MACROECONOMIC FACTORS' INFLUENCE ON THE STOCK MARKET PERFORMANCE: A STUDY ON THE COLOMBO STOCK EXCHANGE

ISSN: 2772 128X (Online)
ISSN: 2792 1492 (Print)
SLJESIM
VOLUME 2 ISSUE 1
June 2023
sljesim@sab.ac.lk
www.sab.ac.lk/sljesim

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Received: *30 December 2022* ***Revised:*** *09 May 2024* ***Accepted:*** *15 July 2024*

How to Cite this Article*, Samarawickrama I.D.W. and Pallegedara A. (2023). Macroeconomic Factors' Influence on the Stock Market Performance: A Study on The Colombo Stock Exchange, Sri Lanka Journal of Economics, Statistics and Information Management*, 2(1), 01-20

Abstract

Sri Lanka, a developing country relies on the Colombo Stock Exchange (CSE) for capital generation and relies on the economic growth of the country to be competitive. Similarly, the economy bank on the CSE for its economic growth. The stagnant economic growth and gradual stock market growth have stranded the CSE in global financial integration. It is of utmost importance in identifying the method of revitalizing CSE. Thus, the objective of the study is to identify the influence of key macroeconomic indicators on CSE. The study used the All-Share Price Index (ASPI), interest rate, inflation rate, exchange rate, real GDP, and narrow and broad money supply through the period 2010 to 2020 in identifying macroeconomic causality on the stock performance. The time series nature and the presence of unit roots in variables except interest rate led to the VECM estimations. The study identified the hedging effect of stock prices against inflation and the negative impact of real GDP and interest rates suggested the flight-to-quality behaviour of investors in switching from the stock of CSE to other investments or other stock markets than CSE. The influence of the exchange rate was positive and could be owing to the pegged exchange. However, the money supply did not have a significant impact on the stock prices in the long run. The study implicates the findings of prior studies. Therein, it is vital in reviving the stock market and in attracting foreign investment through stability within the CSE and the economy. Incorporation of the study findings in policy development could replenish the stagnant capital market by implementing investor-friendly macroeconomic policies and regulations.

keywords*:* CSE, Exchange rate, Gross Domestic Product (GDP), Inflation, Interest rate

INTRODUCTION

The economy is an integrated system of production, consumption, and exchange of consumer and capital goods and services. An investment, a deferred income from consumption is a concession of households and firms of an economy in turn for future returns of either capital income or capital appreciation. Further, it is an injection into the circular flow of income in economic development which gets exchanged through a capital market between a borrower and lender. Hence, investment is a central economic phenomena economist abundantly studied, both theoretically and empirically. These study outcomes ultimately influence investors and policymakers' decisions (Dwivedi, 2012; Talwar, 2016).

Among capital markets, stock markets are a major contributor to capital generation. In addition to the financial benefits a stock investment provides, it further consents the claimant to ownership in the invested company. Thus, stocks traded in both primary and secondary markets of a country allow the capital generation of publicly held companies. Stock price movements are firmly related to company-specific, industry-specific, economic, and other unexplained factors in distinct proportions. Further, stock market indices act as a proxy for broad market representation of market performance and are persistently evaluated (Anusha et al., 2022; Talwar, 2016).

Recently, in addition to the financial integration of individual nations through trade and agreements, financial globalization has preceded stock market liberalization. It has led to foreign investments in attractive emerging and developing capital markets. Thence, developing country governments are often relaxing restrictions and intervening in the mediation of economic fundamentals in attracting potential foreign investors (Jaleel & Samarakoon, 2009). Thus, beyond its provisions in stock market activity indication, a stock index is emulated as an economic indicator. Hence, an effective stock exchange performance is an important facet of the economic development of a country.

Farther its perquisites, it is palpable that stock market liberalization is conflated with detriments. Global financial integration is acknowledged to contagion markets through a variety of transmission channels. Thus, is extensively studied how the stock market liberalization has impacted stock market volatility. Explicitly, the exchange rate which values the foreign currency with domestic currency is regarded as an important influence on stock market performance since stock market liberalization. Consequently, a thriving accumulation of literature has attempted to identify the impact the exchange rate has on the stock market performance. The two regimes of exchange rates namely, fixed exchange rate policy and floating exchange rate policy are often recognised to provide distinct bearings on the stock markets (Gokmenoglu et al., 2021).

A stock market's dependence on the real economic health of its performance is identified to be persistent. Asset pricing theories whilst heeding to the risk and return phenomenon have further expressed the need to consider the influences the asset prices could encounter from the economic fundamentals. Further, economists identify demand-sided and supply-sided macroeconomic policies that subsequently affect

stock prices and stock market performance. Economic factors such as inflation, Gross Domestic Product (GDP), industrial growth rate, exchange rate, interest rate, government budgetary deficits, and shifts in the yield curve are commonly identified as key economic influences in elucidation the returns of stocks (Talwar, 2016).

Sri Lanka, a developing country relies on Colombo Stock Exchange (CSE) as the prominent capital generator in its economy. As of 31st September 2022, CSE has 294 listed companies with a market capitalization of over 4341.13 billion Sri Lankan Rupees. All Share Price Index (ASPI) and Standards and Poor Sri Lanka 20 (S&P 20) are the broad market index and narrow market indices associated with CSE respectively. CSE has opted for foreign investment since 1990. However, since its inception in 1986, it has shown stagnant growth under a handful of turbulent periods (Colombo Stock Exchange, 2022; Jaleel & Samarakoon, 2009).

With the inherent importance of economic development, abundant empirical studies have been conducted in the identification of macroeconomic variables and their causality to the stock performance both locally and internationally. A voluminous body of mathematical and statistical modelling techniques paired with economic theories have been adopted in the empirical studies However, the study results are, and common ground is implausible in terms of the techniques used or the macroeconomic influence.

The present gradual development of the CSE and stagnant economic development in Sri Lanka necessitate a contemporary analysis of the influence of the macroeconomic variables on the stock prices of the CSE. Further, discern on the macroeconomic factor influence allows the admissible policy development that nourishes the economic development and consequently surges the attractiveness of CSE in foreign investments. Apt comprehension of influence leads to timely policy implementation empowering a competitive front for Sri Lanka in attracting foreign investment through favourable policies and limited restrictions. Further, per prior studies, policymakers and investors decision making on the CSE are based the ordinary comportment of macroeconomic influence. Therein, post-economic crisis the policymaker and investor decisions would base on the steady economic conditions. Thus, the objective of the study is to gain insights into an equitably steady span of the economy and how the macroeconomic variables of Sri Lanka influence the stock market performance.

In the study, a period of 2010 to 2020 is studied to provide contemporary observations on prevalent macroeconomic influences on stock market performance. The macroeconomic factors are modelled against the market indices of the CSE providing a macro-overview of the causality present. With the inconsistent findings of the previous studies, the study aims to achieve two goals. Initially, the study aims to find what factors influence the stock pricing of CSE. Consequently, the degree of influence each macroeconomic variable has on the CSE stock pricing is to be identified. The time series nature of the data led to the Vector Autoregressive (VAR) modelling of the macroeconomic factors against the closing prices of the stock indices.

LITERATURE REVIEW

An investment is acquiring physical or financial assets that yield over time. Among capital investments, the stock is an autonomous investment. Stock price movements are generally explained by company-specific, industry-specific, economic, and other unexplained factors (Talwar, 2016).

Macroeconomic policies which affect the course of macroeconomic factors are conjoint of two broader components, namely, demand-side and supply-side policies. Demand-side policies are intended to control the aggregate demand of an economy whilst supply-side policies are intended for a productive potential increment of an economy. Despite the distinct intentions, both are empirically palpable in influencing the stock market performance (Talwar, 2016).

2.1 Asset Pricing

Asset pricing theories are incepted on the 'Modern Portfolio Theory' (MPT) by Henry Markowitz in 1959. Thereon asset pricing has become sophisticated and developed. The major theories discussed in asset pricing are the Capital Assets Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT) (Dwivedi, 2012; Majumder, 2012; Talwar, 2016).

CAPM introduced by William Sharpe, John Lintner and Jan Mossin in the 1960s proposes that the risk inherent in a stock could be comprehended through a comprehensive market portfolio inclusive of financial assets, consumer durables, human capital, and real estate. Hence, it is a single-factor model. Despite being introduced four decades prior, CAPM is a widely used asset pricing model owing to its market risk factor inclusivity (Bossaerts & Plott, 2000; Fama & French, 2004; Talwar, 2016). Intertemporal CAPM further progresses the CAPM.

Multifactor models incepted modelled the unanticipated changes in the system and determine the sensitivity of the assets to these systematic risks. Among the basic two models of multi-factor models, APT in 1976 proposes a linear relationship among the stock returns and several systematic risk factors. Empirical studies identify inflation, Gross National Product (GNP), confidence, and shifts in yield curves are the key macroeconomic factors that explain the return on a security. Further, Fama-French three-factor model and its extension, the five-factor model provides an alternative approach to APT extending the CAPM (Fama & French, 2014; Talwar, 2016)

However, Majumder (2012) proposed that owing to the less efficiency in the developing markets, efficient market asset pricing models require changes when applied to less-than-efficient stock markets.

2.2 Macroeconomic Factor Causality:

An economy comprises four major markets: the goods market, the money market; the security market, and the labour market. Among the macroeconomic indicators of the economy, the study analyses the influence of the inflation rate, exchange rate, interest rate, Gross Domestic Product (GDP), and money supply on the stock performance.

Inflation in an economy is the broad measure that measures the rate of increase of commodity prices in a given period. The generalized Fisher model is the main theoretical concept that proposes a causality effect of inflation with stock prices. It states that the real returns of stock and expected inflation are independent of one another and nominal returns of stock are in one-to-one correspondence with the expected inflation rate. (Al-Khazali, 2004; Oner, 2022; Samarakoon, 1996).

Anusha et al. (2022), Bhattarai and Joshi (2009), Gunasekarage et al. (2004), Khalid & Khan (2017) and Rathnayake et al. (2014) identified a hedging effect of stock prices whilst Gunarto and Sembel (2019), Samarakoon (1996) and Ullah et al. (2017) did not identify any significance in the inflation on stock prices. However, Al-Khazali (2004), Samarakoon (1996), Thalagoda et al. (2018), Vidanage and Dayaratne-Banda (2013), and Wongbangpo and Sharma (2002) study outcomes were of negative causality.

Financial integration has brought the importance of the exchange rate to light as it is a leading indicator of the economic health of a nation. The influence of an exchange rate on stock performance is explained by Stock Oriented or the Portfolio Balance Theory, the Goods-market theory or the Flow-oriented model, and Mundell Fleming Theory. Flow-oriented model by Dornbusch and Fischer in 1980 states that the dynamics of the exchange rate affect the competitiveness of a company and subsequently affect the stock prices. On the other hand, the stock-oriented model emphasises that increments in capital transactions in the stock market increase the demand for a domestic currency to subsequently appreciate the exchange rate. Mundell Fleming emphasises that the authority monetary and fiscal policy has in influencing the aggregate demand of an open economy is contingent on the exchange rate regime in effect (Fauziah & Moeljadi, 2015; Gokmenoglu et al., 2021; Javangwe & Takawira, 2022; Lakshmanasamy, 2021; Wongbangpo & Sharma, 2002). Further, United States Dollar is the global currency used in the studies owing to its lead in long run (LR) cointegration with the other markets (Aroul & Swanson, 2018).

Among the empirical studies conducted CAMBA (2020), Fauziah and Moeljadi (2015), Gunarto and Sembel (2019), Khalid and Khan (2017), and Wickremasinghe (2012) identified a positive causality from the exchange rate to the stock prices. On the contrary Javangwe & Takawira (2022), Kulatunga (2015), Menike (2010), Ranjani and Dharmadasa (2018), and Vidanage and Dayaratne-Banda (2013) identified a negative influence on the stock prices. Moreover, Anusha et al. (2022), Weeraratne (2020) identified no causality and Amarasinghe and Dharmaratne (2014), Lakshmanasamy (2021), Lingaraja et al. (2020) and Yuan et al. (2020) identified mixed results.

The interest rate is a measure of the percentage a lender would receive for deferring from consumption for a future date. Thus, time value is a major determinant of future yields of stock, and the discount rate of the equity valuation affects the pricing of stocks. Among the economic theory, the theory of the Austrian School, the neoclassical theory, the theory of liquidity, and the loan theory are the four main

theories of interest rate. Among these, the theory of liquidity emphasises the role of money in interest determination (Kaluarachchi & Fernando, 2017; Spahija, 2016).

Bissoon et al. (2016), Gunasekarage et al. (2004), Rathnayake et al. (2014) and Ullah et al. (2017) identified positive causality. On the other hand, Amarasinghe (2015), Anusha et al. (2022), Bhattarai and Joshi (2009), Gunarto and Sembel (2019), Javangwe and Takawira (2022), Kamal (2018), Khalid and Khan (2017) and Menike (2010) identified negative relations whereas CAMBA (2020), Ranjani and Dharmadasa (2018), Thalagoda et al. (2018) and Vidanage and Dayaratne-Banda (2013) found no significance in the causality studies. Kulatunga (2015) and Wongbangpo and Sharma (2002) identified mixed results.

Money is a medium of exchange in an economy that contributes as a measure of value, a store of value, and as a standard of deferred payments. Aside from GDP, the money supply is considered the most important macro-variable in economic growth. Thus, regulation of an optimum level of the money supply is done through the monetary policy of a country alongside the interest rates. Largely, the Quantity theory of money and the Liquidity Hypothesis are used in explaining the causality of money supply and stock prices.

Quantity Theory of money states that the money supply of an economy is directly proportional to the weighted average price levels. This forms a relationship between money supply and stock prices where the surplus of money supply in an economy increases the demand for stocks thereby increasing share prices. The liquidity hypothesis states that if a security has a longer maturity period, its term premium would be higher (Bissoon et al., 2016; Dwivedi, 2012).

Bissoon et al. (2016), Gunasekarage et al. (2004), Gunarto and Sembel (2019), Rathnayake et al. (2016), and Thalagoda et al. (2018) identified positive relations between money supply and stock prices. On the contrary, Bhattarai & Joshi (2009) and Vidanage and Dayaratne-Banda (2013) did not identify any significance in the causality.

GDP is a measure of the final monetary value of the goods and services produced in a country for a given period (Callen, 2022). Supply-side models of macroeconomic mechanics establish the dynamics between the GDP and stock prices. The influence of GDP on stock prices is established through aggregate earnings and earnings per share (EPS) (Spahija, 2016).

Among the empirical studies, Gunarto and Sembel (2019), Kulatunga (2015), Rathnayake et al. (2016), and Samarakoon (2009) have positive relations. However, Ranjani and Dharmadasa (2018) identified no significance in the causality between GDP and stock prices.

Further, most of the variations in stock prices can be captured by the innovations in interest rate, money supply, and Gross National Product (GNP) (Wongbangpo & Sharma, 2002).

METHODOLOGY

The study employed the Vector Autoregressive modelling technique in modelling the influence of the identified macroeconomic variables on stock performance. All Share Price Index (ASPI), the broad market index of the CSE was selected to obtain a macro-view of the influence. Owing to the unit-root presence Vector Error Correction Model (VECM), the derivation of VAR was employed in the modelling of the study.

3.1 Empirical Framework

3.1.1 Variable Selection

Per the theoretical and empirical studies explored, the study aims to identify the macroeconomic variable influence on the stock prices using the Generalized Fisher hypothesis, Stock-oriented model, Flow-oriented model, quantity theory of money and liquidity theory. Generalized Fisher hypothesis examines the stock prices against impact of inflation whilst the quantity theory of money distinguishes the influence of money supply on stock prices. Further liquidity theory emphasises on the role of interest rate and money supply. Stock-oriented and flow-oriented models examine the effects of interest rate and exchange rate. Hence, the study employs the inflation rate, interest rate, exchange rate, real GDP and money supply in determining the macroeconomic influence on the stock prices.

3.1.2 Data

Monthly data from January 2010 to February 2020 were employed for the study. Closing prices of the All-Share Price Index (ASPI) (aspi), the broad market index of CSE was taken as the proxy of stock prices. Further, Colombo Consumer Price Index (ccpi), 91-day Treasury bills (tbill), United States Dollar to Sri Lankan Rupee values (usd), log of real GDP (real_gdp) and log of narrow money supply indicator (m1 and m2) and log of broad money supply indicator (m4) were employed as the proxies of inflation, interest rate, exchange rate, GDP and money supply respectively. The secondary data were collected from the CSE and the National Economic Data Library of the Central bank of Sri Lanka.

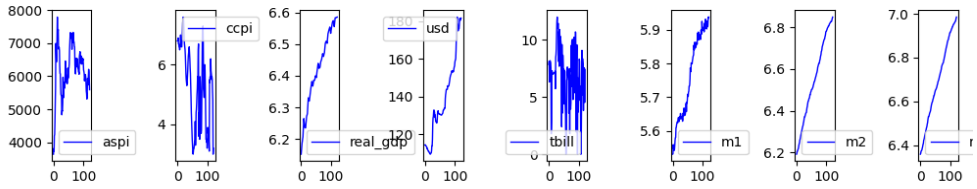

Figure 1: Variable Behaviour (2010-2020)
Source: Developed by author

3.1.3 Empirical model

The study assumes that if there exists a causality toward ASPI from the selected macroeconomic variables, equation 01 would provide the relation among the ASPI and the macroeconomic variables.

$$\boldsymbol{aspi_t = \alpha + \emptyset_1 ccpi_t + \emptyset_2 real\_gdp_t + \emptyset_3 usd_t + \emptyset_4 tbill_t + \emptyset_5 m1_t + \emptyset_6 m2_t + \emptyset_7 m4_t + \varepsilon_t} \rightarrow \textbf{(1)}$$

Where:

$aspi_t$ −Closing price of ASPI at period t

$\emptyset_n$ − Coefficients of macroeconomic variables (n = 1, …, 7)

ε_t − Error term

Hence, the null hypothesis of the study is $\emptyset_1 = \emptyset_2 = \emptyset_3 = \emptyset_4 = \emptyset_5 = \emptyset_6 = \emptyset_7 = 0$ where there exists no causality from the macroeconomic variable toward ASPI. In an alternative hypothesis where $\emptyset_1 \neq \emptyset_2 \neq \emptyset_3 \neq \emptyset_4 \neq \emptyset_5 \neq \emptyset_6 \neq \emptyset_7 \neq 0$ the magnitude of the causality can be estimated.

3.1.4 Unit-root testing

Presence of unit roots in data render the data stochastic therein, requiring to be difference to obtain a deterministic dataset. The study identifies presence of unit roots in the data through an Augmented Dickey-Fuller (ADF) test and Phillip-Perron (P-P) test. ADF and P-P are based on the null hypothesis that the variable contains a unit root at 95 percent confidence level.

3.1.5 Choice of lag length

Selection of the lag length can be guided by economic theories or statistical approaches. Akaike information criterion (AIC), Bayes information criterion (BIC), Hannan–Quinn information criterion (HQIC) and Akaike's final prediction error (FPE) were considered in the process. However, when obtaining lag length for the model AIC information criteria were chosen due to its minimum underestimating property among the information criteria (Liew, 2004).

3.1.6 Johansen Co-integration and Vector Error Correction Model (VECM)

Vector Auto Regressive models assume the variables to be stationary and dynamic. When in need, co-integrating relationships can be imposed by re-parameterizing the VAR model as a Vector Error Correction Model (VECM). Further, Johansen co-integration tests are more suitable for multi-equation models (Killian & Lütkepohl, 2017).

For a co-integrated Y_t;

$$\Delta \boldsymbol{Y_t} = \boldsymbol{\Pi Y_{t-1}} + \sum_{j=1}^{p-1} \boldsymbol{\Gamma_j \Delta Y_{t-j}} + \boldsymbol{\varepsilon_t} \rightarrow \textbf{(2)}$$

Where:

$\Gamma_j = -I + \phi_1 + \cdots + \phi_j, j = 1, \ldots, p-1$ are a m×m matrices

$\Pi = \gamma A'$ is the long run impact matrix where A and γ are r×k matrices

ε_t are independent and identically distributed errors

To estimate the co-integration restrictions, Johansen (1980) introduced two matrices named α and β. With rk (α) = rk (β) = r as $\prod = \alpha\, \beta'$. Thus $\beta' y_{t-1}$ is an identity matrix containing co-integration relations such that $\Pi_{y_{t-1}} = \alpha\beta' y_{t-1}$ with$(\alpha'\alpha)^{-1}\alpha'$. With $= rk(\Pi)$, the rank of Π is commonly referred to as the co-integration rank of the system where β is the co-integration matrix. α is commonly referred to as the loading matrix. α and β are not unique matrices which enables an infinite number of linear transformations within the co-integration rank 0 – k (Lütkepohl, 2004). Therein, VECM is used in identifying the equilibrium present within the macroeconomic variables and the stock prices in the short run (SR) and long run (LR).

RESULTS AND DISCUSSION

Foremost, the analysis was done for the unit root testing. The null hypothesis of ADF and P-P tests suggests there is a unit root in the process at a 95 percent confidence level. After examining the behaviour of the macroeconomic variable for the period considered (Figure 01), constant and trend were considered in determining the unit roots of the variable except for tbill and ccpi. tbill and ccpi were considered with only a constant term to be consistent with the behavioural attributes.

Thus, per the results (Table 01), it can be concluded that all variables are weakly stationary at its initial state or the first difference (I (1)) rejecting the null hypothesis at 95 percent confidence level.

When obtaining lag length for the model AIC information criteria were chosen due to its minimum underestimating property among the information criteria (Liew, 2004). Thus, a lag length of four was chosen for the VECM model (Table 02).

Table 01: Unit root test

Variable	No Difference		1st Difference		Stationary
	ADF	P-P	ADF	P-P	
aspi	-3.154	-3.345	-5.522	-10.34	I~ (1)
	(0.094)	(0.059)	(0.000)**	(0.000)**	
usd	-2.668	-2.096	-6.542	-6.026	I~ (1)
	(0.250)	(0.549)	(0.000)**	(0.000)**	
ccpi	-2.168	-2.905	-5.089	-10.598	I~ (1)

	(0.508)	(0.161)	(0.000)**	(0.000)**	
tbill	-3.858	-7.049	-3.677	-7.049	I~ (1)
	(0.01)**	(0.000)**	(0.005)**	(0.000)**	
Real_gdp	-1.82	-2.646	4.282	-2.117	I~ (1)
	(0.670)	(0.508)	(0.003)**	(0.238)	
m1	-3.674	-3.151	-16.314	-18.23	I~ (1)
	(0.024)**	(0.095)*	(0.000)**	(0.000)**	
m2	-1.831	-1.574	-4.455	-10.05	I~ (1)
	(0.694)	(0.803)	(0.002)**	(0.000)**	
m4	-1.322	-1.554	-4.182	-10.267	I~ (1)
	(0.882)	(0.810)	(0.005)**	(0.000)**	

*** - Significant at 95% confidence level*

**- Significant at 90% confidence level*

Source: Developed by author

Table 02: Lag order selection

VECM Order Selection (* highlights the minimums)				
	AIC	**BIC**	**FPE**	**HQIC**
0	-31.75	-29.69*	1.64E-14	-30.91
1	-32.46	-28.75	8.25E-15	-30.96*
2	-32.6	-27.25	7.599e-15*	-30.44
3	-32.47	-25.47	9.77E-15	-29.64
4	-32.65*	-24	1.00E-14	-29.15

Source: Developed by author

Johansen co-integration test mainly validates the co-integration relationship existing between the variables considered through a trace statistic and an eigenvalue statistic. Both statistics employ the same null hypothesis that there exists no co-integration among the variables considered. However, based on the results obtained for the Johansen co-integration test, the null hypothesis can be rejected at a 95 percent confidence level (Table 03). Thus, it could be accepted that there exists at least one co-integration relation between the variables considered (For trace statistic < critical value at 95 percent)

Nevertheless, Johansen co-integration test does not provide a co-integration with direction and magnitude concerning the variables. Hence, a VECM is modelled. A VECM requires a co-integration rank for the model to be built upon. Thus, the Trace statistics are further employed in determining the co-integration rank.

Table 03: Results of Johansen co-integration tests

	Critical values			**Trace**	**Eigen**
Test	**90%**	**95%**	**99%**	**Statistic**	**values**
0	169.06	175.16	187.19	251.18	0.4893
1	133.79	139.28	150.08	181.97	0.4261

2	102.47	107.34	116.98	124.78	0.3423
3	75.1	79.34	87.77	81.63	0.2613
4	51.65	55.25	62.52	50.43	0.2130

Source: Developed by author

Table 04: Cointegration rank selection

r_0	r_1	test statistic	critical value
0	8	269.6	175.2
1	8	190.8	139.3
2	8	123.8	107.3
3	8	80.01	79.34
4	8	48.85	55.25

Source: Developed by author

A co-integration rank of four was selected for the VECM through a trace statistic test at a 95 percent confidence level. (For trace statistic < critical value) (Table 04). The results indicate that there are at most four co-integration equations that the VECM could estimate with the variables considered. Thus, aside from the influences of the macroeconomic variables on ASPI, other causalities present could be identified from the model.

Based on the VECM estimated, the null hypothesis of the study could be rejected at a 95 percent confidence level for the causality between ASPI (aspi) and the macroeconomic variables, inflation rate (ccpi), GDP (real_gdp), the exchange rate (usd), and the interest rate (tbill). However, the null hypothesis of there exists no co-integration among the ASPI and money supply on both broad and narrow money supply based on the LR co-integration relations depicted by the error correction term of ASPI (ec1) (Table 05).

The existence of four cointegration functions further states that the stock returns of CSE are not efficient in the sei-strong form. Hence, the application of the asset pricing model defined for efficient markets would not derive accurate estimations (Majumder, 2012; Vidanage & Dayaratne-Banda 2013).

The LR relations presented for ASPI denote that ASPI negatively adjusts itself to be at equilibrium in the long run. Given the macroeconomic variables, the inflation rate and the exchange rate impact ASPI positively in the LR. However, GDP and interest rate influence negatively whilst the influence of money supply is not statistically significant.

Table 05: LR cointegration relations among the variables considered. (α values)

	aspi	ccpi	real_gdp	usd	tbill	m1	m2	m4
ec1	-0.261	0.0003	-2.68E-06	0.001	-0.001	1.64E-06	-2.35E-07	5.51E-08
	(0.000)**	(0.011)**	(0.001)**	(0.037)**	(0.003)**	(0.335)	(0.637)	(0.893)
ec2	39.032	-0.204	-0.001	0.038	-0.233	0.002	0.0015	-1.5E-03
	(0.221)	(0.004)**	(0.063)*	(0.816)	(0.407)	(0.167)	(0.000)**	(0.000)**
ec2	-1113.39	-9.999	-0.160	3.754	21.492	0.382	0.117	0.103
	(0.586)	(0.027)**	(0.000)**	(0.722)	(0.233)	(0.000)**	(0.000)**	(0.000)**

ec4	-15.178 (0.052)*	0.005 ((0.777)	-0.001 (0.000)**	-0.174 (0.000)**	-0.241 (0.000)**	-0.0004 (0.163)	0.0003 (0.001)**	-0.0003 (0.000)**

** - *Significant at 95% confidence level*

*- *Significant at 90% confidence level*

Source: Developed by author

On the other hand, the inflation rate (ec2) is influenced by the real GDP and the broad money supply negatively and is influenced positively by M2, a narrow money supply in the LR. Further, Inflation negatively adjusts itself to be tandem with LR equilibrium.

Given the GDP (ec3), the real GDP of the country adjusts itself weekly negatively in the LR equilibrium. This indicates the deterioration of the economic growth in the period 2010 to 2020. It is further getting negatively influenced by the inflation rate of the country and the money supply influence positively.

Considering the exchange rate (ec4), itself is adjusted negatively to be at a LR equilibrium. Further, the exchange rate is negatively influenced by the real GDP, interest rate, M1 of narrow money supply, and broad money supply. ASPI also negatively influences the exchange rate at a weak significance.

On the other hand, all macroeconomic variables show a significant influence on ASPI in the SR. Interest rate, M2 narrow money supply, and M4 broad money supply positively influence the ASPI in the SR (Table 06). However, the inflation rate, GDP, exchange rate, and M1 narrow money supply show negative influence. Further, the linear trend of the model indicates a negative growth in stock prices and stock market performance. When graphically interpreted, the SR relations among the variables, the ASPI and M1 has a positive impact on the ASPI while the other macroeconomic variables transfer a negative impact to the ASPI during a shock in the system (See Appendix 01). of the study each at ceteris paribus.

Table 06: SR relations among ASPI and macroeconomic variables (β values)

	coef	**std err**	**z**	**P>|z|**
beta.aspi	1	0.000	0.000	0.000
beta.ccpi	-2.22E-14	0.000	0.000	0.000
beta.real_gdp	-4.24E-13	0.000	0.000	0.000
beta.usd	-2.13E-15	0.000	0.000	0.000
beta.tbill	229.8785	55.826	4.118	0.000
beta.m1	-6497.2569	0.156	-41500	0.000
beta.m2	2.78E+03	0.002	1460000	0.000
beta.m4	1.99E+04	0.309	64200	0.000
const	-1.16E+05	5441.597	-21.399	0.000
linear trend	-95.1988	15.248	-6.243	0.000

** - *Significant at 95% confidence level*

*- *Significant at 90% confidence level*

Source: Developed by author

Inflation is influencing stock prices positively in the LR indicating the hedging effect of the stock prices to expected inflation accepting the Generalized Fisher hypothesis in the LR for expected inflation (Samarakoon, 1996). It indicates that stock prices do not maintain their stock prices in the LR relative to the consumer price index (Ely & Robinson, 1997). Moreover, the SR findings coincide with the findings of Geske and Roll (1983). Their study findings state that the stock returns are negatively correlated with inflation since the volatility in inflation indicates a chain of events in monetary extensions. The authors conclude that investors adjust their prices anticipating monetary changes. Hence an elusive negative effect is derived in estimations.

In a rational market, the real GDP should have a positive influence on the stock market since the real GDP indicate the purchasing power of the investors. A positive influence of the GDP on a stock market allows the economic growth of a country through increased purchasing power and reinvestment in the capital market. However, in both LR and SR, the GDP influences the stock market negatively. It indicates that the economy is deteriorating the investors are not willing to invest in the CSE. Further indicates the loss of confidence in the capital market. It could further signify that with the increased purchasing power, investors both foreign and locally would prefer to invest in other investments or stock markets other than CSE (Omar et al., 2022)

In a rational market, the real GDP should have a positive influence on the stock market since the real GDP indicate the purchasing power of the investors. A positive influence of the GDP on a stock market allows the economic growth of a country through increased purchasing power and reinvestment in the capital market. However, in both LR and SR, the GDP influences the stock market negatively. It indicates that the economy is deteriorating the investors are not willing to invest in the CSE. This further indicates the loss of confidence in the capital market. It could further signify that with the increased purchasing power, investors both foreign and local would prefer to invest in other investments or stock markets other than CSE (Omar et al., 2022)

Considering the significant influence of the exchange rate on the ASPI, in the LR exchange rate influence accepts the stock-oriented model concept due to its positive influence. However, the negative SR influence could be from the flow-oriented concept. Moreover, the period considered has a pegged exchange rate policy where the monetary policy implemented prevents the floating of the exchange rate through the artificial injection of foreign currency into the economy through the government reserves and debt. It is more accurate to consider the foreign reserve influence along with the exchange rate to determine the most precise economic theory application.

The negative effect of the interest rate further proves the deteriorated confidence of investors in the Sri Lankan stock market. The 91-day treasury bill yield increment decreases the stock prices decreasing the demand for stock indicating the flight-to-quality behaviour of the investors in the LR (Kaluarachchi & Fernando, 2017).

Findings on money supply are contradictory to the findings of Bissoon et al. (2016), Gunasekarage et al. (2004), Gunarto and Sembel (2019), Rathnayake et al. (2016),

and Thalagoda et al. (2018). However, the study findings coincide with Bhattarai & Joshi (2009) and Vidanage and Dayaratne-Banda (2013).

Further, the study findings conform to the findings of Madurapperuma (2022) that macroeconomic variables are forced to be in an equilibrium with the stock prices in the LR.

The study findings have vital importance in revitalizing the CSE as a competitive stock market of the region and thereby revitalizing the economic growth of the country. They identified the macroeconomic variable influence through a fairly steady period of the country. Thus, the outliers of the findings are minimum. Hence, incorporating the macroeconomic variable positively in the macroeconomic policy would influence investor decision-making. Additionally, Elyasiani et al. (1998) identify that lack of liquidity, smaller capitalization, unilateral investment barriers, and concentrated investments in Blue-chip companies or S&P 20 listed companies could lead to lesser financial integration. Further, improving the transparency of the stock market operations, improving confidence, improving information availability, minimum government intervention and extended periods of political stability could improve the stock market performance (Rathnayake et al., 2014; Wickramasinghe, 2016)

CONCLUSION

Macroeconomic variables are of greater importance to the performance of the capital market of the country. Colombo Stock Exchange, the prominent stock market of Sri Lanka plays a vital role in the capital generation of the country. However, the stagnant economic growth and gradual stock market growth have rendered the CSE stranded in global financial integration. It is of utmost importance in identifying the method of revitalizing the CSE and thereby reviving the economic growth of Sri Lanka. Thus, the study aimed to identify the presence of causality of key macroeconomic indicators on the stock market. Hence, identified the degree of impact each macroeconomic variable has on the CSE.

The study used ASPI, the broad market index in obtaining an overview of the macroeconomic causality through the period 2010 to 2020, a rather stable period of the country to remove outliers from the study. The time series nature and the presence of unit roots lead to the VECM estimations.

The study identified that ASPI negatively adjusts itself to be in tandem with the equilibrium in the LR. Further, the study identified the hedging effect of stock prices against inflation was significant. LR cointegrations of real GDP and interest rate depict the flight-to-quality behaviour of investors in switching from the stock of CSE to other investments or other stock markets than CSE. It depicts that stagnant economic growth and deteriorated confidence are major barriers to stock market development. The positive impact the exchange rate has on stock prices should be further examined owing to the pegged exchange rate that was present during the period concerned. Contrary to the common belief, the money supply did not have a significant impact on the stock prices in the LR.

The study implicates the findings of prior studies and is vital in reviving the stock market to be competitive among other developing countries in attracting foreign investment. Incorporation of the study findings in policy development could replenish the stagnant capital market of the country by boosting investor confidence and implementing investor-friendly macroeconomic policies and regulations. Further, development and concentration on companies than the blue-chip companies could help in the process.

REFERENCES

Al-Khazali, O. M. (2004). The generalized Fisher hypothesis in the Asian markets. *Journal of Economic Studies*, *31*(2), 144–157. https://doi.org/10.1108/01443580410527123

Anusha, P., Dhushanthan, B., & Vinayagathasan, T. (2022). The relationship between exchange rate and stock market performance: Empirical evidence from Sri Lanka. *Business and Economic Research*, *12*(2), 135. https://doi.org/10.5296/ber.v12i2.19822

Aroul, R. R., & Swanson, P. E. (2018). Linkages between the foreign exchange markets of BRIC countries—Brazil, Russia, India and China—and the USA. *Journal of Emerging Market Finance*, *17*(3), 333–353. https://doi.org/10.1177/0972652718800081

Bhattarai, R. C., & Joshi, N. K. (2009). Dynamic relationship among the stock market and the macroeconomic factors. *South Asia Economic Journal*, *10*(2), 451–469. https://doi.org/10.1177/139156140901000208

Bissoon, R., Seetanah, B., Bhattu-Babajee, R., Gopy-Ramdhany, N., & Seetah, K. (2016). Monetary policy impact on stock return: Evidence from growing stock markets. *Theoretical Economics Letters*, *06*(05), 1186–1195. https://doi.org/10.4236/tel.2016.65112

Bossaerts, P. L., & Plott, C. R. (2000). Basic principles of asset pricing theory: Evidence from large-scale experimental financial markets. *SSRN Electronic Journal*, 1–48. https://doi.org/10.2139/ssrn.240649

Callen, T. (2022). *Gross domestic product: An economy's all*. IMF. Retrieved December 20, 2022, from https://www.imf.org/en/Publications/fandd/issues/Series/Back-to-Basics/gross-domestic-product-GDP

CAMBA, A. C. (2020). Capturing the short-run and long-run causal behavior of Philippine stock market volatility under vector error correction environment. *The Journal of Asian Finance, Economics and Business*, *7*(8), 41–49. https://doi.org/10.13106/jafeb.2020.vol7.no8.041

Colombo Stock Exchange. (2022). *Trade Summary*. Colombo Stock Exchange. Retrieved December 28, 2022, from https://www.cse.lk/pages/trade-summary/trade-summary.component.html

Dwivedi, D. N. (2012). *Macroeconomics: Theory and policy* (3rd ed.). Tata McGraw-Hill.

Ely, D. P., & Robinson, K. J. (1997). Are stocks a hedge against inflation? international evidence using a long-run approach. *Journal of International Money and Finance*, *16*(1), 141–167. https://doi.org/10.1016/s0261-5606(96)00039-3

Elyasiani, E., Perera, P., & Puri, T. N. (1998). Interdependence and dynamic linkages between stock markets of Sri Lanka and its trading partners. *Journal of Multinational Financial Management*, *8*(1), 89–101. https://doi.org/10.1016/s1042-444x(98)00020-6

Fama, E. F., & French, K. R. (2004). The Capital Asset Pricing Model: Theory and evidence. *Journal of Economic Perspectives*, *18*(3), 25–46. https://doi.org/10.2139/ssrn.440920

Fama, E. F., & French, K. R. (2014). A five-factor asset pricing model. *Journal of Financial Economics*, *116*(1), 1–22. https://doi.org/10.1016/j.jfineco.2014.10.010

Fauziah, F., & Moeljadi, M. (2015). Dynamic relationship between exchange rates and stock prices in Asia on period 2009-2013. *Journal of Economics, Finance & Accounting*, *2*(1), 124–134. https://doi.org/10.17261/pressacademia.201519783

Geske, R., & Roll, R. (1983). The Fiscal and Monetary Linkage Between Stock Returns and Inflation. The Journal of Finance, 38(1), 1–33. doi:10.2307/2327635 Robert Geske and Richard Roll (1983). The Fiscal and Monetary Linkage Between Stock Returns and Inflation. *The Journal of Finance*, *38*(1), 1–33. https://doi.org/10.2307/2327635

Gokmenoglu, K., Eren, B. M., & Hesami, S. (2021). Exchange rates and stock markets in emerging economies: New evidence using the quantile-on-quantile approach. *Quantitative Finance and Economics*, *5*(1), 94–110. https://doi.org/10.3934/qfe.2021005

Gunarto, A. G., & Sembel, H. M. R. (2019). THE EFFECT OF MACROECONOMY ON STOCK PERFORMANCE OF LQ45 COMPANIES AT IDX. *International Journal of Business, Economics and Law*, *19*(1), 22–29.

Gunasekarage, A., Pisedtasalasai, A., & Power, D. M. (2004). Macroeconomic influence on the stock market: Evidence from an emerging market in South Asia. *Journal of Emerging Market Finance*, *3*(3), 285–304. https://doi.org/10.1177/097265270400300304

Jaleel, F. M., & Samarakoon, L. P. (2009). Stock market liberalization and return volatility: Evidence from the emerging market of Sri Lanka. *Journal of Multinational Financial Management*, *19*(5), 409–423. https://doi.org/10.1016/j.mulfin.2009.07.006

Javangwe, K. Z., & Takawira, O. (2022). Exchange Rate Movement and stock market performance: An application of the ARDL model. *Cogent Economics & Finance*, *10*(1), 1–20. https://doi.org/10.1080/23322039.2022.2075520

Kaluarachchi, D. G. P., & Fernando, A. J. (2017). *The relationship between interest rate and stock price: Empirical Evidence from Colombo Stock Exchange*. Digital Repository. Retrieved December 1, 2022, from http://dr.lib.sjp.ac.lk/bitstream/handle/123456789/7680/The%20Relationship%20Between%20Interest%20Rate%20and%20Stock%20Price%20Empirical%20Evidence%20from%20Colombo%20Stock%20Exchange.pdf?sequence=1

Kamal, A. L. M. (2018). The impact of Treasury bill rate and interest rate on the stock market returns in Egypt. *International Journal of Development and Sustainability*, *7*(2), 604–618.

Khalid, W., & Khan, S. (2017). Effects of macroeconomic variables on the stock market volatility: The Pakistan experience. *International Journal of Econometrics and Financial Management*, *5*(2), 42–59. https://doi.org/10.12691/ijefm-5-2-4

Khan, M. K., Teng, J.-Z., & Khan, M. I. (2019). Cointegration between macroeconomic factors and the exchange rate USD/CNY. *Financial Innovation*, *5*(1). https://doi.org/10.1186/s40854-018-0117-x

Killian , H., & Lütkepohl, H. (2017). *Structural Vector Autoregressive Analysis.* Cambridge: Cambridge University Press.

Kulatunga, K. M. M. C. B. (2015). Macroeconomic Factors and Stock Market Development: With Special Reference to Colombo Stock Exchange. *International Journal of Scientific and Research Publications*, *5*(8), 303–309.

Lakshmanasamy, T. (2021). Relationship between exchange rate and stock market volatilities in India. *International Journal of Finance Research*, *2*(4), 244–259. https://doi.org/10.47747/ijfr.v2i4.443

Liew, V. K.-S. (2004, September 16). *Which lag selection criteria should we employ? - researchgate*. Economics Bulletin. Retrieved December 27, 2022, from https://www.researchgate.net/publication/4827253_Which_Lag_Selection_Criteria_Should_We_Employ

Lingaraja, K., Mohan, C. J. B., Selvam, M., Raja, M., & Kathiravan, C. (2020). Exchange Rate Volatility And Causality Effect Of Sri Lanka (Lkr) With Asian Emerging Countries Currency Against USD. *International Journal of Management (IJM)*, *11*(2), 191–208.

Lütkepohl, H. (2004). *Applied Time Series Econometrics.* (H. Lutkepohl, & M. Kratzig, Eds.) Cambridge: Cambridge University Press.

Madurapperuma, W. (2022). The dynamic relationship between economic crisis, macroeconomic variables and stock prices in Sri Lanka. *Journal of Money and Business*, *3*(1), 25–42. https://doi.org/10.1108/jmb-06-2022-0033

Majumder, D. (2012). *Asset pricing model for Inefficient markets: Empirical evidence from the Indian Market*. Reserve Bank of India Occasional Papers. Retrieved November 28, 2022, from https://rbidocs.rbi.org.in/rdocs/Content/PDFs/04AS250614F.pdf

Menike, L. M. C. S. (2010). The effect of macroeconomic variables on stock prices in emerging Sri Lankan stock market. *Sabaragamuwa University Journal*, *6*(1), 50–67. https://doi.org/10.4038/suslj.v6i1.1689

Omar, A. B., Ali, A., Mouneer, S., Kouser, R., & Al-Faryan, M. A. (2022). Is stock market development sensitive to macroeconomic indicators? A fresh evidence using ARDL bounds testing approach. *PLOS ONE*, *17*(10). https://doi.org/10.1371/journal.pone.0275708

Oner , C. (2022). *Inflation: Prices on the rise*. IMF Publications. Retrieved December 20, 2022, from https://www.imf.org/en/Publications/fandd/issues/Series/Back-to-Basics/Inflation

Ranjani, R. P. C., & Dharmadasa, W. N. D. (2018). THE IMPACT OF MACRO ECONOMIC VARIABLES ON STOCK PRICES: EVIDENCE FROM COLOMBO STOCK EXCHANGE. *Journal of Commerce & Accounting Research*, *7*(2), 9–17.

Rathnayaka, R. M., & Seneviratna, D. M. K. (2018). Impact of macroeconomic variables on stock market returns: A case study of colombo stock exchange, Sri Lanka. *Kelaniya Journal of Management*, *6*, 1. https://doi.org/10.4038/kjm.v6i0.7541

Rathnayake, R. M. K. T., Senevirathne, D. M. K. N., & Jianguo, W. (2016). Short-term and long-term dynamics between macroeconomic indicators and market fluctuation: A study of Colombo Stock Exchange. *Journal of Management Matters*, *3*(1), 21–28.

Rathnayake, R. M. K. T., Seneviratna, D. M. K. N., & Nagawatta, S. C. (2014). International Conference on Management and Economics. In *Proceedings of the 3rd International Conference on Management and Economics* (pp. 209–216). Galle, Sri Lanka; University of Ruhuna.

Samarakoon, L. P. (1996). Stock Market Returns and Inflation: Sri Lankan Evidence. *Sri Lankan Journal of Management*, *1*(4), 293–311.

Samarakoon, L. P. (2009, November 19). *An empirical analysis of the relationship between fundamentals and stock returns in Sri Lanka*. SSRN. Retrieved December 1, 2022, from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1509788

Spahija, F. (2016). ANALYSIS OF THE MAIN THEORIES OF INTEREST RATES. *International Journal of Economics, Commerce and Management*, *IV*(6), 643–658.

Thalagoda, G., Rathnayake, K., & Abeysundara, S. (2018). Cointegration based regression to analyse linkage between share price index and macroeconomic variables: Evidence from colombo stock exchange. *OALib*, *05*(11), 1–14. https://doi.org/10.4236/oalib.1104955

Talwar, S. (2016). *Security Analysis and Portfolio Management* (1st ed.). Cengage Learning India Pvt. Ltd.

Ullah, G. M., Islam, A., Alam, M. S., & Khan, M. K. (2017). Effect of macroeconomic variables on stock market performance of SAARC Countries. *Asian Economic and Financial Review*, *7*(8), 770–779. https://doi.org/10.18488/journal.aefr.2017.78.770.779

Vidanage, T. N., & Dayaratne-Banda, O. G. (2013). Factors Determining the Predictability of Stock Prices in Emerging Capital Markets: Evidence from Colombo Stock Exchange. *Modern Sri Lanka Studies*, *4*(1), 32–53.

Weeraratne, T. S. (2020). Macroeconomic variables and stock market prices in Frontier Markets: A panel data analysis. *NSBM Journal of Management*, *6*(2), 90. https://doi.org/10.4038/nsbmjm.v6i2.61

Wickramasinghe, G. B. (2016). Efficiency of Foreign Exchange Market of Sri Lanka: Some Empirical Evidence. *Economics Management and Financial Markets*, *11*(4), 49–60.

Wickremasinghe, G. B. (2012). Stock prices and exchange rates in Sri Lanka: some empirical evidence. *Investment Management and Financial Innovations*, *9*(4), 8–14.

Wongbangpo, P., & Sharma, S. C. (2002). Stock market and Macroeconomic Fundamental Dynamic Interactions: ASEAN-5 countries. *Journal of Asian Economics*, *13*(1), 27–51. https://doi.org/10.1016/s1049-0078(01)00111-7

Yuan, J., Li, X., Shi, Y., Chan, F. T., Ruan, J., & Zhu, Y. (2020). Linkages between chinese stock price index and exchange rates-an evidence from the belt and road initiative. *IEEE Access*, *8*, 95403–95416. https://doi.org/10.1109/access.2020.2995941

APPENDIX

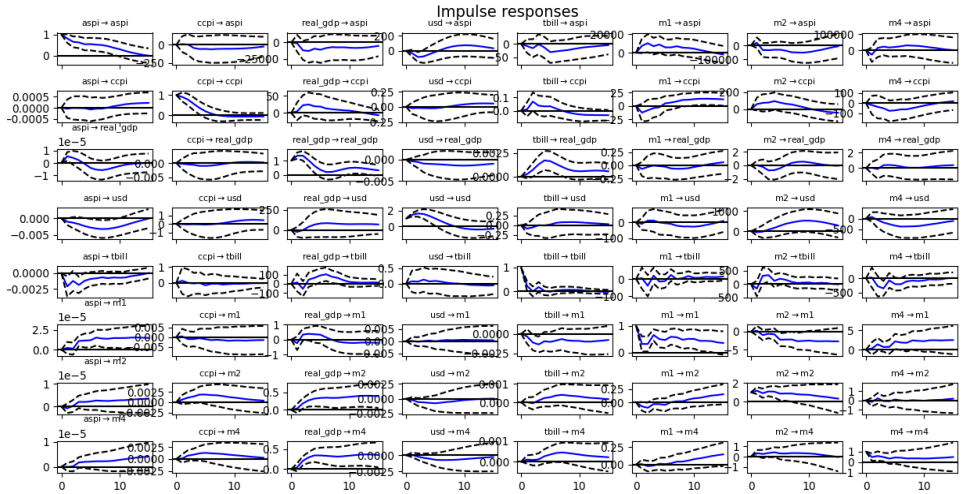

Figure 01: Impulse Responses of the system variables