

INTERACTION BETWEEN THE SRI LANKAN STOCK MARKET AND SURROUNDING ASIAN STOCK MARKETS

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Abstract

The study examined the interaction between Sri Lankan stock market and surrounding Asian stock markets in terms of cointegration, correlations, information spillovers, and impulse responses, considering India, China, Pakistan, Singapore, Malaysia, Hong Kong, Korea, and Japan as neighboring stock markets to the Sri Lankan market. Daily data of stock indices of each country spanning from 01st January 2000 to 31st December 2012 was used. Findings revealed that the Sri Lankan stock market is cointegrated with the Korean stock market but not with others. Correlations were significant between Sri Lanka and India, Singapore, Malaysia, Hong Kong, Korea, and Japan. Moreover, Pakistan, Malaysian, and Korean stock markets had Granger caused-in-mean to the Sri Lankan stock market while India and Korea had Granger caused-in-variance. Extreme downside risks in Chinese stock market also had Granger caused the Sri Lankan stock market. Impulse responses revealed the impact of shocks in Asian stock markets on the Sri Lankan stock market.

Keywords: Asian Stock Markets, Granger Causality, Impulse Response, Information Spillover, Sri Lankan Stock Market, Stock Market Interactions

Introduction

This study investigates how the Sri Lankan stock market interacts with surrounding Asian stock markets. In general, interactions between Asian emerging stock markets have been given a growing attention in recent research. Improved flow of capital across national borders, reduction of transaction costs, increase in the flow of information, interests in identifying market leaders and followers, and diversification opportunities across less correlated markets are the main reasons for the increasing interest on emerging market interactions (Narayan, Smyth and Nandha, 2004). Adding value to this line of literature, this study examines how the Sri Lankan stock market interacts with its neighbourhood considering different types of relationships such as causality, correlations, and impulse responses. Specifically, this study attempts to answer the questions; 1) does the Sri Lankan stock market integrate with other Asian stock markets? 2) are there information spillovers from other Asian markets to the Sri Lankan stock market? 3) Is the information in the Sri Lankan stock market spilled over to other Asian stock

markets? Answering these questions permit us to identify whether the Sri Lankan stock market is alone in the Asian region or not. To represent the Asian region stock markets, eight countries namely, India, China, Pakistan, Singapore, Malaysia, Hong Kong, Korea, and Japan were selected. This study contributes to the existing literature by examining the level of internationalization of the Sri Lankan stock market within the Asian region using both contemporaneous and lead-lag relationships simultaneously.

Previous attempts in investigating the interaction between the Sri Lankan and other regional markets are limited. Elyasiani, Perera, and Puri (1998) investigated the interdependence and dynamic linkages between the capital market of Sri Lanka and the markets of its major trading partners such as Taiwan, Singapore, Japan, South Korea, Hong Kong, India, and the US during 1989 to 1994. They concluded that there is no significant interdependence between the Sri Lankan market and the equity markets of the US and the Asian stocks. In contrast, Narayan et al. (2004) used daily data from 1995 to 2001 and conclude that, in the long run, stock prices in Bangladesh, India and Sri Lanka Granger-caused stock prices in Pakistan. De Gooijer and Sivarajasingham (2008) also investigated the interactions between the Sri Lankan market with ten other leading stock markets (six industrialized markets and four emerging markets of South-East Asia) during 1987 to 2006 and found that there are no significant long-term causal linkages between Sri Lanka and the other countries. More recently, Srianthakumar and Narayan (2015) observed low correlation between Sri Lankan and Chinese, Indian, Malaysian, Pakistani, Singaporean, and US stock markets which has not been affected by the Sri Lanka's conflict and tension due to war. Overall, existing literature provides evidence that the interaction between Sri Lankan and other stock markets are mixed. This study extends this strand of literature by adopting multiple methods to examine the relationship between the Sri Lankan stock market and other Asian stock markets.

Econometric Methods

This study addresses three issues corresponding to market-to-market interactions namely, market integration, information spillover, and response to shock from one market to another market. Market integration is investigated using both cointegration analysis of Engle and Granger (1987) for stock price indices and contemporaneous correlation analysis for returns. The information spillover is investigated using Granger causality approach (Granger, 1980; Granger and John, 1986). Here, the study employs Hong (2001) methodology to test the Granger causality-in-mean, and -in-variance, while Hong, Liu and Wang (2009) approach to test the Granger causality-in-risk¹. The main reason for using these novel approaches opposed to conventional VAR and multivariate-GARCH methods is that the ability of Hong's methodology to test Granger causality by using a series of lags along with a high level of importance assigned on nearby lags. Finally, the study examines the potential impacts of shocks on other Asian markets to the Sri Lankan stock market and contrariwise using generalized impulse response functions developed by Pesaran and Shin (1998).

¹Here, the risk corresponds to the value-at-risk due to extreme downside movements of stock returns.

Data and Results

Daily data of value-weighted equity market indices of each country is retrieved from Bloomberg covering the period from 01st January 2000 to 31st December 2012. Returns are based on the log differenced index values of each country. The study uses the Nifty index of India, Shanghai stock index (SSE) of China, KSE100 index of Pakistan, MSCI index of Singapore (MSCISG), SLCI index of Malaysia, Hang Seng index of Hong Kong, KOSPI index of Korea, and Nikkei 225 index of Japan. In order to represent the Sri Lankan stock market, the all share price index of CSE (ASPI) is used, while as a robustness check, repeating the analysis is performed by using the MSCI Sri Lankan index (MSCILK).

Graphical inspection of all indices indicate that, all stock markets are trending upwards during the period of 2000-2012.² Panel A of Table 1 presents results of Augmented Dickey–Fuller tests and justify that all return series are significantly stationary while Ljung–Box tests (Panel A of Table 1) justify the serial autocorrelations except in China and Singapore. Existence of serial autocorrelations may lead to market inefficiencies due to potential predictability of future returns. According to the same Panel in Table 1, significance of heteroscedasticity is also evident from the Engle’s ARCH test. Therefore, the existence of the information content in volatility dynamics is also well justified.

Cointegrations and Correlations between Stock Markets

Panel B in Table 1 presents contemporaneous correlations between index returns of all countries. The Korean stock market is significantly cointegrated with the Sri Lankan market which is justified with both ASPI and MSCILK. All the other markets does not indicate integrations with the Sri Lankan stock market. Thus, it is evident that the Sri Lankan stock market does not permanently integrate with the other Asian markets except with Korea. The Korean integration to the Sri Lankan stock market can be expected due to the collaborations between two countries for trading activities in the stock market. Because, trades from Korea and the Sri Lanka stock exchange have been increasing in the recent past.³ However, trading partnerships from other Asian countries such as Japan, China and India have no cointegration with the Sri Lankan stock market and opens the gate for the investors to reap arbitrage profits through international diversification of stocks in these countries in the long-run. Similar to these results, Narayan et al. (2004) also found that the Sri Lankan market is not cointegrated with the south Asian stock markets such as India, Pakistan and Bangladesh though these countries are geographically close to each other.

²Results are not presented here but available upon request.

³See <http://www.ft.lk/article/465849/Sri-Lanka-South-Korea-trade-rises-by-6->

Table 1: Summary statistics and correlations of daily returns for ten stock market indices

This table presents descriptive statistics, market fundamentals, and correlations corresponding to ten stock market indices namely, Nifty index of India, Shanghai stock index (SSE) of China, KSE100 index of Pakistan, MSCI index of Singapore (MSCISG), SLCI index of Malaysia, Hang Seng index of Hong Kong, KOSPI index of Korea, Nikkei index of Japan, ASPI and MSCI indices of Sri Lanka. Sample period spans from 01-01-2000 to 31-12-2012. In panel A, descriptive statistics, results of ADF test for unit root, Ljung–Box test (LBQ) for serial autocorrelations, and Engle's ARCH Test for heteroscedasticity are presented. The H_0 of the ADF is the unit root hypothesis. The H_0 of the LBQ test is the existence of a serially unautocorrelated series. The H_0 of the ARCH test is the homoscedasticity of the underlying series. Panel B presents unconditional correlations between all stock index returns. All tests are performed at 5 lags and *, ** and *** denote significance at the 10, 5 and 1% levels, respectively.

<i>Panel A: Descriptive statistics and other fundamentals of returns</i>										
	India (Nifty)	China (SSE)	Pakistan (KSE100)	Singapore (MSCISG)	Malaysia (KLCI)	Hong Kong (Hang Seng)	Koria (KOSPI)	Japan (Nikkei)	Sri Lanka (ASPI)	Sri Lanka (MSCISL)
Mean	0.0004	0.0002	0.0010	0.0001	0.0004	0.0001	0.0003	-0.0002	0.0009	0.0007
Stdev	0.0214	0.0186	0.0174	0.0175	0.0125	0.0174	0.0259	0.0181	0.0155	0.0198
Skewness	-0.1341	0.2772	-0.1477	0.8711	-0.3854	-0.0344	-0.5217	-0.4121	0.9603	1.7320
Kurtosis	11.2809	7.1148	7.4872	25.5573	11.8445	11.7922	13.7162	9.2042	35.7530	39.8633
Sample Size	2409	2409	2409	2409	2409	2409	2409	2409	2409	2409
ADF Test	-19.9171***	-20.9051***	-17.8543***	-20.5366***	-19.4621***	-21.1281***	-20.5188***	-20.9239***	-18.2264***	-18.6552***
LBQ Test	16.7585***	8.996	39.9743***	7.7386	31.9841***	20.3692***	21.4481***	15.2339***	56.2545***	71.2702***
ARCH Test	125.0554***	91.7099***	266.7803***	28.0766***	67.4301***	303.8499***	245.9086***	374.0390***	54.5218***	52.8224***
Cointegration										
with ASPI	-2.1874	-1.3677	-1.9059	-3.0287	-2.0884	-2.4638	-3.5445**	-3.0445		
with MSCISL	-2.109	-1.3828	-2.6361	-2.7518	-1.7466	-2.3146	-3.6573**	-3.0607*	-1.896	
<i>Panel B: Correlations</i>										
India	1									
China	0.2270***	1								
Pakistan	0.1105***	0.0624***	1							
Singapore	0.5800***	0.2426***	0.1071***	1						
Malaysia	0.4269***	0.2572***	0.1142***	0.5435***	1					
Hong Kong	0.4958***	0.3414***	0.1184***	0.6390***	0.5006***	1				
Koria	0.5104***	0.1994***	0.1137***	0.6360***	0.4633***	0.6494***	1			
Japan	0.3656***	0.1914***	0.0914***	0.5059***	0.3675***	0.6007***	0.5785***	1		
Sri Lanka-ASPI	0.1004***	0.0303	0.0336*	0.1291***	0.0934***	0.1449***	0.0789***	0.0949***	1	
Sri Lanka_MSCI	0.1115***	0.0376*	0.0168	0.1262***	0.0910***	0.1286***	0.0692***	0.0948***	0.8321***	1

Source: Author Constructed

Contemporaneous correlations between index returns of all countries reveal that all stock markets are virtually correlated with each other significantly (See Panel B of Table 1). Correlations among Singapore, Malaysia, Hong Kong and Korea seem to be stronger than other correlations. This result favours the view that geographically and economically closer markets exhibit higher correlation and short-run comovements among themselves. Similar results can also be found from Madaleno and Pinho (2012). Though significant correlations exist between Sri Lanka and other Asian markets, they are relatively weak. This finding is consistent with Elyasiani et al. (1998) which justifies the weak (mostly insignificant) correlations from the Sri Lankan stock market.

Granger Causality between Sri Lankan and Other Stock Markets

Results of Granger causality-in-mean test (Hong, 2001) in Panel A of Table 2 clearly show that the causality in mean is significant from Pakistan, Malaysia, and Korea to the Sri Lankan market. Both ASPI and MSCILK are affected from the markets implying that the stock market fluctuations in Pakistan, Malaysia, and Korea up to the past three weeks may cause the stock market movements in Sri Lanka. However, causality in mean from the Sri Lankan market to other Asian markets is not significant indicating that the stock market fluctuations in Sri Lanka has no impact on the markets on their levels. Moreover, causality-in-variance tests (Hong, 2001) in Panel B of Table 2 depict a different picture corresponding to causalities in variance. That is, the volatility that arises in Indian and Korean stock markets causes volatility in the Sri Lankan market as far as the ASPI is concerned. Volatility spillover from India is not significant for the MSCILK. Unlike in causality in mean, Pakistan stock market seems to be affected by the Sri Lankan market's volatility. Additionally, results corresponding to MSCILK indicate that Indian, Hong Kong, and Japanese markets absorb volatility in Sri Lankan markets. Finally, causality-in-risk tests (Hong et al., 2009) in Panel C of Table 2 justify that an extreme downside movement in Chinese stock market returns had Granger caused the Sri Lankan stock market. However, this impact is not significant for the MSCILK.

Table 2. Granger causality test results

This table presents the results of Granger causality tests between the Sri Lankan stock market and other Asian stock markets using the causality in mean and variance tests due to Hong (2001), and causality in risk tests due to Hong et al. (2009) for the sample period 2000-2012. Daniel kernel with 15 lags is used in all Hong's tests of causality. *, ** and *** denote significance at the 10, 5 and 1% levels, respectively.

	To ASPI	From ASPI	To MSCISL	From MSCISL
<i>Panel A: Causality in mean</i>				
India (Nifty)	0.2097	-0.2320	0.2097	-0.2320
China (SSE)	-1.3219	-0.5287	-1.3219	-0.5287
Pakistan (KSE100)	1.8997**	1.1430	1.8997**	1.1430
Singapore (MSCISG)	-0.0329	0.4194	-0.0329	0.4194
Malaysia (KLCI)	2.0207**	0.4700	2.0207**	0.4700
Hong Kong (Hang Seng)	-0.1076	0.8877	-0.1076	0.8877
Korea (KOSPI)	2.0265**	-0.3239	2.0265**	-0.3239
Japan (Nikkei)	-0.0585	0.0359	-0.0585	0.0359
<i>Panel B: Causality in variance</i>				
India (Nifty)	12.1370***	-1.1194	0.0858	3.1765***
China (SSE)	-1.3396	-1.4266	-0.5270	1.3736*
Pakistan (KSE100)	-1.5035	7.4097***	-1.1359	6.0510***
Singapore (MSCISG)	-1.0701	-1.4105	-1.4648	0.3356
Malaysia (KLCI)	-0.1408	-0.4587	-1.3478	-0.0929
Hong Kong (Hang Seng)	0.5732	-1.2333	-1.4744	1.6820**
Korea (KOSPI)	29.6723***	-0.6190	4.9862***	0.3909
Japan (Nikkei)	-0.3873	-1.3966	-1.3675	2.2507**
<i>Panel C: Causality in downside risk</i>				
India (Nifty)	-0.4913	-0.2472	-0.3766	0.8690
China (SSE)	2.4280***	-0.6919	-0.1047	-0.5081
Pakistan (KSE100)	-1.2747	1.0474	0.8092	1.3252*
Singapore (MSCISG)	-1.2064	0.2003	-1.3621	0.5098
Malaysia (KLCI)	0.5685	1.5669*	0.6744	0.2459
Hong Kong (Hang Seng)	-0.3224	-0.0855	-0.5500	0.9235
Korea (KOSPI)	0.4716	-0.1184	0.7158	0.4512
Japan (Nikkei)	0.1027	-0.4623	0.1179	-0.9237

Source: Author Constructed

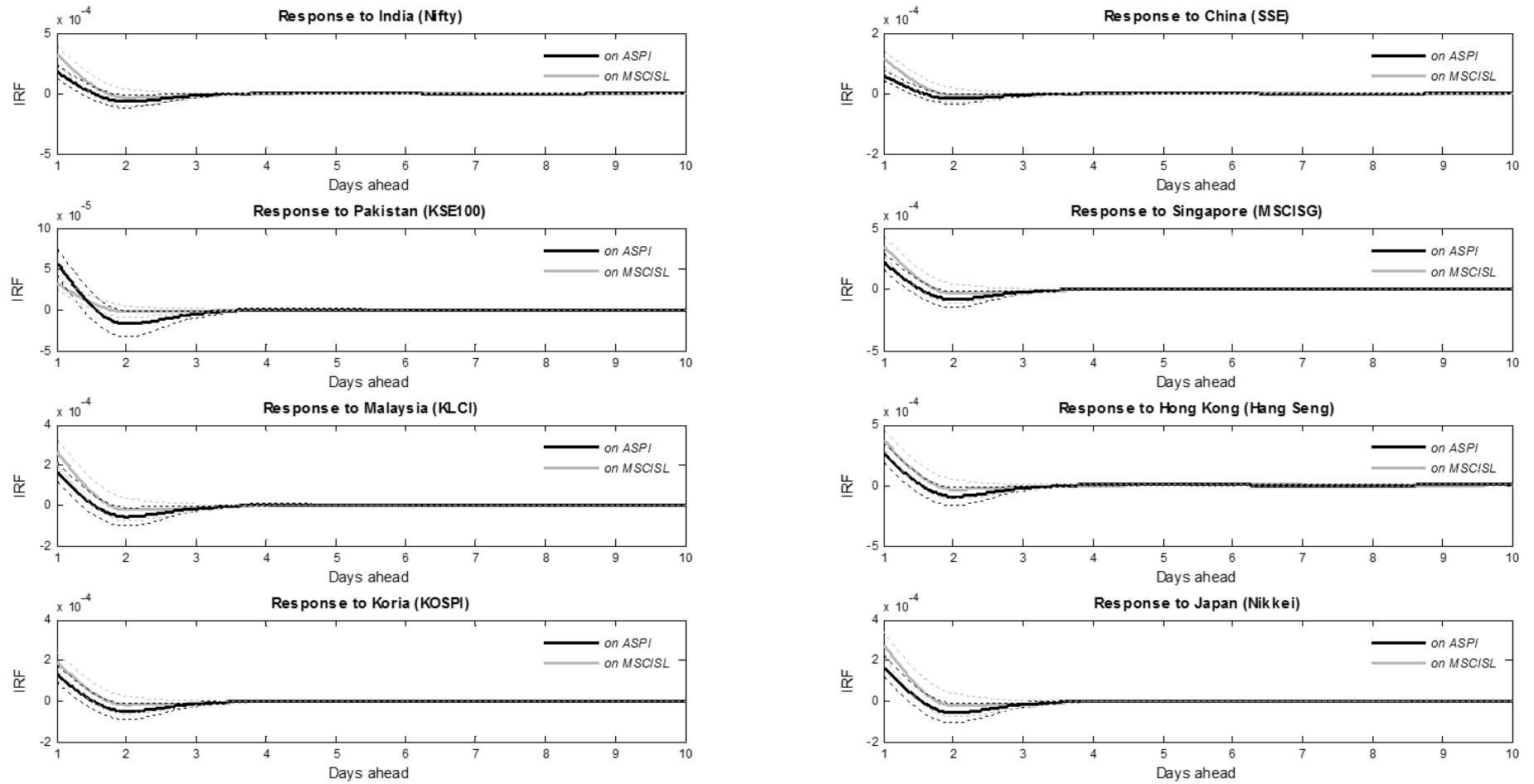


Figure 1. Generalized Impulse Responses

This figure illustrates generalized impulse response functions due to a shock on each Asian stock markets on the Sri Lankan stock market over the period from 1st January 2000 to 31st December 2012. The responses corresponding to ASPI and MSCISL respectively are plotted in each graph in black and grey colours. Dotted lines represent 90% simulated confidence bands.

Source: Author Constructed

Impulse Response Functions

In addition to the cointegration, correlation, and Granger causality tests, the impulse response functions are used to investigate the interaction between the Sri Lankan stock market and the other Asian stock markets. The specific purpose of using impulse response functions is to investigate the potential impact of a current shock to one market on the following days of other markets. Impulse responses for both ASPI and MSCILK indices are computed along with 90% simulated confidence intervals. Results are illustrated in Figure 1 and clearly demonstrate that the Sri Lankan stock market is sensitive to current shocks on other Asian markets only on the following day. The magnitudes of the response in two Sri Lankan stock market indices (ASPI, MSCILK) are close to each other. Moreover, both Sri Lankan stock indices react positively to all other Asian stock market shocks. This result contradicts the previous finding in Elyasiani et al. (1998) corresponding to the response of the Sri Lankan stock market due to other market shocks where Elyasiani et al. (1998) documents that the Sri Lankan stock market does not significantly respond to other Asian market shocks during 1989 to 1994. However, Narayan et al. (2004) document that shocks to stock prices in India, and Pakistan during the sample period from 1995 to 2001 have a positive effect on stock prices in Sri Lanka which is consistent with ours. Thus, it is evident that the sensitivity in the Sri Lankan stock market over the movements in surrounding markets has been changed after 1994. This may be due to the implementation of the automated electronic clearing and settlement Central Depository System in 1991 which causes the trading activities more transparent and dynamic in the Colombo Stock Exchange.

Conclusion

Findings of this study revealed that the Sri Lankan stock market is cointegrated with the Korean stock market but not with others. Contemporaneous correlations are significant between Sri Lanka and other Asian countries such as India, Singapore, Malaysia, Hong Kong, Korea, and Japan. Pakistan, Malaysian, and Korean stock markets Granger caused in mean to the Sri Lankan stock market while India and Korea Granger caused in variance. Extreme downside risks in Chinese stock market also Granger caused the Sri Lankan stock market. Impulse response analysis provided evidence for the following day's impact on the Sri Lankan stock market due to a current shock on other Asian stock markets. It is well known that, at least at the beginning of the 1990s, South Asian markets have undergone rapid market liberalization, which has opened up the region to higher investment and trade flows. Moreover, the post war era in Sri Lanka after 2009 assumes a safe market condition for the investments. Therefore, findings of this study could be useful to both foreign and local investors of the Sri Lankan stock market who seek for opportunities to minimize their risk. Further research can be focused specifically on examining the reasons for poor integration in Sri Lankan stock market specifically with Indian and Chinese markets. Because, these two countries act as major investors in the Sri Lankan economy. Moreover, future research may focus on finding ways to increase the level of attractiveness of the Sri Lankan stock market to foreign investors.

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