domestic product (RGDP) and stock indices. All the variables in the data set are transformed into natural logarithms for the usual statistical reasons. For the stock indices, all the values are extracted from various issues of each twelve Asian countries stock

exchange statistical report. Meanwhile, RGDP data are compiled from various issues of the International Financial Statistics published by International Monetary Fund (IMF) by deflating the nominal GDP with Consumer Price Index (CPI) at a base year of 2000.

There are no quarterly data for India, Sri Lanka and Taiwan. Against this background, it is necessary to interpolate the annual series to obtain quarterly series for India, Sri Lanka, Taiwan and the five countries (China, Indonesia, Malaysia, Singapore and Thailand) mentioned above which have quarterly observations for some of sample periods. To this end, we utilize a quadratic interpolation method outlined and used in Bergstrom (1990). Let $x_{t\text{-}1}$, x_t and x_{t+1} be three successive annual observation of variable x, the four quarterly figures within a given year can be interpolated respectively as follow:

$$\int_{1}^{1.25}(as^2+bs+c)ds = 0.05468x_{t-1} + 0.23438x_t - 0.039067x_{t+1} \quad (1)$$

$$\int_{1.25}^{1.50}(as^2+bs+c)ds = 0.00781x_{t-1} + 0.26563x_t - 0.02344x_{t+1} \quad (2)$$

$$\int_{1.50}^{1.75}(as^2+bs+c)ds = -0.02344x_{t-1} + 0.26562x_t + 0.00781x_{t+1} \quad (3)$$

$$\int_{1.75}^{2}(as^2+bs+c)ds = -0.0391x_{t-1} + 0.23437x_t + 0.05469x_{t+1} \quad (4)$$

EMPIRICAL RESULTS

Unit Roots Test Results

A prerequisite for testing for cointegration in a set of variables is to test for stochastic trends (unit roots) in the autoregressive representation of each individual time series. They should be integrated of the same order to be cointegrated. In other words, the variables should be stationary after differencing each time series the same number of times. To do the task, we rely on Augmented Dickey-Fuller (ADF) unit root test, which is

one of the most commonly used univariate unit root tests proposed by Dickey and Fuller (1981). This test runs an ordinary least square (OLS) regression such as follow:

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + \varepsilon_t \qquad (5)$$

where ΔY_t is the first difference of the Y_t, α_0 is intercept, α_1 are the coefficients, t is time or trend variable, p is the number of lagged terms chosen to ensure that ε_t is white noise. The optimal lag length of p is selected by using the Aikaike's information criteria (AIC) suggested by Aikaike (1977). If the observed t-statistic is found to be negative and statistically significant, we can reject the null hypothesis of a unit root. Table 1 presents the results of the ADF test. The report indicates that we cannot reject the null hypothesis of a unit root for the variables under study in level for all the twelve Asian countries. However, the ADF tests show that all the variables are stationary at first difference, implying of the generalization of $I(1)$ variables.

[Insert Table 1 here]

Cointegration Test Results

Cointegration methodology allows us to test for the presence of equilibrium relationship between economic variables. Following Johansen (1988) and Johansen and Juselius (1990), consider the following vector autoregressive (VAR) model:

$$X_t = \Pi_1 X_{t-1} + \Pi_2 X_{t-2} + ... + \Pi_k X_{t-k} + \varepsilon_t \qquad (t = 1,\ldots,T) \qquad (6)$$

where X_t is a column vector of m endogenous variables. $\Pi_1, \Pi_2, ..., \Pi_k$ are p x q coefficient matrices and ε_t is a p x 1 vector of white noise. Since most economic time series are nonstationary, VAR models such as in Equation (6) are generally estimated in their first-difference forms as:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + ... + \Gamma_{k-1} \Delta X_{t-k-1} - \Pi X_{t-k} + \varepsilon_t \qquad (t = 1,\ldots, T) \quad (7)$$

where

$$\Gamma_i = -\mathrm{I} + \Pi_1 + \Pi_2 +,...,+\Pi_i, \ (i = 1,\ldots,k\text{-}1) \text{ and } \Pi = \mathrm{I} - \Pi -,...,-\Pi_k$$

Equation (7) differs from a standard first-difference version of a VAR model only by the presence of ΠX_{t-k} term in it. It is this term that contains information about the long-run equilibrium relationship between the variables in X_t. If the rank of the Π matrix r is $0 < r < m$, then there are two matrices α and β each with dimension $m \times r$ such that $\alpha\beta' = \Pi$. r represents the number of cointegrating relationships among the variables in X_t. The matrix β contains the elements of r cointegrating vectors and has the property that the elements of $\beta' X_t$ are stationary. α is the matrix of error correction parameters that measure the speed of adjustments in ΔX_t. The Johansen approach is based on two test statistics: (i) the trace test and (ii) the maximal eigenvalue test. The trace test statistic can be specified as follow:

$$\tau_{trace} = -T \sum_{i=r+1}^{p} \ln(1 - \lambda_i) \qquad (8)$$

where λ_i = the p-r smallest squared canonical or eigenvalue correlation of v_{0t} with respect to v_{1t} and T is the number of observation. In the trace test the null hypothesis is that the number of distinct cointegration vector(s) is less than or equal to r against a general alternative. On the other hand, the maximum eigenvalue tests examine the null hypothesis of exactly r cointegrating vector(s) with the test statistic follow as below:

$$\tau_{\max} = -T \ln(1 - \lambda_{r+1}) \qquad (9)$$

where λ_{r+1} is the $(r + 1)^{th}$ largest squared canonical correlation or eigenvalue. The null hypothesis of $r = 0$ is tested against the alternative of $r + 1$ cointegrating vectors.

The cointegration test results are reported in Tables 2[1]. The test results of the trace test (λ_{trace}) indicate that the null hypothesis of no cointegrating vector ($r = 0$) is being rejected in four out of twelve Asian countries examined, namely, China, the Philippines, Singapore and Taiwan. This result implies that the real economic activity and stock market in the above mentioned countries share a common stochastic trend and tend to have a stable long run equilibrium relationship. On the other hand, countries which show no evidence of cointegration between stock market and economic growth embracing Hong Kong, India, Indonesia, Korea, Malaysia, Sri Lanka and Thailand. The trace test statistics are insignificant at 5 percent level for the null hypothesis of no cointegrating vector to be rejected. This indicates that the stock market and economic growth in these economies tend to diverge, even in the long run. Whereas, Japan exists $r = 2$ cointegrating vectors in the trace test which implies a full rank matrix.

[Insert Table 2 here]

Granger Causality Test Results based on VECM

Once cointegration was established between two variables, we next conducted a Granger causality test to determine the direction of causation between these two variables in the environment of VECM. In these systems, a lagged ECT is included in each of them to acquire the long run adjustment to their equilibrium path. The relevant ECT must be included to avoid misspecification and omission of important constraints. Table 3 presents the results of the Granger causality based on the VECM environment. The null hypothesis is always that of non-causation. In the case of China, there is evidence of bi-directional (feedback) causality between stock markets and economic growth in the short run. In the economy of the Philippines, we find uni-directional Granger causality from stock market to economic growth through the significant of the ECT at 5 percent level. This concludes that the stock market leads and economic growth follows in Philippines holds at least in the long run. In the case of Singapore, the results show that there is a uni-

[1] To conserve space, we present only the findings from trace test. Nevertheless, the maximum eigenvalue test produces similar results as in the trace test. These empirical results are available from the authors upon request.

directional short run causal effect running from economic growth to stock market and a bi-directional linkages between stock market and economic growth in the long run. In contrary to the Philippines, we found that economic growth Granger cause stock market in the context of Taiwan in the long run.

For the relationship without the existence of cointegration, the unrestricted VAR can be applied to test for the causal relation between variables. The standard Granger causality test results are presented in Table 4. In the case of Hong Kong, Indonesia, Malaysia and Thailand, the pairwise Granger causality tests indicate that there is a feedback effect in the system, or a short run bi-directional causality between stock market and economic growth. In Japan, stock market does Granger cause economic growth at 1 percent level of significance. While in Korea, stock market does Granger cause economic growth only significant at 10 percent and 1 percent levels in lag 1 and lag 4, respectively. Nevertheless, the case of India suggests otherwise. Finally, in Sri Lanka, there is no evidence of causality. The results of the lead-lag analysis between stock market and economic growth in the long run and short run are summarized in Figures 1 and 2, respectively.

[Insert Table 3 here]

[Insert Table 4 here]

[Insert Figure 1 here]

[Insert Figure 2 here]

CONCLUSIONS AND IMPLICATIONS

The empirical finding of this study suggests that China, the Philippines, Singapore and Taiwan stock markets and economic growth induce a stable cointegration relationship and they have a tendency to move together in the long run towards the path of equilibrium. In the Philippines, VECM results show that stock market can promote

economic growth in the long run. While in Hong Kong, Indonesia, Malaysia and Thailand, there is a bi-directional short run causal relationship between stock markets and economic growth. The empirical finding of this study suggests that Japan and Korea stock markets can stimulus to the economic growth in the short run, but not vice verse. Unlike Korea and Japan, the stock market in India suggests otherwise. There is no evidence of causality among the variables under study for the case of Sri Lanka.

The composite indice is the most imperative gauge for stock market performance and it is widely treated as the market yardstick for investors and related authorities. Our finding suggests that stock markets in most of the countries under study play a fundamental role in promoting economic growth in the short run as well as long run. Therefore, the corresponding countries authorities should take capital market measures to improve revelation and simplicity with the aim to facilitate a sustainable stock market. More stringent regulations should also be implemented to shield investors, to enhance the corporate ascendancy practices, and also to ensure a systematic and fair market in the stock market trading of securities.

In addition, the empirical results also suggest that stock markets can stimulus economic growth and vice versa in China, Hong Kong, Indonesia, Malaysia and Thailand. Since the pragmatic results show a mixture of findings of causal interactions between stock markets and economic growth, the policy implication, as a result, should not be generalized but it should be designed differently to best fit the economic environment in different countries. It is to our utmost optimism that these findings might cast some imminent to investors in helping them to predict upcoming market movement in accordance to stock market activities. Also, it has the purpose of serving as a constructive assistance and reminder for government and private sectors to always scrutinize the effectiveness of each policy they implement.

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Table 1: ADF Unit Root Test Results for Series in Level and First Difference

Country	Series	Level	First Difference
		Trend	No Trend
China	LRGDP	-0.705 (4)	-4.118 (3) ***
	LSTOCK	-0.298 (2)	-3.762 (2) ***
Hong Kong	LRGDP	-1.104 (8)	-3.545 (4) ***
	LSTOCK	-2.225 (3)	-4.738 (2) ***
India	LRGDP	-2.498 (1)	-3.496 (10) **
	LSTOCK	-2.034 (0)	-10.200 (0) ***
Indonesia	LRGDP	-1.237 (7)	-5.698 (6) ***
	LSTOCK	-1.835 (0)	-9.210 (0) ***
Japan	LRGDP	-0.860 (7)	-4.026 (2) ***
	LSTOCK	-1.788 (0)	-9.415 (0) ***
Korea	LRGDP	-1.539 (8)	-3.672 (4) ***
	LSTOCK	-1.702 (0)	-10.225 (0) ***
Malaysia	LRGDP	-2.226 (8)	-4.547 (4) ***
	LSTOCK	-2.723 (0)	-10.854 (0) ***
Philippines	LRGDP	-2.168 (7)	-3.407 (3) **
	LSTOCK	-2.326 (0)	-6.754 (1) ***
Singapore	LRGDP	-1.558 (11)	-3.465 (3) **
	LSTOCK	-2.780 (0)	-8.936 (0) ***
Sri Lanka	LRGDP	-2.805 (2)	-8.249 (1) ***
	LSTOCK	-1.895 (1)	-7.616 (0) ***
Taiwan	LRGDP	-1.797 (0)	-4.628 (3) ***
	LSTOCK	-2.815 (2)	-8.341 (1) ***
Thailand	LRGDP	-2.272 (3)	-4.054 (2)***
	LSTOCK	-1.939 (0)	-9.729 (0)***

Notes: LRGDP = natural logarithm of real GDP and LSTOCK = natural logarithm of stock indices. Asterisks (**) and (***) denote significant at 5%, and 1% levels, respectively.

Table 2: Johansen and Juselius Cointegration Test Results

Trace Statistic (λ_{trace}) Test				
Country	H_0	H_A	Test Statistic	95% C.V.
China (k = 10)	r = 0	r ≥ 1	18.435**	15.41
	r ≤ 1	r ≥ 2	0.835	3.76
Hong Kong (k = 4)	r = 0	r ≥ 1	12.525	15.41
	r ≤ 1	r ≥ 2	3.438	3.76
India (k = 3)	r = 0	r ≥ 1	5.590	15.41
	r ≤ 1	r ≥ 2	0.322	3.76
Indonesia (k = 8)	r = 0	r ≥ 1	9.731	15.41
	r ≤ 1	r ≥ 2	2.505	3.76
Japan (k = 4)	r = 0	r ≥ 1	20.183**	15.41
	r ≤ 1	r ≥ 2	6.238**	3.76
Korea (k = 6)	r = 0	r ≥ 1	11.316	15.41
	r ≤ 1	r ≥ 2	3.325	3.76
Malaysia (k = 7)	r = 0	r ≥ 1	6.375	15.41
	r ≤ 1	r ≥ 2	0.018	3.76
Philippines (k = 3)	r = 0	r ≥ 1	37.208***	15.41
	r ≤ 1	r ≥ 2	1.219	3.76
Singapore (k = 2)	r = 0	r ≥ 1	24.510***	15.41
	r ≤ 1	r ≥ 2	2.292	3.76
Sri Lanka (k = 1)	r = 0	r ≥ 1	5.773	15.41
	r ≤ 1	r ≥ 2	0.299	3.76
Taiwan (k = 9)	r = 0	r ≥ 1	22.834***	15.41
	r ≤ 1	r ≥ 2	2.784	3.76
Thailand (k =5)	r = 0	r ≥ 1	8.430	15.41
	r ≤ 1	r ≥ 2	1.149	3.76

Notes: The k is the lag length selected based on AIC and r is the cointegrating vector. These statistics are computed with a constant in the unrestricted VAR equation. Asterisks (**) and (***) denote significant at 5%, and 1% levels, respectively.

Table 3: Granger Causality Test Results based on VECM

Country	k	STOCK ⇏ RGDP		RGDP ⇏ STOCK	
		ECT_{t-1}	χ^2-statistic	ECT_{t-1}	χ^2-statistic
China	10	0.008	3.197	-0.31	5.34
		[0.869]	(0.074)*	[-1.151]	(0.021)**
Philippines	3	0.018	2.010	-0.057	1.646
		[2.283]**	(-0.113)	[-1.104]	(-0.199)
Singapore	2	0.032	1.073	-0.461	9.319
		[2.179]**	(-0.304)	[-4.481]**	(0.002)**
Taiwan	9	-0.004	0.473	-0.475	1.692
		[-1.235]	(0.492)	[-2.680]**	(0.193)

Notes: The χ^2-statistic tests the joint significant of the lagged value of the independent variables, while *t*-statistic tests the significance of the error correction term. Figures in brackets ( ) are the *p*-values and [ ] are *t*-statistics. Asterisk (**) and (*) denote statistically significant at 5% and 10% levels, respectively.

Table 4: Pairwise Granger Causality Test Results

Country	Null Hypothesis	Lag 1	Lag 2	Lag 3	Lag 4
Hong Kong	Stock does not Granger cause RGDP	7.042***	4.399**	3.207**	5.833***
	RGDP does not Granger cause Stock	7.966***	3.104**	3.125**	2.096*
India	Stock does not Granger cause RGDP	0.483	0.128	0.884	0.641
	RGDP does not Granger cause Stock	3.785**	1.852	1.554	1.033
Indonesia	Stock does not Granger cause RGDP	6.001**	3.587**	2.093	2.115*
	RGDP does not Granger cause Stock	1.305	0.641	2.319*	2.443**
Japan	Stock does not Granger cause RGDP	15.007***	12.630***	7.263***	5.491***
	RGDP does not Granger cause Stock	1.135	0.495	1.609	0.391
Korea	Stock does not Granger cause RGDP	3.376*	1.265	0.863	6.444***
	RGDP does not Granger cause Stock	0.995	0.442	1.044	1.167
Malaysia	Stock does not Granger cause RGDP	4.494***	2.445*	5.704***	5.542***
	RGDP does not Granger cause Stock	3.804**	3.011**	2.852**	2.401*
Sri Lanka	Stock does not Granger cause RGDP	1.470	0.905	1.296	1.442
	RGDP does not Granger cause Stock	0.159	0.376	0.682	0.516
Thailand	Stock does not Granger cause RGDP	0.559	0.387	2.479*	2.703**
	RGDP does not Granger cause Stock	0.518	3.507**	1.881	1.457

Note: Asterisks (*), (**) and (***) denote significant at 10%, 5% and 1% levels, respectively.

Figure1: Long-Run Granger Causality Test Result based on VECM

Philippines	PSE	→	RGDP
Singapore	SGX	↔	RGDP
Taiwan	TSE	←	RGDP

Notes: PSE → RGDP indicates that changes in PSE (Philippines Stock Exchange) Granger cause changes in RGDP in the long run. SGX ↔ RGDP implies that there is a bi-directional causality relationship between SGX (Stock Exchange of Singapore) and RGDP in the long run. RGDP → TSE denotes that changes in RGDP Granger cause changes in TSE (Taiwan Stock Exchange) in the long run.

Figure 2: Short-Run Granger Causality Test Results based on VECM and Standard VAR

China	SSE	↔	RGDP
Hong Kong	HKEx	↔	RGDP
India	BSE	←	RGDP
Indonesia	JSX	↔	RGDP
Japan	TSE	→	RGDP
Korea	KSE	→	RGDP
Malaysia	KLSE[2]	↔	RGDP
Singapore	SGX	←	RGDP
Sri Lanka	CSE	⇸	RGDP
Thailand	SET	↔	RGDP

Notes: SSE → RGDP indicates that changes in SSE (Shanghai Stock Exchange) Granger cause changes in RGDP in the short run. SSE ← RGDP implies the reverse of the relationship stated above. ⟷ denotes no causation exists among RGDP and stock indices. HKEx denotes Stock Exchange of Hong Kong, JSX denotes Jakarta Stock Exchange, BSE denotes Bombay Stock Exchange, TSE denotes Tokyo Stock Exchange, KSE denotes Korea Stock Exchange, KLSE denotes Kuala Lumpur Stock Exchange, SGX denotes Stock Exchange of Singapore, CSE denotes Colombo Stock Exchange, and SET denotes Stock Exchange of Thailand.

[2] KLSE was renamed Bursa Malaysia in 2004.