Does Sri Lankan Stock Market Interact with Asian Stock Markets?

D.D. Chalith Kavinda

Department of Business Finance,
Faculty of Management,
University of Peradeniya,
Peradeniya, Sri Lanka
Email: chalith407@gmail.com

Abstract

International diversification attempts to reduce risk by investing in more than one nation. By diversifying across nations whose economic cycles are not perfectly correlated, investors can reduce the variability of returns. The aim of this study is to identify the interaction of the Sri Lankan stock market with other stock markets in Asian region and to assess the feasibility of investment diversification opportunities. The results show that Sri Lankan stock market is highly correlated with the Indian Stock Market and there is a long run relationship between the Sri Lankan and the Malaysian stock market. Information spillover from Malaysia and China stock markets to the Sri Lankan stock market is apparent and vice versa from Sri Lankan stock market to the Singapore stock market. The recommendation is not to diversify the investment in the Asian markets since no market is zero or negatively correlated with the Sri Lankan stock market.

Key words: International diversification, Information spill over, Correlation

1. Introduction
1.1 Background of the study

Over the past decades, policy makers of both developed and developing countries have undertaken various measures to eliminate the barriers to the flow of resources across national boundaries. This has immensely contributed to the globalization of financial markets across the world. As a result of increasing globalization, investors are more aware of global opportunities, and the accessibility to stock markets has been substantially increased. This provides considerable incentive for investors to look for international investment opportunities. Hence, studies relating to co-movements between stock markets is very important for portfolio managers who wish to diversify their portfolios into other

markets for higher risk-adjusted returns. It is well known that stock market investments are risky. Both practitioners and theoreticians recommend to hold a well-diversified portfolio in order to reduce this risk. Therefore, an understanding of the degree of stock market interdependence is also very important since it enables investors to diversify their investments and to policy makers to formulate appropriate policies to determine the flow of resources among national boundaries (Paramati, Gupta, Roca, 2015). In the finance literature there are two well-known theories, the Capital Asset Pricing Model (CAPM) and the Modern Portfolio Theory (MPT), which suggest that individual and institutional investors should hold a well-diversified portfolio to reduce risk. An institutional investor can achieve a well-diversified portfolio because the amount of funds in the portfolio is large enough for in-house diversification. Individual investors with limited wealth will have to find another way that does not require substantial funds to diversify their portfolios. This will assist investors to make informed portfolio investment decisions. It is also argued that since differences exist in levels of economic growth and timing of business cycles among various countries, international portfolio diversification can be used as a means of reducing risk (Yavas, 2007). This international portfolio diversification aids to identify the causal linkages among stock markets which provides an important implication for securities pricing, hedging and trading strategies, and financial market regulations. Also, the presence of long-term linear and nonlinear relationships may be used to achieve financial gains from international portfolio diversification and to reduce systematic local risks. Consequently, there exists a large body of literature examining the presence of causal linkages between developed (less risky) markets. They typically find that the US market leads other developed markets (King and Wadhwani, 1990).

1.2 Research problem and objective of the study

Although there has been a large number of studies emphasizing on market integration and interdependence, very few of the existing studies have focused on the linkage between Asian stock markets. In the emerging markets, Sri Lanka has become one of the fastest growing economies after its civil conflict against the Liberation Tamil Tigers (LTT) in 2009 (Sriyalatha and Toril, 2013). The Sri Lankan stock market has over the years been quite unique, in the sense that it has had a low correlation with developed and emerging markets and their trends. This has been something that many analysts have noted in the past, and certainly gives an interesting selling point considering that funds that generally look at frontier markets look for diversification opportunities (Obeyesekere, n.d). Therefore, the question is raised, though the diversification opportunities are exits, which type of a correlation and the strength of that relationship that Sri Lankan stock market has with other Asian markets. Identification of the type and the strength of the correlation is important since, modern portfolio theory suggests that it is always better to go with stocks which are having negative or zero-correlation.

Therefore, 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 researches. Narayan, Smyth and Nandha (2004) stated that 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.

This study attempts to identify following research questions. First it analyses the relationship of the Sri Lankan stock market with the other Asian stock markets. Second, it analyses whether the Sri Lankan stock market has any co-integration with the other Asian stock markets. Third, it analyses whether

there are any information spillovers from the other Asian markets to the Sri Lankan stock market and whether there is any information in the Sri Lankan stock market spilled over to the other Asian stock markets. Finally, it attempts to provide recommendation about investment diversification opportunities for Sri Lanka.

1.3 Importance of the study

Foreign relations of Sri Lanka refer to the diplomatic and commercial relations between Sri Lanka and other countries. Sri Lanka has stressed its principle of friendship towards all, enmity towards none in its diplomacy. Sri Lanka traditionally follows a Non-Aligned Foreign Policy which does not take sides with major powers. Since the end of the Cold War, the country has pursued better relations with all major powers and seeks to strengthen its diplomatic, economic and military ties with India, Bangladesh, Russia, United States, China, Pakistan, Japan, Malaysia, South Korea and European Union(Ministry of Foreign Affairs,n.d).

The Sri Lankan economy has seen robust annual growth at 6.4 percent over the course of the 2003-2012 period, a figure which is well above its regional peers. In Gross Domestic Product (GDP) per capita terms, it is ahead of other countries in the South Asian region. As well as the country earned strong growth rates in recent years. Since the end of the three-decade civil war, Sri Lanka has begun focusing on long-term strategic and structural development challenges as it strives to transitionto an upper middle-income country. The countries positive developments such as noticeable improvements in the gross official reserves, flexible exchange rate management, a recovering balance of payments position, strong foreign direct investments (FDI) numbers and fiscal consolidation have contributed to an improvement in the macro-economic outlook, which is certainly important when attempting to attract foreign investment to stock market. With these economic performances it quite encourages and indicates that Sri Lankan stocks remain attractive to foreign portfolio investors, especially those with investment interests in frontier markets. Present developments indicate a reason to believe that Sri Lanka at the moment is viewed as a market with considerable growth potential, which is vindicated by the substantial level of foreign investor interest which have experienced in recent times. Therefore, the identification of market interaction would help to diversify investments and to increase the return with lower risk (https://en.wikipedia.org/wiki/Economy_of_Sri_Lanka).

2. Literature review

The issue of stock market integration has been of interest among policy makers and practitioners for many years due to the significant effect it has on flow or reallocation of resources. One stream of researchers argues that higher economic integration between countries can have substantial influence on their stock market correlations and cointegration relationships. While, other stream of researchers argues that economic integration has no impact on their stock market relationship. These findings indicate either contradictory or inconclusive. Thus, it is very much important to provide critical literature review on stock market interdependence and trade linkages (Paramati, Gupta, Roca, 2015)

Previous studies attempted to investigate the interaction between the Sri Lankan and other regional stock markets are limited. Elyasiani, Perera, and Puri (1998) investigated the interdependence and dynamic linkages between the stock market of Sri Lanka and the stock markets of its major trading partners such as Taiwan, Singapore, Japan, South Korea, Hong Kong, India, and the US during 1989 to 1994. The result of the study indicated that there is no significant interdependence between the Sri Lankan stock market and the stock markets of the US and the Asian stock markets. In contrast,

Narayan et al., (2004) used daily data from 1995 to 2001 and concluded 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 stock market with ten other leading stockmarkets. The result was in line with the previous studies and they found that there is no significant relationship between the Sri Lankan stock market with other countries. However, unlike other studies, this study demonstrates that these linkages are time-varying. More importantly, it expounds on whether weak associations between the stockmarkets of Sri Lanka and its trading partners are a result of the Sri Lankan civil war. It appears that the impact of a civil war on stock market linkages between countries,using the Dynamic Conditional Correlation (DCC)model in particular, has not been researched before. None of the three studies involving Sri Lanka have touchedon this topic, i.e.) consider the Sri Lankan conflict in depth (Kumara, Upananda, and Rajib, 2014; Peiris, 2012; Deyshappriya, 2014)

Further, Harper and Jin (2012) pointed out that while diversification opportunities across developed markets is well-researched, diversification into emerging markets has received less attention. This study examined the stockmarket interdependencies between Sri Lanka and its major trading partners in the context of Sri Lanka's civil war. These selected nations (namely China, India, Pakistan, Singapore, Malaysia and the US) have economies that are developed, emerging and developing.

Due to the limitation of the existing literature on interaction between Sri Lankan stock markets and stock markets of other countries, it is important to analyze the studies that have been conducted for other countries. Most of the studies on stock market interdependence in emerging markets have been done on geographical groups of markets, such as markets in Central and Eastern Europe. In the international context the existing literature on stock market correlations mainly relies on asset correlations as an appropriate measure of stock market integration (Liow, 2012; Wang and Moore, 2008; Yu, Fung, and Tam, 2010).Further, Moore and Wang (2014), Turhan, Sensoy, Ozturk and Hacihasanoglu (2014), Tamakoshi and Hamori (2014) and Syllignakis and Kouretas (2011), among many, show evidence that correlations in international stock returns change over time. Thus, to form a successful international portfolio, capturing the time varying nature of correlations is important. A number of studies in the literature argue that international trade is believed to foster business cycle synchronization across the countries, and therefore affect the level of their stock market interdependence (Walti, 2011; Beine, 2010). A study by Walti (2011) provides an interesting argument that the effect of bilateral trade operates through both the demand and supply side of economies. In the Australian context, researchers have begun to explore whether bilateral trade linkages between Australia and its trading partners have any impact on the interdependence of their stock markets. Some studies document that bilateral trade linkage among Australia and its trading partners have significant impact on their stock market co-dependence. For instance, Shamsuddin and Kim (2003) explore the long-run relationship between Australia and its two major trading partners, i.e., Japan and the USA, using weekly data. The empirical results of this study show that there was a long-run relationship between these markets until the time of the Asian financial crisis. However, results suggest that following the crisis, there was no evidence of a cointegration relationship among these markets. Another study by Kazi (2008) investigates the long-run relationship between the stock markets of Australia and its major trading partners (the UK, the USA, Japan, Canada, Germany and France) using annual data from 1945 to 2002. The evidence from this study confirms the long-run relationship between Australia and its major trading partners.

Apart from these studies, some studies in the Australian context find contradictory results. For example, a study by Roca (1999) explores the price linkages between the stock market of Australia and its major trading partners (the USA, the UK, Japan, Hong Kong, Singapore, Taiwan and Korea). The findings show no evidence of a long-run relationship between Australia and its trading partners. Similarly, Hatemi-J and Roca (2007) investigate the stock market interactions between Australia and its major trading partners (Japan, the USA, the UK, Hong Kong, Singapore Taiwan and Korea). The findings of this study show no significant long-term causal linkages in the pre- and post-crisis periods of Asia. Further, results show low correlations between Australia and its trading partners. Based on these results, the authors suggest that Australian investors can benefit by diversifying their portfolios into these markets.

All of the above studies rely on the restrictive assumption of linearity either through the use of linear causality tests or via linear time series methodology. Moreover, some of these studies fail to notice that parametric linear Granger causality tests have low power against nonlinear alternatives (Baek and Brock, 1992). Recognition of the nonlinear property of stock prices, and subsequently exploring for possible long-run nonlinear relations among national stock markets, came after publication of the study by Hiemstra and Jones (HJ). For instance, using the HJ 3causality test, Hunter (2003) focuses on the emerging markets of Argentina, Chile, and Mexico. Similarly, Ozdemir and Cakan (2007) examine the dynamic relationships between the stock market indices of the US, Japan, France, and the UK.

Moving to the Sri Lankan context again, a recent study has been done by Kuruppuarachchi. 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, HongKong, 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 invariance.

The review of the existing literature on stock market interdependence in the context of Sri Lanka and its trading partners reveal that these studies also brought mixed results as the general literature.

3. Methodology
This study uses quantitative research approach.

3.1 Data Collection
The aim of this study is to examine the interaction of Sri Lankan stock market with other stock markets in Asian region. Sample was consisted with the daily data of value-weighted equity market indices of each country is retrieved frominvesting.com web site and CSE data Library covering the period from 01stFebruary 2012 to 01st February 2018. Following Kuruppuarachchi, this study uses the stock market indices of BSESENSEX index (BSESN) of India, Shanghai Composite stock index (SSCE) of China, Karachi100 index (KSE) of Pakistan, FTSE Straits Times Singapore index of Singapore (STI), FTSE Malaysia KLCI index (KLSE) of Malaysia, Hang Seng index (HSI) of HongKong, KOSPI index (KS11) of Korea, VN30 index (VN30) of Vietnam and Nikkei 225 index (N225) of Japan. In order to represent the Sri Lankan stock market, the all share price index of CSE (ASPI) is used.

3.2 Research Hypotheses

Based on the review of the theoretical and empirical literature that have been conducted, the following hypotheses are put forward in order to response to the research question.

Hypothesis $_{0A}$: There is no any relationship between the Sri Lankan stock market and the other stock markets in the Asian region.

Hypothesis $_{0B}$: There is no any cointegration between the Sri Lankan stock market andthe other stock markets in the Asian region.

Hypothesis $_{0c}$: There are no any information spill overs from the Sri Lankan stock market to the other stock markets in the Asian Region.

Hypothesis $_{0d}$: There are no any information spill overs from the other stock markets in the Asian region to the Sri Lankan stock market.

3.3 Econometric Methods

Following econometric methods are conducted in order to proceed with the analysis.

- ➢ **Stationary Test**

  This study used Augmented Dickey–Fuller tests to justify that all data series are significantly stationary.
- ➢ **Serial Correlation Test**
- ➢ **Heteroskedasticity Test**
- ➢ **Correlation Analysis**
- ➢ **Regression Analysis**

  Regression analysis was conducted by taking the impact of one independent variable to the dependent variable, at a time. The main reason for this was, it would explain, the relationship between the variables separately. Also, if there is an issue of correlation with the independent variables, it can also be insignificant if the model only takes one independent variable at a time to regress it with the dependent variable.
- ➢ **Cointegration tests by Engle-Granger and Johansen methodologies**
- ➢ **Granger causality test**
- ➢ **Impulse response functions**

  This illustrates the response of one variable to an impulse in another variable in a system that involves a number of further variables as well.
  - ❖ In order to conduct the statistical test for the data analysis E-VIEWS statistical software package has been used.

3.5 Regression models

$$ASPI = \beta_0 + \beta_1 BSE\ SENSEX + \varepsilon_{it} \quad (1)$$
$$ASPI = \beta_0 + \beta_1 KSE + \varepsilon_{it} \quad (2)$$
$$ASPI = \beta_0 + \beta_1 SSCE + \varepsilon_{it} \quad (3)$$
$$ASPI = \beta_0 + \beta_1 N225 + \varepsilon_{it} \quad (4)$$
$$ASPI = \beta_0 + \beta_1 STI + \varepsilon_{it} \quad (5)$$
$$ASPI = \beta_0 + \beta_1 KS11 + \varepsilon_{it}(6)$$
$$ASPI = \beta_0 + \beta_1 HSI + \varepsilon_{it} \quad (7)$$

$$ASPI = \beta_0 + \beta_1 VN30 + \varepsilon_{it} \quad (8)$$
$$ASPI = \beta 0 + \beta_1 KLSE + \varepsilon_{it} (9)$$

4. Results and discussion

This section of the study illustrates the analysis done to test the above-mentioned hypothesis. First the data series were analyzed by using a stationary process in order to remove the time trend of the data. Then the serial correlation test and the heteroscedasticity test have been conducted to the data series. 'Breush-Pegan-Godfrey' model has been used to check the heteroscedasticity. Here, it is very much essential to express that the data series is not homoscedasticity. This means that the data series have the issue of heteroscedasticity. This described a situation in which the error termis not the same across all values of the independent variables. In order to achieve the objective of the research, the dependent variable that is ASPI was regressed with stock market indices of other Asian countries separately. Therefore, one independent variable has been taken toexplain one dependent variable at a time. As a result of that the variances of the error term may not be same across all the values of the data set or the independent variable. Because, the dependent variable may be affected by other variables except these stock market indices.

4.1 Correlation analysis

The correlation analysis was conducted for each of the variables. Some of the independent variables exhibited the issue of correlation including VN and BSE SENSEX, KO11 and SI, BSE SENSEX and KSE, KSE and N225, N225 and BSE SENSEX. This issue was eliminated since the model did not take the impact of all these stock indices to ASPI at once. Rather it regressed each of these independent variables separately with the dependent variable (Table 01).

Table 01: Correlations

	ASPI	*BSESENSEX*	*FTSE*	*HSI*	*KLCE*	*KO11*	*KSE*	*N225*	*SSCE*	*VN30*
ASPID	1.00	0.75	0.41	0.53	0.50	0.26	0.60	0.76	0.61	0.52
BSESENSEX	0.75	1.00	0.21	0.72	0.31	0.70	0.90	0.90	0.74	0.85
FTSE	0.41	0.21	1.00	0.66	0.66	0.32	-0.01	0.23	0.14	0.25
HIS	0.53	0.72	0.66	1.00	0.51	0.82	0.54	0.68	0.56	0.71
KLCE	0.50	0.31	0.66	0.51	1.00	0.22	0.22	0.38	0.00	0.39
KO11	0.26	0.70	0.32	0.82	0.22	1.00	0.60	0.59	0.46	0.77
KSE	0.60	0.90	-0.01	0.54	0.22	0.60	1.00	0.88	0.65	0.78
N225	0.76	0.90	0.23	0.68	0.38	0.59	0.88	1.00	0.77	0.79
SSCE	0.61	0.74	0.14	0.56	0.00	0.46	0.65	0.77	1.00	0.47
VN30	0.52	0.85	0.25	0.71	0.39	0.77	0.78	0.79	0.47	1.00

4.2 Regression Analysis

The regression analysis demonstrated the significant results for the model that has been developed. The issue of heteroscedasticity was mitigated to a considerable level by conducting a white test to get the white standard errors to the model other than the normal standard errors. Since the sample was

large, this white test gives a better t-statistics and coefficients that can be reliably measure the model developed (Table 02).

Table 02: Regression Analysis

Independent Variables	*India*	*Pakistan*	*China*	*Japan*	*Singapore*	*Korea*	*Hong Kong*	*Vietnam*	*Malaysia*
Dependent Variable	**BSESENSEX**	**KSE**	**SSCE**	**N225**	**STI**	**KS11**	**HSI**	**VN30**	**KLCE**
ASPI									
R^2	0.56	0.35	0.37	0.58	0.16	0.07	0.28	0.27	0.25
F-Statistics	1827.32	797.08	860.62	2030.71	287.03	108.35	558.84	532.91	491.55
Sig.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Intercept	3885.08	5250.59	4687.58	4293.53	2501.80	4110.25	3120.65	3964.12	122.64
Coefficient	0.10	0.04	0.59	0.13	1.23	1.09	0.14	3.91	3.60
t Stat	37.75	28.25	33.50	47.52	16.94	12.51	21.81	20.28	20.95
Sig.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

According to the analysis for ASPI, BSE SENSEX was positively associated with ASPI at the 1 percent significant level. ASPI demonstrated a significant positive association with BSE SENSEX with a coefficient of 0.10, which is significant at 1 percent level. The explanatory power R^2 is having 0.56 percent, which stated that BSE SENSEX index has the power of 0.56 to explain ASPI.   The overall model for ASPI with BSE SENSEX is significant at 1 percent significant level.

The ASPI is having a significant positive association with KSE and it is significant at 1 percent level. The coefficient illustrated the value of 0.04 with KSE. The overall model ASPI with KSE was significant at 1 percent level and it has a R^2 value of 0.35.

China, one of the major trading partner of Sri Lanka, has a significant positive association with ASPI, by having a coefficient value of 0.59. The China stock market is likely to explain the Sri Lankan stock market with an explanatory power of 0.37, which is significant at 1 percent level.

The N225, Japanese stock index has a significant positive association with ASPI. The coefficient value between the two indices were 0.13, which was significant at 1 percent level. The explanatory power reflected by the N225 index was high with a R^2 value of 0.58 and that is significant at 1 percent level. This R^2 value was the highest explanatory power given by an index to the ASPI in the Asian region.

Singapore, one of the well-developed countries in the Asian region provides a significant positive association with ASPI. The calculated coefficient value was 1.23, which is significant at 1 percent level. The explanatory power added by the STI to ASPI was 0.16. This explanatory power was significant at 1 percent level.

The lowest explanatory power was added by KOSPI to ASPI, that is 0.07. Nevertheless, it was significant at 1 percent level. The relationship in between the KOSPI and ASPI was positive with a coefficient value of 1.09, which is significant at 1 percent level.

ASPI is having a significant positive association with HIS with a coefficient value of 0.14, which is significant at 1 percent level. The R^2 value that have been provided by the HIS to ASPI was 0.28, which is significant at 1 percent level.

VN30 index of Vietnam is having a significant positive association with ASPI index with a coefficient value of 3.91. This coefficient value is significant at 1 percent level. The explanatory power contributed by the VN30 index was 0.27 and that is significant at 1 percent level.

ASPI and KLSE the index of Malaysia provided a significant positive association with a coefficient value of 3.60, which was significant at 1 percent level. The explanatory power provided by the KLSE to ASPI was 0.25. This was significant at 1 percent level.

To summarize, it was revealed that overall models for each of the indices were significant at 1 percent significant level. The literature of previous researches including Elyasiani et al., (1998) and Narayan et al., (2004) provided that there is no any relationship in between ASPI and other indices. This study attempted to provide an additional contribution to the existing literature by identifying significant association in between ASPI and other stock market indices in the Asian region. Hence, this result was contributed at large to reject the null hypothesis developed. For the regression analysis the developed null hypothesis (There is no any interaction/interdependence/relation between Sri Lankan stock market with other stock market in the Asian region) was rejected at 1 percent significant level.

4.3 Cointegration tests by Engle-Granger and Johansen methodologies

Cointegration test reflects whether there is a long run relationship between two indices as far as this study is being concerned. In this test, there were two other statistical concept that has been used in this study. Those were Trace statistics and Max-Eigen Statistics. In order to reject the null hypothesis developed for this test the calculated p-value should be less than 0.05(Table 03).

Table 03: Cointegration Analysis

Independent Variables	*India*	*Pakistan*	*China*	*Japan*	*Singapore*	*Korea*	*Hong Kong*	*Vietnam*	*Malaysia*
Dependent Variable	**BSE SENSEX**	**KSE**	**SSCE**	**N225**	**STI**	**KS11**	**HSI**	**VN30**	**KLCE**
ASPI									
Trace Statistic	4.622488	15.49471	9.808855	5.912563	8.434473	4.28187	6.039473	4.957345	16.9866
Sig.	0.8475	0.7025	0.2957	0.7059	0.4202	0.8795	0.6909	0.8133	0.0296
Max-Eigen Statistic	4.308612	3.25377	7.241824	4.400757	5.854248	3.42968	4.897131	4.506034	11.8407
Sig.	0.8254	0.9284	0.4609	0.8148	0.632	0.9141	0.7548	0.8024	0.1168

The result of this test indicated that the Malaysian stock market is significantly cointegrated with the Sri Lankan stock market which was significant at 0.05 level by rejecting the null hypothesis developed. All the other markets do 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 Malaysia, although the regression analysis provided significant positive relationships. The Malaysian integration to the Sri Lankan stock market can be expected due to the collaborations between two countries for trading activities and that would result in the stock market cointegration. Because, trades from Malaysia and the Sri Lanka stock exchange have been increasing inthe recent past. This was also supported by the literature review. That is Paramati et al., (2015) reflected that one stream of researchers argues that higher economic integration between countries can have substantial influence on their stock market correlations and cointegration relationships.

Additionally, some studies documented that bilateral trade linkage among Australia and its trading partners have significant impact on their stock market co-dependence. For instance, Shamsuddin et al. (2003) explores the long-run relationship between Australia and its two major trading partners, i.e., Japan and the USA.

4.4 Granger causality test

This test was carried out in order to identify whether the information spills over from Sri Lanka to other Asian countries or other Asian countries to Sri Lanka. In general, this describes whether the Sri Lankan ASPI causes other Asian stock markets or other Asian stock market causes Sri Lankan ASPI. In order to conduct the test, it necessary to determine the appropriate lag length at first for a particular model. To identify the appropriate lag length lowest Akaike information criterion (AKI) has been used. The lower is the AIC value, the better is the model. For this test the null hypothesis developed was that there is no any information spill over from ASPI to other Asian region stock markets and vice versa (no information spill over from other Asian region stock markets to ASPI.)

The result indicated that KLCE is granger causes ASPI at 1 percent significant level, ASPI granger causes FTSE at 5 percent level and SSCE granger causes ASPI at 5 percent significant level. In other words, there is an information spill over from the Malaysian stock market (KLCE) and the China stock market (SSCE) to the Sri Lankan stock market (ASPI).The Sri Lankan stock market (ASPI) spills information to Singapore stock market (FTSE). The result was contributed significantly to reject the null hypothesis that has been developed.

4.5 Impulse Reponses

In addition to the correlation, cointegration 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. The responses time of 15 has been selected in order to conduct the impulse reposes analysis. It shows the responses of the error terms of each of the Asian region stock market indices to Sri Lankan stock market (ASPI) for next 15 months.

- **Responsiveness of ASPI to HSI**
  If there is change in the HIS for the first four months in the future, ASPI will have a negative impact from HIS (Figure 01).
- **Responsiveness of HSI to ASPI**
  If there is a change in the ASPI for the first 6 months in the future, then it will be negatively affecting to ASPI. After that ASPI will have a positive impact from HIS (Figure 02).
- **Responsiveness of ASPI to STI**
  If there is change in the STI for the first four months in the future, ASPI will have a negative impact from ASPI (Figure 03).
- **Responsiveness of STI to ASPI**
  If there is change in the ASPI for the first two months in the future, STI will have a negative impact from STI (Figure 04).
- **Responsiveness of ASPI to VN30**
  When the VN30shows a positive movement during future seventh months times, ASPI shows negative reactions with in that period (Figure 05).

- **Responsiveness of VN30 to ASPI**

  If there is change in the ASPI index of Sri Lanka, VN30 will have a negative impact in the long-run (Figure 06).
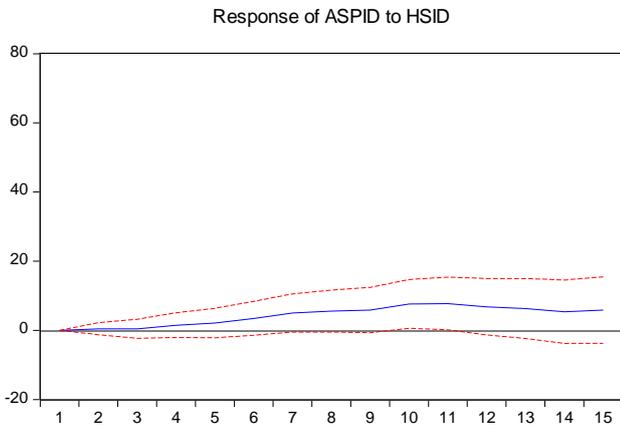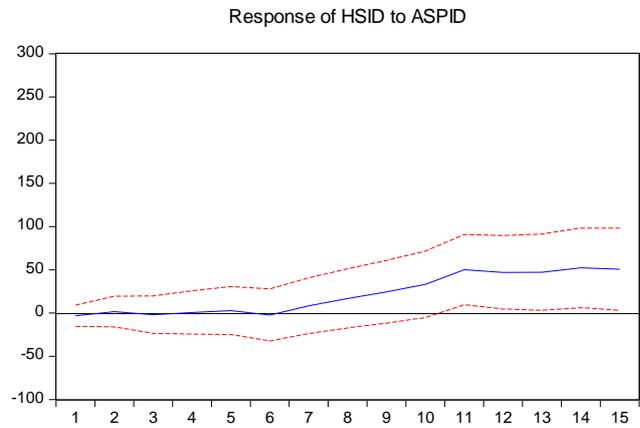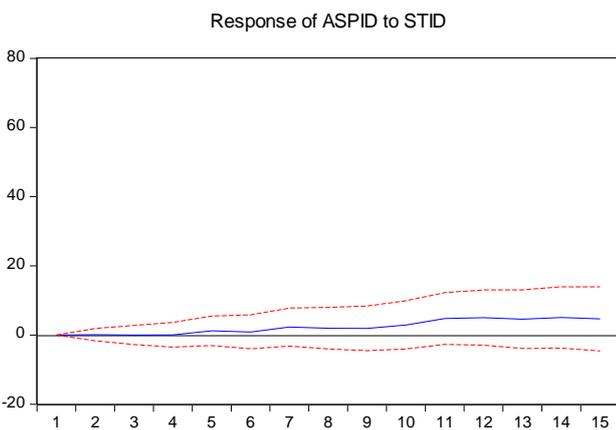
Response of ASPID to HSID

Figure: 01

Response of HSID to ASPID

Figure: 02

Response of ASPID to STID

Figure: 03

Response of STID to ASPID

Figure: 04

Response of ASPID to VN30D
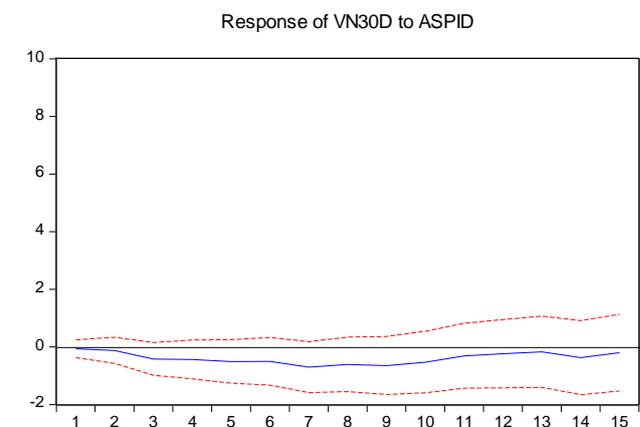
Figure: 05

Response of VN30D to ASPID
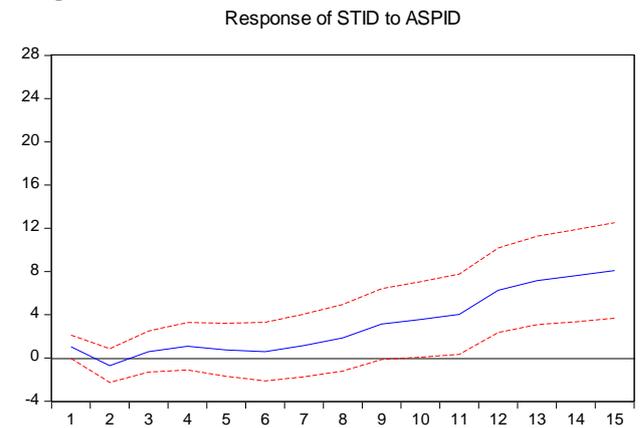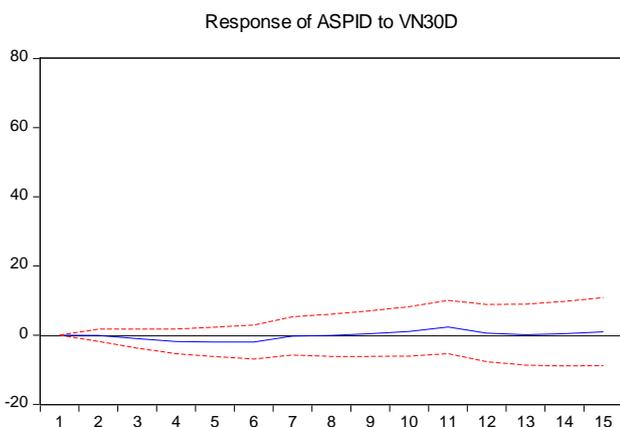
Figure: 06

5. Conclusion

This study examined the relationship, interaction and interdependency of the Sri Lankan stock market to other stock markets in the Asian region. The study is motivated by recent researches and the number of transactions taken place in between the Asian countries which will lead to interaction between stock markets. The results of the study indicated that there is a significant relationship in between Sri Lankan stock market and other stock markets in the Asian countries. There is a strong significant relationship between the Sri Lankan the stock market and the Indian stock market. Moreover, there is long run relationship in between the Malaysian stock market and the Sri Lankan stock market which may also can be useful for investment diversification. The causality test indicated that there is an information spill over from the Malaysian stock market (KLCE) and the China stock market (SSCE) to the Sri Lankan stock market (ASPI), and also the Sri Lankan stock market (ASPI) spills information to the Singapore stock market (FTSE). This is mainly because the number of trading partnerships that Sri Lanka has undertaken with these countries. For an instance, Sri Lanka and Malaysia have expressed satisfaction with the progress made over the years and reaffirmed their determination to take their bilateral relations forward by exploring new areas of cooperation including in political, trade and investment, education, tourism, human resource, training and cultural relations and people-to-people contact. In recent years, trade between China and Sri Lanka has grown rapidly. They have the excess capital and the capacity to take high risks, and they financed the construction of the Hambantota Port at a time when no other country or development partner was willing to invest in it. From an international relations point of view, China also serves as a counter balance against the regional hegemony of India and other influences on Sri Lanka. This will enhance the investment opportunities within the countries and there by impacting the stock markets as well. The impulse responses show that for the future months Sri Lankan stock market is likely to have negative impulse responses from Singapore, Vietnam, Hong Kong. In conclusion, it can be stated that though the Sri Lankan stock market is having relationships with other markets it is not advised to hold portfolios of the other Asian countries since the study could not find any negative or zero corelated markets to Sri Lanka.

The results of this study make an important contribution to the body of knowledge and are also valuable for policy makers and portfolio managers. Consequently, it could be useful to both foreign and local investors of the Sri Lankan stock market who seek for opportunities to minimize their risk for a given return. Further research can be focused to examine the reasons for poor integration in the Sri Lankan stock market specifically with the Indian and the Japan markets. Since, 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.

References

Ani, (2017), Sri Lanka, Malaysia reaffirm determination to take bilateral relations forward. [online] Available at: http://www.business-standard.com/article/news-ani/sri-lanka-malaysia-reaffirm-determination-to-take-bilateral-relations-forward-116121700285_1.html (December 17,2017)

Beine, M., Cosma, A. & Vermeulen R. (2010). The dark side of global integration: Increasing tail dependence, Journal of Banking & Finance, 34, 184-192.

Hiemstra, C.,&Jones, J.D. (1994) Testing for linear and nonlinear Granger causality in the stock price-volume relation, J. Finan. 49 (1994) 1639-1664.

Gilmore, G.C.,&McManus, G.M. (2002). International portfolio diversification: US and Central European equity markets, Emerging Markets Rev. 3 (2002) 69-83.

Gooijer, D.G, J., & Sivarajasingham, S. (2008). 'Parametric and nonparametric Granger causality testing: linkages between international stock markets', Physica A: Statistical Mechanics and its Applications, vol. 387, pp. 2547-2560.

Hunter, M.D. (2004). Linear and nonlinear dynamic linkages between emerging market ADRs and their underlying stocks, 2003.Available at SSRN: https://ssrn.com/abstract=586542 or http://dx.doi.org/10.2139/ssrn.586542.

Baek, E., &Brock, W.(1992). A general test for non-linear Granger causality: Bivariate model, Working paper, Iowa State University and University of Wisconsin, Madison, WI, 1992.

Elyasiani, E, Perera P, & Puri, TN 1998, 'Interdependence and dynamic linkages between stock markets of Sri Lanka and its trading partners', Journal of Multinational Financial Management, vol. 8, pp. 89-101.

Hatemi-J A. and Roca E.D. (2007) Equity market price interdependence based on bootstrap causality tests: evidence from Australia and its major trading partners, Applied Financial Economics, 17, 827-835.

Kazi M.H. (2008) Is Australian stock market integrated to the equity markets of its major trading partners, International Review of Business Research Papers, 4, 247-257.

Kuruppuarachchi, D. (n.d).Interaction Between the Sri Lankan Stock Market and Surrounding Asian Stock Markets.

Mervyn, A.K., &Wadhwani, S. (1990). Transmission of volatility between stock markets. The Review of Financial Studies, 3(1), 5-33.

Melissa, (2017), Correlated and Non-Correlated Assets. [Online] Available: https://www.thebalance.com/what-is-asset-correlation-2894312 (September 02,2017)

Ministry of Foreign Affairs. Foreign relations of Sri Lanka. [Online] Available online at: https://www.revolvy.com/main/index.php?s=Foreign%20relations%20of%20Sri%20Lanka (January 31, 2018).

Narayan, P, Smyth, R & Nandha, M 2004, 'Interdependence and dynamic linkagesbetween the emerging stock markets of South Asia', Accounting & Finance, 44, pp.419-439.

Narayan, S., Sriananthakumar, S. (2015). Are prolonged conflict and tension deterrents for stock market integration? The case of Sri Lanka. International Review of Economics and Finance, 39, 504–520.

Obeyesekere, S (n.d). CSE records highest ever foreign investment in January. [Online] Available at: https://www.invest.lk/cse-records-highest-ever-foreign-investment-january/ (February 03,2018).

Paramati, S.R., Gupta, R. & Roca, E. (2015) "Stock market interdependence between Australia and its trading partners: does trade intensity matter?" Applied Economics (available online): DOI: 10.1080/00036846.2015.1047088.

Roca E.D. (1999) Short-term and long-term price linkages between the equity markets of Australia and its major trading partners, Applied Financial Economics, 9, 501-511.

Shamsuddin A.F. and Kim J.H. (2003) Integration and interdependence of stock and foreign exchange markets: an Australian perspective, Journal of International Financial Markets, Institutions and Money, 13, 237-254.

Sriyalatha, A. K., Toril, H. (2013). Interdependence of the Stock Markets, Before and During the Economic Crisis.

Statistics Solutions. (2013), Homoscedasticity. [online] Available online at: http://www.statisticssolutions.com/homoscedasticity/(February 01, 2018.

Wälti, S. (2011) Stock market synchronization and monetary integration, Journal of International Money and Finance, 30, 96-110.

Yavas, F.B.(2007). Benefits of International Portfolio Diversification. Graziadio BusinessReview, 10, (2)

Z.A. Ozdemir, E. Cakan, Non-linear dynamic linkages in the international stock markets, Physica A 377 (2007) 173-180.