SEVEN ASIAN EMERGING EQUITY MARKETS: ARE THEY INTEGRATED?

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ABSTRACT

This study investigates how closely the equity indices of seven emerging countries in South Asia and South East Asia (Bangladesh, China, India, Indonesia, Malaysia, Pakistan and Sri Lanka) are integrated as these countries do share many common economic, political, and cultural relationships.

The analysis uses the cointegration methodology developed by Johansen. It is the preferred method to other alternatives since it enables testing for the presence of more than one cointegrating vector. The cointegration results confirm that the equity indices of these countries are highly integrated. There is also evidence that some of the emerging economies have started displaying divergence from each other because of dissimilar levels of development and growth. Equity markets integration should be of interest to academics, practitioners, institutional investors, portfolio managers and

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government regulators. If the equity markets are integrated, hedging and international diversification strategies will be less beneficial.

Key words: Emerging Asian equity markets, integration
JEL Codes: G14, G15

I. INTRODUCTION

The seven Asian countries of Bangladesh, China, India, Indonesia, Malaysia, Pakistan and Sri Lanka can be viewed as a region which is becoming more and more entwined in terms of economic activity. Over the last two decades, there has been a significant increase in the flow of capital, labor, technology and information across this area, Azman-Saini, et. al. (2002). Also noted are the increased liberalization of controlled economies and a host of trade and economic arrangements, Fidrmuc and Korhonen (2009). As discussed by Cai (2003), free trade agreements (FTA) within the Southeast Asian nations will undoubtedly continue to grow. It is in the best interest for these countries to establish FTA's because of the growing economic ties and emphasis on regionalism. Such developments can result in greater cooperation among countries in the Southeast and South Asian regions. Events (whether positive or negative) taking place in one of these countries usually causes some impact on other parts of the region. Asian equity markets are receiving increasing attention due to several reasons: 1) more than one third of the population lives in Asia; 2) more than one third of the global GDP is produced in Asia; 3) Asia offers the fastest growing economies in terms of GDP; and, 4) Asia is a hub of outsourcing for developed economies.

This research is distinguishable from other studies in several ways. First, the focus is on emerging stock markets in Asia which are playing an increasingly greater role in the world economy. Second, our sample countries come from four different regions of Asia. Also, our sample includes more than one third of the world's population.

Thus, the question to be addressed by this research is whether the equity markets of these seven countries are integrated and, if so, to what extent. The next section presents a review of the literature. Section III describes the data and methodology. Section IV presents the results and the last section the summary and conclusion.

II. LITERATURE REVIEW

Almost all studies focus on a specific region of Asia or more mature markets. For example, Chi and Li (2006) explored the question of financial integration in East Asian equity markets. Results based on International Capital Asset Pricing Model (ICAPM) methodology show that the financial integration has increased over time within these markets and with Japan, the leading Asian market. The study utilizes a longer time series but it ends in 2005.

Johnson and Soenen (2002) examined the integration of 12 Asian markets with Japan's equity market using daily equity returns from 1988 to 1998. They found evidence of high integration of the equity markets of Australia, China, Hong Kong, Malaysia, New Zealand, and Singapore and with the equity market of Japan. They also identified certain underlying factors, such as inflation, interest rates, GDP growth, exports, and foreign direct investments (FDIs) across these countries. These factors impact the degree of co-movement among these equity markets.

Tai (2007) found empirical evidence of integration of six Asian markets (India, Korea, Malaysia, Philippines, Taiwan, and Thailand) into world capital markets since their official liberalization dates. Araju and Khanapuri (2010) found significant influence of U.S. on developed and emerging markets of Asia due to its dominant position in international economy and trade. Based on their results, they questioned the supposed benefits of portfolio diversification accrued to U.S. investors entering Asian markets.

Yilmaz (2010) examined the return and volatility spillovers among the East Asian equity markets in the early 1990s using the forecast error variance methodology. Their findings showed that during the recent global financial crisis both the return and volatility spillover indices reach their respective peaks. The return spillover index, however, showed increased market integration whereas the volatility spillover index experiences significant bursts during major market crisis. Henry and Lakshman (2007) investigated transmission of shocks to asset returns in South-Asian equity markets for the period from 1990 to 2006. They found strong evidence that the returns shocks are transmitted across markets impacting prices as well as volatility.

Weber (2012) used co-integration and serial correlation methods to examine the long run convergence of GDPs and business cycles of South Korea, Singapore, and Taiwan. Results showed a high degree of coherence in long-run GDP growth and stronger influence from the US economy rather than from Japan.

Araju and Khanapuri (2010) found empirical evidence of US dominance over Asian markets and increased Asian markets integration. They concluded that intended diversification, a benefit of massive portfolio investments in Asian equity markets, has declined. Western investors should be mindful of changing dynamics of the global markets.

Qayyum and Mohsin (2005) examined the extent of market integration among five South Asian countries: Pakistan, India, Bangladesh, Sri Lanka, and Nepal. Based on underlying factors, results showed a higher degree of integration among Pakistan, India and Nepal but a lesser degree of integration for Sri Lanka and Bangladesh. Also, they found an absence of integration of the Indian market with the world market.

El-Wassal (2005) used co-integration and Granger causality tests on 12 emerging markets from 1988 to 2000 and found evidence of long term integration in returns of equity markets in India, Korea, Malaysia, the Philippines and Zimbabwe.

III. DATA AND METHODOLOGY

Monthly equity indices data for the sample countries (Bangladesh, China, India, Indonesia, Malaysia, Pakistan and Sri Lanka) were obtained from Bloomberg and covers the period from February 28, 2001 to January 31, 2011. For this study, South Asian countries include Bangladesh, India, Pakistan, and Sri Lanka; the South East Asian countries include China, Indonesia and Malaysia.

Most studies show that security returns in the U.S. and other global markets are non-stationary, non-normal and serially correlated. Studies offering evidence on one or more of the above characteristics include: Fama (1970), Lo and MacKinlay (1988), Serletis and Rosenberg (2009), Kendal (1953), Engle (1982) and Scheinkman and LeBaron (1989).

Before testing for co-integration, between two or more time series, it is necessary to test whether the time series are integrated to the same order. Engle and Granger (1987) point out that a time series will be integrated to order d (1(d)) if, when differenced d times, the series has a stationary, invertible, ARMA representation. Two or more time series are said to be co-integrated if the series are integrated of the same order, but some linear combination of the series in the system is integrated to a lower order.

This part of the analysis uses the methodology developed by Johansen (1988). It is the preferred method to other alternatives since it enables testing for the presence of more than one cointegrating vector. The description that follows draws from Johansen (1988, 1991, 1994), and Johansen and Juselius (1990, 1991).

The Johansen method provides some distinct advantages. For example, identification of the number of cointegrating vectors is possible with the Johansen test. Such inferences are based on the number of significant eigenvalues. Also, many argue that the statistical properties and power for Johansen's test are generally higher than for alternative procedures. To check for stationarity arising from a linear combination of variables, the following AR representation for a vector VTS made up of n variables is used,

$$VTS_t = c + \sum_{i=1}^{s-1} \phi_i Q_{it} + \sum_{i=1}^{k} \pi_i VTS_{t-i} + \varepsilon_t \qquad (1)$$

where VTS is at most I(1), Q_{it} are seasonal dummies (i.e., a vector of non-stochastic variables) and c is a constant. It is not necessary that all variables that make up VTS be I(1). To find cointegration in the system, only two variables in the system need be I(1). If only two time series are examined (bivariate representation), both have to be I(1). If an error-correction term is appended, then:

$$\Delta VTS_t = c + \sum_{i=1}^{s-1} \phi_i Q_{it} + \sum_{i=1}^{k-1} \Gamma_I \Delta VTS_{t-i} + \Pi VTS_{t-k} + \varepsilon_t \qquad (2)$$

which is basically a vector representation of equation (1) with seasonal dummies added. All long-run information is contained in the levels terms, ΠVTS_{t-k}, and short-run information in the differences ΔVTS_{t-i}. The above equation would have the same degree of integration on both sides only if $\Pi = 0$ (the series are not cointegrated) or ΠVTS_{t-k} is (0), which infers cointegration. In order to test for cointegration, the validity of $H_1(r)$, shown below, is tested as:

$$H_1(r) : \prod = \gamma\beta' \qquad (3)$$

where β is a matrix of cointegrating vectors and γ represents a matrix of error correction coefficients. The hypothesis $H_1(r)$ implies that the process ΔVTS_t is stationary, VTS_t is nonstationary, and β' VTS_t is stationary (Johansen, 1991). The Johansen method yields the Trace and the λ_{max} statistics that enable determination of the number of cointegrating vectors.

IV. RESULTS OF EMPIRICAL TESTS

In order to eliminate autocorrelations in the time-series, the appropriate lag length is found using the Akaike information criterion (AIC). The lag length is selected by minimizing the AIC over different choices for the length of the lag. The values of AIC are formulated by computing the value of the equation *T log (RSS) +2 K*, where *K* is the number of regressors, *T* is the number of observations and *RSS* is the residual sum of squares. These results are shown in Table 1 (see Nlags) along with the results of the Philips-Perron unit root tests. From Table 1 it becomes clear that the time series require a range of lags in order to correct for the presence of autocorrelation. For instance, for the time series belonging to China, a lag length of 2 is needed to minimize the AIC and purge autocorrelations, whereas Bangladesh requires a lag length of 1 to correct for autocorrelations. For some markets, shorter lag corrections are required. In these instances autocorrelations that are present decay quickly. We next tested for stationarity.

Tests for Stationarity of Each Time Series Using the Philips-Perron (P&P) Test

The time series are tested for a unit root using the P&P tests. The P&P tests suggest that all of the time series are nonstationary without trend (i.e., non-rejection of $\alpha_1 = 0$).

In most instances with trend, there is a need for cointegrated methodologies (critical values at the 10% level are provided in the last row of Table 1). While it is reassuring to note the non-rejection of nonstationarity, this is not altogether surprising since many other studies find nonstationary in time series (Phillips and Perron, 1988; Brenner and Kroner, 1995; and, Doukas and Rahman, 1987).

Table 1

Tests of Stationarity for the Equity Indices of South and South East Asian Countries Using Phillips-Perron Test (P&P)

Series	Nlags	No Trend $\alpha_1=0$	Akaike Criterion (minimized)
Country Index			
Bangladesh	1	-2.47	13.55
China	2	-1.86	14.03
India	0	-0.67	14.14
Indonesia	0	0.01	12.47
Malaysia	0	-0.57	10.43
Pakistan	0	-1.18	15.91
Sri Lanka	0	2.78	13.42
Asymptotic Critical Values			
10% Level	-2.57	5% Level -2.90	1% Level -3.53

The P&P denotes the Phillips-Perron tests. P&P is computed with a constant term. The tests are conducted with and without linear trend. The Unit Root tests are performed with the appropriate lag length. For each time series the lag length are estimated by minimizing the Akaike Information Criterion (AIC) values. T-Values (single hypothesis) and F-values (multiple hypotheses) for tests of various hypotheses concerning equation no trend and equation with trend are estimated. Note, $\alpha_1=0$ is the unit root test, $\alpha_0=0$ tests for constant (drift), and $\alpha_2=0$ tests for linear trend. Asymptotic critical values are from Phillips and Perron (1986).

Johansen Tests for Cointegration Rank for System of Equity Markets

The results for systems (composed of the seven south Asian emerging countries equity markets as an asset group) using Johansen's method are presented in Table 2. The tests using Trace statistic are reported in Table 2 along with the critical and the 'p' values. These are basically likelihood ratio tests, where the null hypothesis is $L_{r+1} =L_{r+2}=\ldots\ldots=L_p=0$, indicating that the system has *p-r* unit roots, where *r* is the number of

cointegrating vectors. The rank is then determined using a sequential approach starting with the hypothesis of *p* unit roots. If this is rejected then the next hypothesis $L_2=L_3=\ldots\ldots=L_p=0$ is tested and so on.

In order to consider hedging possibilities, the relationship between equity markets with other markets or instruments of different countries within the South Asian and South East Asian countries can be analyzed. Trace Values are shown for the full range of cointegrating vectors (i.e., for n-1 vectors). For example, for the group of countries in our study (Pakistan, India, Sri Lanka, Bangladesh, China, Indonesia, and Malaysia), the Trace Values are from r=0 to r=6. The rejection of r=0 indicates that at least one cointegrating vector is present. The rejection of r=1 indicates the presence of at least two cointegrating vectors and so on. A similar relationship is found for South East and South Asian countries excluding China.

Highly Cointegrated Systems

The most striking result in Table 2 is the high level of cointegration between the equity markets of these countries. There is evidence of three cointegrating vectors (i.e., cointegration at the n-2 level) between equity markets of different countries in two out of three groups. For instance, the South Asian and South East Asian countries (including China) in the first group display the strongest relationship indicating that these countries are strongly bound together. The result is quite intuitive as these countries have a number of trade pacts for economic cooperation. In addition, these countries are in close proximity of each other with large migration of populations that have strong economic and cultural ties between them. The reader will also note the large coefficient values associated with these systems. For example, the trace test for presence of first cointegrating vector in this system is highly significant at the 1% level of significance. Even the second cointegrating vector is very significant at 1% level of significance. The implication is that there is more than one variable that is binding these countries together. Since, some of these countries are emerging rapidly (for example, China, India, Malaysia, and Indonesia and to a lesser extent Sri Lanka), it is likely that similar levels of GDP growth rates, inflation, money supply, interest rates, and other economic fundamentals are binding these economies in a long-term equilibrium. A similar relationship is found when South Asian and South East Asian countries (excluding China) are analyzed. The results show strong cointegration with three cointegrating vectors binding the equity indices of these countries. This result also may be expected as China has the fastest growth rate and has many trading partners from the developed markets in the Americas and Europe. The likelihood that China may have a weaker relationship with these economies is much higher due to the fact that the developed market is more important for China than the South Asian and South East Asian countries. But, excluding China, the countries are likely to have a closer trade and economic relationship for a variety of goods and services that are exported and imported between them.

Table 2
Long-Term Relationship between the Equity Indices of South and South East Asian Countries Using Johansen's Cointegration Methodology

Group	r	Trace	Critical Value (5%)	Prob.
All South and South East Asian Countries				
	0	150.16***	125.62	0.0007
	1	104.75***	95.75	0.0104
	2	70.31**	69.82	0.0457
	3	40.43	47.86	0.2072
	4	18.69	29.79	0.5151
	5	6.17	15.49	0.6756
	6	0.03	3.84	0.8625
All South and South East Asian Countries (Without China)				
	0	111.80***	95.75	0.0025
	1	79.16***	69.81	0.0074
	2	47.63**	47.85	0.0525
	3	23.82	29.80	0.2080
	4	8.99	15.49	0.3654
	5	0.20	3.84	0.6576
All South Asian Countries				
0	54.04***	47.85	0.0117	
1	30.89**	29.80	0.0373	
	2	12.25	15.49	0.1451
	3	0.21	3.84	0.6500

The optimal lag length for Johansen cointegration model is obtained from an examination of the residual autocorrelation functions of the cointegrating regressions. Critical values for Johansen tests are taken from tables in Johansen and Juselius (1990) paper. The *** , **, * denotes significance levels of 1 percent, 5 percent, and 10 percent respectively, .

The cointegration relationship is also present between the countries that comprise the South Asian group. In fact, there are two cointegrating vectors between these groups of countries. The significance of the coefficients is, however, at 5% level. This may be due to dominance of China for export of manufactured goods to these countries and political issues that some of these economies have faced and are facing today. Although, these countries have similar cultural and economic relationships there is some amount of divergence between these economies in the sense that India and Sri Lanka are displaying a much higher growth rate and economic development. The trade between them is relatively small in percentage terms but is likely to be expanded over a period of time when some of the political issues are sorted out.

V. SUMMARY AND CONCLUSIONS

This study investigates how closely the equity indices of seven emerging countries in South Asian and South East Asian countries are integrated as these countries do share many common economic, political, and cultural relationships. The results confirm that the equity indices of these countries are highly integrated. There is also evidence that some of the emerging economies have started displaying divergence from each other because of dissimilar levels of development and growth. Although a number of trade pacts exist between these countries and the largest trading partners are the Asian countries for each of these economies, the implementation of such pacts is lagging behind due to political and other barriers. This does create many hedging and diversification possibilities for the investors in these economies as and when there is a greater transparency and flow of information between these countries is made available.

In addition to the above, equity markets integration should be of interest to academics, practitioners, institutional investors, portfolio managers and government regulators. If, as noted by this research the equity markets are integrated, hedging and international diversification strategies will be less beneficial.

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