



A Long-Term Relationship Between Sri Lankan Stock Market and Global Stock Markets: A Time Series Analysis

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ABSTRACT

A stock market plays a vital role in the capital generation of a nation. With increased financial integration, factoring the regional and international dynamics shared in stock markets assist investors in portfolio diversification decisions and assist policy makers in implementing appropriate policies during a turmoil period. Thus, the study intended to identify the dynamic relations of the Colombo Stock Exchange (CSE) with other prominent global markets to provide insights in making appropriate investment and policy decisions. The study analysed the daily returns of All Share Price Index (ASPI), the broad market index of Sri Lanka and six international stock markets of US, UK, China, Japan, Germany, and India from May 1992 to December 2020. Owing to the non-stationarity of data, a Vector Error Correction Model (VECM) was developed. The stationarity and the presence of cointegration among ASPI and all selected stock markets were identified except the Chinese stock market. German and Indian stock markets were negatively integrated with ASPI in the long run contrasting to the Japanese, US, and UK stock markets positively cointegrated with ASPI. The study provided evidence for trade links and

national level trade and cooperation leading to higher market integrations. Furthermore, the study extended the empirical evidence on geographically and economically closer countries being highly integrated in the long-term. Therein, on contrary to previous studies, study identified that CSE as a frontier market gets affected by larger stock markets in the long run. Hence, study insights were imperative in investor and policy-maker decisions on the long run relations present among ASPI and the selected stock markets.

1. INTRODUCTION

With increasingly perishing national boundaries and active trade and cooperation, financial integration among nations is recognized with risk-sharing across national borders. Among financial market entities, stock markets play a vital role in the capital generation of a nation. Thus, decision makers of stock markets are cautious of global relations among nations and its economies in operations that bring both risks and rewards (Moser, 2003; Samarakoon, 2009). Factoring the regional and international dynamics shared in stock markets assist investors in portfolio diversification decisions and assist policy makers in implementing appropriate policies during a turmoil period.

Co-integration analysis, a time series technique is used to analyse stochastic patterns of financial data in identifying long-term investment opportunities (Ferbian & Herwany, 2008). Further, it identified interdependencies among stock markets. In the long run, markets were identified to reflect the general nature of the economies. Thus, empirical studies were conducted globally to identify co-integration among stock indices ranging from identifying co-integration between sectoral stock indices within a stock market to regional and global analysis on international stock exchanges. However, literature on Sri Lankan stock market integrations is limited. Among them, Lamba

(2005) concluded that Sri Lankan stock market was relatively isolated from the developed markets during the period 1997-2003. Shahzad, et al. (2015) identified the co-integrations present between Sri Lankan and Bangladesh stock markets. Shahzad et al. (2016) determined that Sri Lanka has less interdependence with South Asian markets, India, and Pakistan in contrast to the marginal spill-over effects of India identified by Gunasinghe (2005). Habiba et al (2020) identified that among South Asian markets, Sri Lanka has long run and short run causal relations with the US. Further, Thomas et al. (2017) identified the influence of larger market on the Sri Lankan stock market whilst, Zahid and Khurshid (2018) identified that cointegrations among India, Pakistan and Sri Lankan increased through trade agreements. This warrants further exploration of relationships among Sri Lankan stock market and other prominent global markets.

Colombo Stock Exchange (CSE) is the prime equity generator of Sri Lanka with 289 listed companies and the total market capitalization of 3,823.37 billion Sri Lankan Rupees as of the 1st June 2023. CSE is represented by the All-Share Prices Index (ASPI), the broad market index and the Standards and Poor Sri Lanka 20 (S&P, SL20), monitoring 20 of the largest and most liquid companies in the CSE (Colombo Stock Exchange, 2022). Global economic developments are known to affect the Sri Lankan financial stability due to its high exposure to the international markets, thus the CSE is frequently affected from the global market events. Since the global financial crisis of 2007-2009, a greater emphasis was given to reducing the systematic risk within financial systems throughout the world including Sri Lanka (Central Bank of Sri Lanka, 2019). Thus, the study aimed to determine the dynamic relations present between the CSE and the major stock exchanges in major countries and to identify the presence of cointegrations among CSE and six global stock markets selected.

2. MATERIALS AND METHODS

The study identified six prominent stock exchanges of the world based on their market capitalization as of January 2021 to conduct the analysis on dynamic relations. The study used daily closing prices of United States' Dow Jones Industrial Average (DJIA), United Kingdom's Financial Times Stock Exchange FTSE100 (FTSE), German Deutscher Aktien Index (DAX), Japanese Nikkei225 (NIKKEI), Chinese Shanghai Stock Exchange Composite Index (SSE), National Stock Index of India NIFTY50 (NSE) indices in their national currency over the period from May 1992 to December 2020 in identifying the existing long run relations among them and ASPI. Data were in the relevant local currency value without the reflection of an exchange rate for the ease of assessing behavioural patterns of the stock indices and ASPI. Data were gathered from the published data of Yahoo Finance and Wall Street Journal Market Data, CSE and the website of National Stock Exchange, India. The logarithms daily closing prices of the stock exchanges were analysed with the broad market index ASPI of the CSE. Owing to non-stationary nature of data, the long run dynamic relations were identified with the Vector Error Correction Models (VECM). Post estimations were conducted to validate the models fitted during the empirical analysis.

With the time series' nature of data, the study used time series econometric tools in exploring the relations among the indices. The study followed Sucuhai & Bije (2020) in the study modelling and operational framework. Each selected international stock market was processed with ASPI to identify their individual relations to the Sri Lankan stock market.

$$ASPI_t = \alpha + FSI_t' \beta + \varepsilon_t \rightarrow$$

Where $ASPI_t$ – ASPI of time t, FSI_t' – Foreign Stock Index of time t, α – matrix of weights, β – matrix of co-integrating parameters

and Error term.

The statistical model (1) was derived from the bivariate co-integration estimations of MacKinnon (1994). To estimate the co-integration restrictions, Johansen (1980) introduced two matrices named α and β . Thus, $\beta' FSI_{t-1}$ was an identity matrix containing co-integration relations. β was not a unique matrix which enabled an infinite number of co-integration relations or linear transformations within the co-integration rank $0 - k$. The coefficients are modelled to determine the long-term relations ASPI has with the respective foreign stock market index (Killian & Lütkepohl, 2017; MacKinnon, 1994). β estimated the long run cointegration equilibrium of the VECM model. However, the model is estimated for the first difference of the data owing to its inherent non-stationary nature.

3. RESULTS AND DISCUSSION

The study analyzed the log closing prices of the indices in the study. The unit root testing for co-integration was obtained from Augmented Dickey Fuller test (ADF). All stock indices showed co-integration with ASPI at 95 percent confidence level by the first difference (Table 1).

However, ADF does not explicitly state the degree of co-integration the selected indices have with ASPI. Thus, the study used Johansen Cointegration tests with trace statistics and the Eigen values in identifying the degree of cointegration. At 95 percent confidence, trace statistic and eigen values rejected the null hypothesis of no cointegration (Table 2). It implied that there were at least three linear combinations of cointegration among the indices that reach an equilibrium following a turbulence. Owing to the non-stationarity of the log closing prices, the study used VECM in modelling the cointegrations. Thus, the model with a cointegration rank (r) of three, identified the long run relations each index has with ASPI in magnitude and the direction.

Table 1: Summary results of the ADF stationary test

Variable	No Difference		1 st Difference		Stationary
	c	ct	c	ct	
DJIA	-0.849 (0.804)	-1.541 (0.815)	-22.635 (0.000)**	-22.635 (0.000)**	$\hat{z}(1)$
FTSE	-0.342 (0.919)	-1.899 (0.655)	-15.736 (0.000)**	-15.736 (0.000)**	$\hat{z}(1)$
DAX	-0.966 (0.765)	-1.712 (0.745)	-28.209 (0.000)**	-28.209 (0.000)**	$\hat{z}(1)$
NIKKEI	-0.916 (0.783)	-1.139 (0.922)	-82.540 (0.000)**	-82.552 (0.000)**	$\hat{z}(1)$
SSE	-9.672 (0.000)**	-24.169 (0.000)**	-21.650 (0.000)**	-21.649 (0.000)**	$\hat{z}(0)$ $\hat{z}(1)$
NSE	-2.850 (0.051)	-2.771 (0.208)	-20.574 (0.000)**	-20.592 (0.000)**	$\hat{z}(1)$

** - Significant at 95% confidence level

Table 2: Results of Johansen cointegration tests

r_0	r_1	Trace Test		Eigen Values Test	
		Trace Statistic	Critical Value (95%)	Eigen Vector	Critical Value (95%)
0	7	188.9	125.6	52.260	46.23
1	7	136.6	95.75	41.250	40.08
2	7	95.38	69.82	34.790	33.88
3	7	60.59	47.85	22.380	27.59
4	7	38.21	29.8		
5	7	19.11	15.49		
6	7	8.203	3.841		

The cointegration vector for the model showed that in the long run, ASPI was influenced by all selected indices except SSE (Table 03). Therein, all selected indices except SSE at a 95 percent confidence showed a weakly exogenous nature suggesting that a shock within the system would originally affect the selected international stock markets and as the initial receptors, they would therein transmit the shock to the Sri Lankan stock market through ASPI.

Table 3: Long run analysis

	coefficient	std err	z	P> z
beta.ASPI	1	0.000	0.000	0.000**
beta.DJIA	2.60E-16	0.000	0.000	0.000**
beta.FTSE	1.58E-16	0.000	0.000	0.000**
beta.DAX	-3.0264	0.39	-13.23	0.000**
beta.NIKKEI	4.4062	0.016	414.24	0.000**
beta.SSE	0.0075	0.022	0.567	0.571
beta.NSE	-2.1066	0.386	-6.389	0.000**
Constant	0.0012	0.016	0.117	0.907
** - Significant at 95% confidence level				

Among the long run cointegrations present, NSE and DAX are among the significant and negatively cointegrated indices that guaranteed a convergence to the long-term equilibrium through negative adjustment. The meager positive relation of DJIA and FTSE and the substantial effect of NIKKEI in the long run suggested a positive adjustment of the ASPI in achieving equilibrium. Further, findings of DJIA supported the findings of Habiba et al. (2020) on long run relations. The cointegrations of ASPI and the stock markets confirmed the findings of Thomas et al. (2017) that Sri Lanka as a frontier market gets influenced by the developed and larger markets. The findings of Kumar (2019), Sehgal et al., (2019) and Zahid and Khurshid (2018) that trade links and national level trade and cooperation led to higher market integrations which were supported with the findings. Cointegration of NSE reinforced findings of in et al. (2002) that geographically and economically closer economies were highly integrated in the long-term. However, it was contrasting the findings of Shahzad et al. (2016). The long-term dynamics identified for ASPI and developed stock markets deviate from the findings of Lamba (2005) for the overall period of 1992-2020. The findings moreover suggested that the long-term co-integrations of Sri Lankan stock market has increased beyond the years 1997-

2003. Thus, findings reinforced that in long term, integration among financial markets evolve with time, globalization, and increased involvement with international financial markets.

The study findings suggested that in the long term, the stock markets considered for the study are cointegrated with the Sri Lankan stock market. Thus, investors are unable to diversify their portfolios through simultaneous investments in Sri Lanka and the positively integrated stock markets. However, the investors can maximize their returns in contingent to the negatively cointegrated markets. Further, the policymakers, in the long term, high interdependence of the CSE would lead to contagion effects from the weakly exogenous impacts resulted from regional and global events.

Post estimations of the VECM through Shapiro-Wilk test for normality and Ljung-Box test for autocorrelations indicated that at 95 percent confidence, non-normality, and presence of autocorrelation in the residuals. However, Lo & MacKinlay (1990) identified non-synchronous trading, weekend and holiday effects, and market opening and closing time differences could lead to the misspecification. Further, Ferbian & Herwany (2008) identified that autocorrelations and non-normal disturbances do not cause misspecification to the findings of the model. Hence, the model estimates are viable for the policy-makers and investor decisions.

4. CONCLUSION

The study aimed to identify the dynamic relations that the Sri Lankan stock market has with the major stock markets in the world. The study incorporated the daily log returns of the stock indices of six major stock markets from May 1992 to December 2020 to identify the long-term dynamic relations. Owing to the time series' nature, outcomes were based on the estimates of VECM analysis. The major findings of the study include all selected

major stock markets except SSE are strongly cointegrated with ASPI. They are weakly exogenous toward ASPI and have long-term dynamic relations with the Sri Lankan stock market. Amongst them, Indian and German stock markets had a negative cointegration whilst the others showed a positive cointegration in the long run. It reflects that Sri Lankan stock market receives any shocks within the system through these stock markets during an event of turmoil which needs to be reflected in policy development. However, high integrations with other positively cointegrated international markets provide little opportunity for the investors in portfolio diversification through Sri Lanka. Sri Lankan stock market like many other South Asian markets is vulnerable to political instability, owner-management behavior, large portions of shares being held by domestic investors and short-term speculative investing (Gunasinghe, 2005). Thus, the present study was adversely affected by them.

The study provided evidence for the increased financial market integration through high trade, investment and diplomatic. The study further extended the empirical evidence on geographically and economically closer countries being highly integrated in the long-term. Thus, the study provided vital insights for policy-makers. In an event of a contagion, Sri Lankan stock market is likely to experience spillover effects from the prominent financial markets considered. Thus, policies to buffer the CSE from these events should be implemented with constant monitoring. On the flip side, the high international financial market integration and globalization leads to higher competitiveness in the global market too which is challenging when attracting international investors. Subsequently, future study directions include cointegration and market behavior toward the Sri Lankan stock market through dissected analysis of the observation period and identification of financial contagion and improvement of the policy measure of the country.

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