

## LONG-RUN RELATIONSHIP BETWEEN MACRO ECONOMIC FACTORS AND STOCK MARKET PERFORMANCE IN SRI LANKA

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### ABSTRACT

*This paper investigates the long-term relationship between macro economic factors namely; gross domestic product, money supply, treasury bill rate, exchange rate, inflation rate and stock market performance such as All share price index and market capitalization in the Sri Lankan market using quarterly data of economic variables for the period 1996 to 2014. The stationarity of the data is tested using Augmented Dickey Fuller (ADF) test. It was found that all variables are stationary on first differencing. The relationships between macro economic factors and indicators of stock market performance are investigated using Johansen co-integration tests, and OLS. Co-integration results indicate the existence of long-run relationship between macro economic factors and stock market performance indicators. Further analyses show that money supply and inflation are positively related with stock market performances but exchange rate, GDP and treasury bill rate are negatively related to the stock market performances.*

**Key words:** All Share Price Index(ASPI), Market capitalization, Macro Economic factors, Sri Lanka

### 1. INTRODUCTION

Stock market is seen as a very significant component of a financial system in any country. It is playing a vital role in mobilization of capital within developing countries. The stock market is arguably the best place for an investor to invest in the shares of listed companies. It helps investors to sell their securities at a higher price. It is a known fact that most of the people invest in shares with the intention of selling the share at a higher price in future. If there is a well functioning share market, investors always invest their money in shares of different companies and it will help to increase the economy of a country and people's income indirectly. Many researchers like Demirguc-Kunt and Levine (1996a), Singh (1997), and Levine and Zervos (1998) found that stock market development plays an important role in economic growth. Jahfer and Inoue (2014) studied the relationship between stock market development and economic growth in Sri Lanka for the period from 1996 to 2011 and they concluded that stock market

development does positively contribute to economic growth and stock market development is the key aspect of economic development in Sri Lanka.

The interaction of the capital market and the macroeconomics variables has been a subject of interest among financial economists and practitioners. It is often argued that stock market performances are determined by some fundamental macroeconomic variables such as the interest rate, gross domestic product (GDP), exchange rate, inflation, money supply and etc. Investors generally believe that monetary policy and macroeconomic events have a large influence on the volatility of the stock prices. This implies that macroeconomic variables could exert effect on share returns and influence investors' investment decisions. In the past, many researchers (Asprem,1989; Yosuf and Majid,2007; Rahman et al., 2009; Singh,2010; Hsing, 2011, 2014; Eita,2012; Khan,2014; and Bhatta, 2010, investigated the relationships between stock market performances and macroeconomic variables and proved the relationship.

The objective of this paper is to investigate the long run relationship between indicators of stock market performances and a set of macroeconomic factors, i.e. gross domestic product, money supply, inflation, treasury bill rate and exchange rate in Sri Lanka. This research would also contribute to the existing literature by linking the macroeconomic factors with Sri Lanka stock market performances. The rest of paper is organized as follows: Section 2 summaries the literature review. Section 3 describes the data and methodology. Section 4 presents empirical evidence of the study. Section 5 concludes the research.

## **2. LITERATURE REVIEW**

There are number of empirical studies examining the relationship between financial market performances and macroeconomic factors and most of studies found that financial sector development contributes positively to economic growth. Mookerjee and Yu (1997) investigated the effect of macroeconomic variables on Singapore stock market and found that stock prices are co-integrated with both measures of the money supply (M1 and M2) and aggregate foreign exchange reserves. However, stock prices and exchange rates do not have a long-term relationship. Ibrahim and Aziz (2003) investigate the relationship between stock prices and industrial production, money supply, consumer price index, exchange rate in Malaysia. Stock prices are found a positive long-run relationships with industrial production and consumer price index. On the contrary, stock prices have a negative association with money supply and exchange rate. According to Büyükşalvarcı, 2010 Macroeconomic factors like inflation, industrial production, exchange rate, money supply, unemployment, risk premium, and rate of interest etc. have large influences on stock market operations. This is mainly because

economic forces affect the discount rates, the ability of firms to generate cash flows and future dividend payments. Arbitrage Pricing Theory (APT) introduced by Ross (1976) suggest that an understanding of the macroeconomic context is essential for investors and policy makers in making effective investment decisions.

Gunasekarage and etc. (2004) examined the impacts of macroeconomic variables namely money supply, treasury bill rate (as a measure of interest rates), consumer price index (as a proxy for inflation) and exchange rate on stock market performance index using monthly data for the above variables. Their results from estimating VECM model reveal that the rate of inflation, the money supply and the Treasury bill rate have statically significant influence on the stock market index. Guneratne Wickremasinghe (2011) analyzed both short and long-run causal relationships between stock prices and macroeconomic variables for Sri Lanka. Their results indicate that there are both short and long-run causal relationships between stock prices and macroeconomic variables. From the above literature review, there are evidences that macro economic factors are negatively as well as positively associated with stock market performance based on economy. And also, less attention has been paid to study about the association between stock market performances and macro economy in emerging markets. Therefore it encourages us to study the long run relationship between stock market performances and macroeconomic factors in the Sri Lankan market.

### **3. DATA AND METHODOLOGY**

#### **3.1. DATA**

In order to investigate the relationship between the indicators of stock market performances and selected macroeconomic factors, quarterly time series data are used for the period 1996 to 2014. Ratanapakorn and Sharma (2007), Eita (2012), and Kemboi and Tarus (2012) also use quarterly data for examining the relationship between stock market performance macroeconomic factors. The data are collected from International Financial Statistics (IFS) published by the International Monetary Fund, Colombo Stock Exchange data library 2015 and Annual Reports of Central Bank of Sri Lanka. To investigate the long-term relationship between the stock market performances and set of macroeconomic factors, All Share Price Index (ASPI) and Market capitalization (MSIZ) are used to measure the stock market performance. The ASPI indicates the price fluctuations of all the listed companies in the CSE and covers all the traded companies during a market day. Therefore, the best measure which reflects all the CSE performance is the ASPI and, it can be used to examine the effect on CSE operations due to changes in selected variables of Sri Lankan economy.

Macro economic factors such as gross domestic product (GDP), money supply(M2), treasury bill rate (TB), exchange rate (EXR) and inflation rate (INF)) are used as independent variables. Following common practice in the literature, economic growth is

measured by the real gross domestic product (GDP) (Constant 2005). Money supply is one of the monetary policy tools which is measured by M2. The exchange rate is defined as domestic currency units (Rs.) per unit of US dollar. Inflation is measured by consumer price index. Treasury bill rate is used as a proxy for money market interest rate.

Table 1 provides the summary of descriptive statistics of the variables used in this study. All the data were transferred to natural logarithms for conventional statistical reasons.

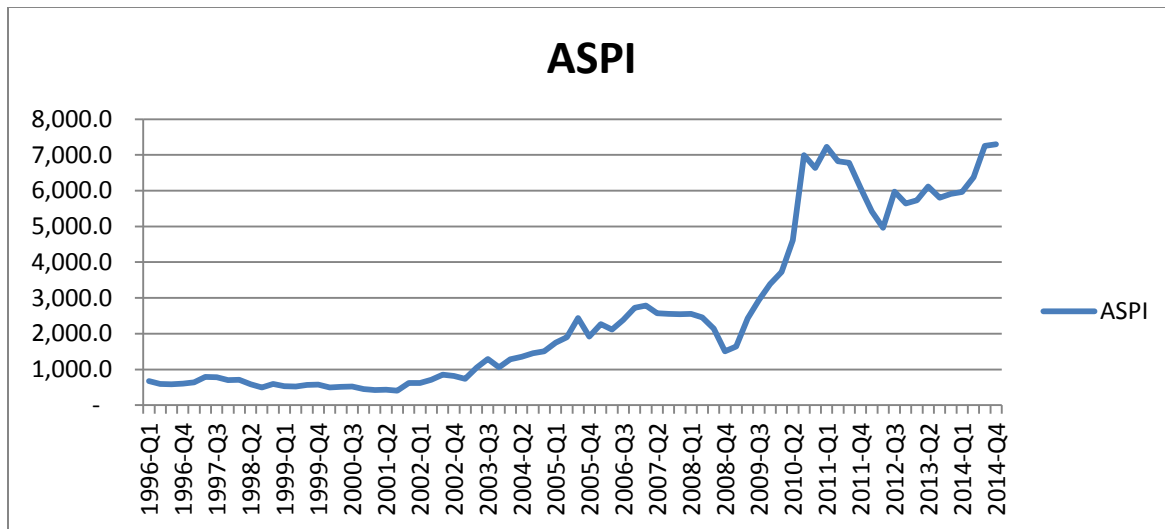
**Table 1 Descriptive Statistics**

|              | ASPI   | MSIZ   | EXR    | GDP    | INF    | M2     | TB     |
|--------------|--------|--------|--------|--------|--------|--------|--------|
| Mean         | 3.2148 | 5.6354 | 1.9752 | 5.7827 | 0.9016 | 5.9681 | 1.0574 |
| Median       | 3.2143 | 5.6891 | 2.0077 | 5.7036 | 0.9415 | 5.9616 | 1.0761 |
| Maximum      | 3.8605 | 6.4866 | 2.1212 | 6.3976 | 1.4238 | 6.5207 | 1.3125 |
| Minimum      | 2.6059 | 4.9054 | 1.7337 | 5.1954 | 0.0205 | 5.4350 | 0.7783 |
| Std. Dev.    | 0.4122 | 0.5324 | 0.1113 | 0.3670 | 0.2745 | 0.3348 | 0.1383 |
| Observations | 75     | 75     | 75     | 75     | 75     | 75     | 75     |

Note: ASPI - All Share Price Index ; MSIZ - Market capitalization; GDP-gross domestic product; M2-money supply; TB- treasury bill rate, EXR - exchange rate; INF- inflation rate

Figures 1, 2, 3 and 4 show the patterns of macroeconomic factors and indicators of stock market performance for the study period 1996 - 2014. It can be observed from the figures 1 and 2 that a significant development in the stock market performances after 2009. That is after the domestic war. There is also significant improvement in the money supply and GDP after 2009.

**Figure 1: All Share Price Index**



**Figure - 2: Market capitalization, GDP and Money Supply**

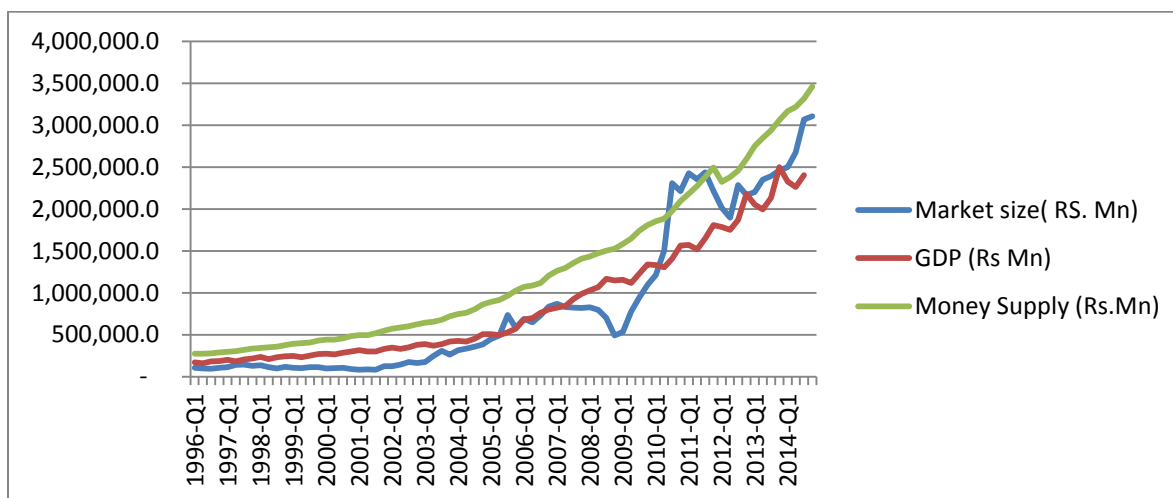


Figure 3 shows the trends of inflation rate, interest rate, treasury bill rate during the period 1996-2014 in Sri Lanka. It is clear from the figure that there is a significant decline of inflation rate, interest rate, treasury bill rate after 2009. It was the peak period from 2006 to 2008.

**Figure - 3: Inflation rate, Interest rate, Treasury bill rate**

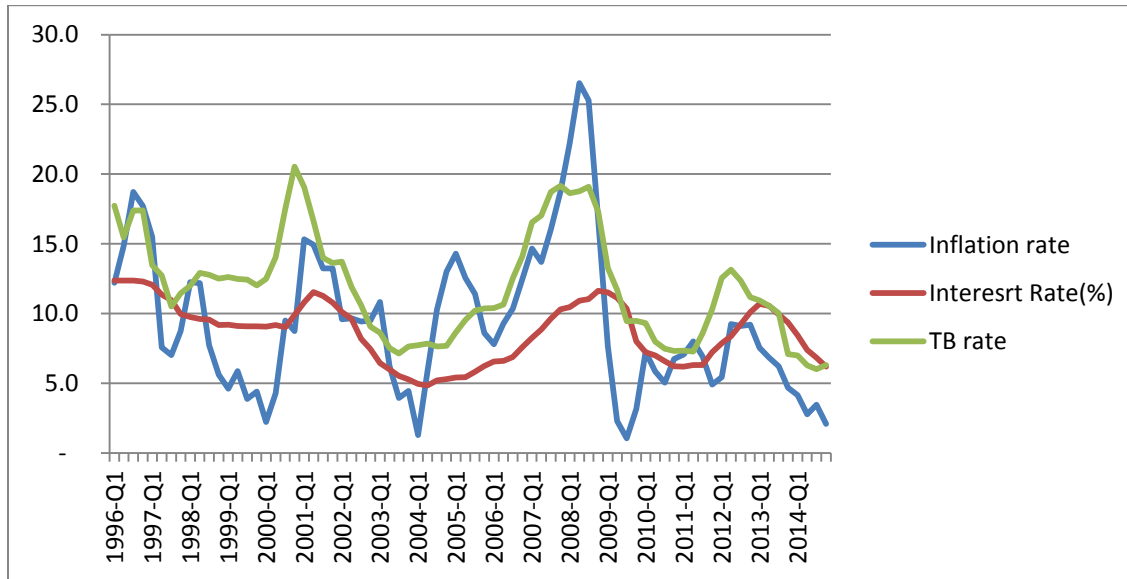
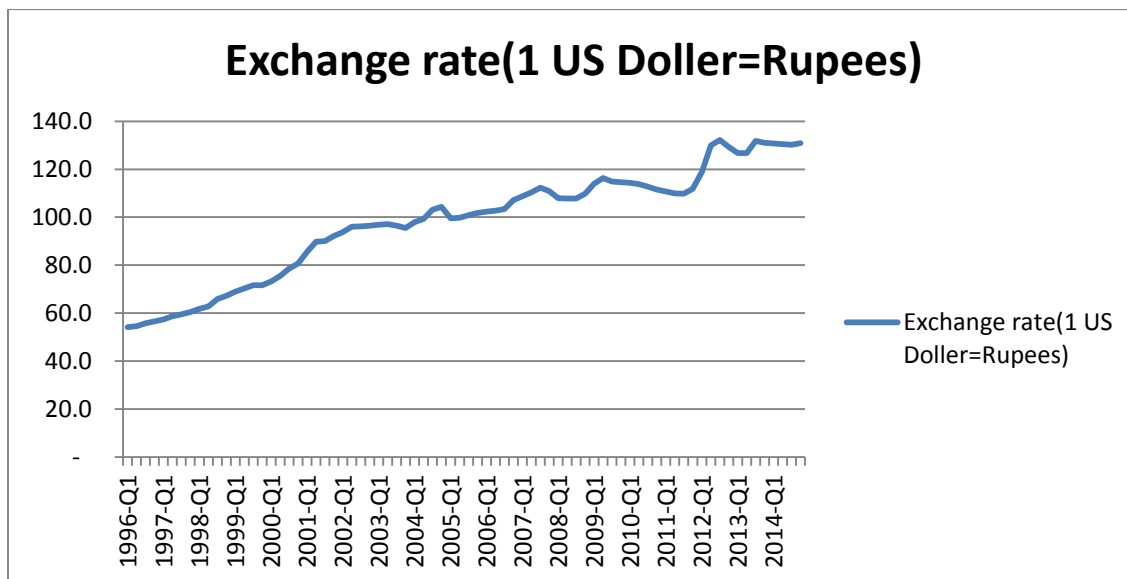


Figure 4 shows the trends of exchange rate between US\$ and Sri Lanka rupees over the period 1996-2014 in Sri Lanka. Exchange rate has been gradually increased from 1996.

**Figure - 4: Exchange rate**



### 3.2. METHODOLOGY

In order to analyse the relationship between stock market performances and macroeconomic factors are examined, first the co-integration tests were done among the variables using the Johansen (1998) co-integration tests. Since Johansen co-integration is sensitive to the lag length, we used Schwarz Information Criterion in the VAR to determine the appropriate number of lag. Second, We analyzed using ordinary least square method.

Since macroeconomic time series data contain unit root, variables used in the study are tested for stationary before analyses. For this purpose, unit roots are tested using Augmented Dickey-Fuller (1979) test. After confirming that the variables are integrated of order one, then it is tested the existence of co-integration relationship between the variables.

The following models are tested to examine the relationship between selected macro economic variables and stock market performance.

Model 1

$$ASPI = \beta_0 + \beta_1 GDP_t + \beta_2 INF_t + \beta_3 M2_t + \beta_4 EXR_t + \beta_5 TB_t + U_t$$

Model 2

$$MSIZ = \beta_0 + \beta_1 GDP_t + \beta_2 INF_t + \beta_3 M2_t + \beta_4 EXR_t + \beta_5 TB_t + U_t$$

Where,

ASPI = All Share Price Index

MSIZ = Stock market capitalization

GDP = Real Gross Domestic Product

INF = Inflation Rate

M2 = Money Supply

EXR = Exchange Rate

TB = Treasury Bill rate

$U_t$  = Error term of regression

Further,

if cointegration detected between variables, then it is known that there exists a long term equilibrium relationship between stock market performance and macro economic variables.



## 4. EMPIRICAL RESULTS

### 4.1. UNIT ROOT TEST

To check the stationarity of the variables, the Augmented Dickey-Fuller (ADF) test was employed. The test is conducted with intercept only and intercept and trend respectively on the level and first differences of the variables. It finds all variables are stationary on first differencing. The results of ADF test are shown in Table 2.

**Table 2**

#### Augmented Dickey-Fuller (ADF) Unit Root Test Results

| Variables | Level               |                               |            | First Difference    |                               |            | Number of observations (After adjustments) |
|-----------|---------------------|-------------------------------|------------|---------------------|-------------------------------|------------|--|
|           | Test with Intercept | Test with Trend and Intercept | Lag Length | Test with Intercept | Test with Trend and Intercept | Lag Length |  |
| ASPI      | -0.0960             | -2.498                        | 0          | -8.159*             | -8.133*                       | 0          | 74   |
| MSIZ      | 0.055               | -2.285                        | 0          | -8.182*             | -8.149*                       | 0          | 74   |
| GDP       | 0.331               | -2.291                        | 4          | -3.608*             | -3.549**                      | 3          | 74   |
| INF       | -2.798              | -2.969                        | 0          | -7.625*             | -7.580*                       | 0          | 74   |
| M2        | 0.039               | -2.948                        | 0          | -8.456*             | -8.392*                       | 1          | 73   |
| EXR       | -2.314              | -2.135                        | 2          | -5.419*             | -5.783*                       | 1          | 73   |
| TB        | -2.279              | -2.279                        | 1          | -5.269*             | -5.248*                       | 0          | 74   |

Note: \*, \*\* indicates significance at the 1%, and 5% level respectively. Critical values with intercept and trend and intercept are for all tests are -3.522, -2.901, and -4.087, -3.472 at the 1%, and 5% levels of significance in that order. Number of lags is selected automatic based Schwarz Information Criterion (SIC).

### 4.2. COINTEGRATION TESTS

Having confirmed that all variable are integrated of order (1), the cointegration tests were done among the variables using the Johansen's cointegration tests to investigate long-term equilibrium relationship among the variables. Number of lags is selected using an optimal lag structure in the unrestricted VAR. Johansen's approach derives two likelihood estimators for the cointegration rank: a trace test and a maximum Eigen value test. Table 3 presents summarized cointegration results estimated using EViews software. Cointegration results indicate the existence of long-run association between stock market performance and macro economic factors in Sri Lanka.



**Table 3**  
**Johansen Co-integration Test Results**

| Hypothesized<br>No. of CE(s)       | Trace Test        |                     |         | Maximum Eigenvalue Test |                     |         |
|------------------------------------|-------------------|---------------------|---------|-------------------------|---------------------|---------|
|                                    | Test<br>Statistic | Critical<br>Value5% | Prob.** | Test<br>Statistic       | Critical<br>Value5% | Prob.** |
| <b>(i) ASPI EXR GDP INF TB M2</b>  |                   |                     |         |                         |                     |         |
| None *                             | 144.8310          | 95.75366            | 0.0000  | 50.40190                | 40.07757            | 0.0025  |
| At most 1 *                        | 94.42909          | 69.81889            | 0.0002  | 40.82369                | 33.87687            | 0.0063  |
| At most 2 *                        | 53.60541          | 47.85613            | 0.0131  | 26.27494                | 27.58434            | 0.0728  |
| At most 3                          | 27.33046          | 29.79707            | 0.0938  | 17.26346                | 21.13162            | 0.1599  |
| At most 4                          | 10.06700          | 15.49471            | 0.2756  | 9.461107                | 14.26460            | 0.2498  |
| At most 5                          | 0.605892          | 3.841466            | 0.4363  | 0.605892                | 3.841466            | 0.4363  |
| <b>(ii) MSIZ EXR GDP INF TB M2</b> |                   |                     |         |                         |                     |         |
| None *                             | 123.7690          | 95.75366            | 0.0002  | 48.64310                | 40.07757            | 0.0043  |
| At most 1 *                        | 75.12591          | 69.81889            | 0.0177  | 27.85222                | 33.87687            | 0.2204  |
| At most 2                          | 47.27368          | 47.85613            | 0.0566  | 20.20768                | 27.58434            | 0.3270  |
| At most 3                          | 27.06600          | 29.79707            | 0.1000  | 12.93907                | 21.13162            | 0.4578  |
| At most 4                          | 14.12693          | 15.49471            | 0.0795  | 10.48758                | 14.26460            | 0.1818  |
| At most 5                          | 3.639352          | 3.841466            | 0.0564  | 3.639352                | 3.841466            | 0.0564  |

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

### 4.3. ORDINARY LAST SQUARE RESULTS

Table 4 reports the results under ordinary least square (OLS). R-squared value of this models are 95.52 and 97.02% respectively which are higher than the 80%. It indicates the models are fitted nicely or data is fitted nicely. All macro economic variables are significant to explain both indicator of stock market performances. Money supply and Inflation are significantly positively associated with ASPI and MSIZ while exchange rate, GDP and treasury bill rate are significantly negatively associated.

**Table 4: OLS results**

| Dependent Variable | ASPI        |             | MSIZ        |             |
|--------------------|-------------|-------------|-------------|-------------|
|                    | Coefficient | t-Statistic | Coefficient | t-Statistic |
| C                  | -3.67436    | -7.706**    | -3.64119    | -7.088**    |
| EXR                | -2.62981    | -7.817**    | -2.73725    | -7.552**    |
| GDP                | -1.02772    | -2.302**    | -1.16496    | -2.423*     |
| INF                | 0.16100     | 3.460**     | 0.16511     | 3.294**     |
| M2                 | 3.06739     | 5.392**     | 3.62810     | 5.919**     |
| TB                 | -0.40198    | -3.561**    | -0.36108    | -2.969**    |
| R-squared          | 0.9572      |             | 0.9702      |             |
| Adjusted R-squared | 0.9541      |             | 0.9681      |             |

## 5. CONCLUSION

This paper investigates the long-term relationship between macro economic factors and stock market performance in Sri Lanka using quarterly data of economic variables for the period 1996 to 2014. The stationarity of the data are tested using Augmented Dickey Fuller (ADF) test. It was found that all variables are stationary on first differencing. The relationships between macro economic variables and indicators of stock market performance are investigated using Johansen co-integration tests, and OLS. Co-integration results indicate the existence of long-run relationship between macro economic factors namely; gross domestic product, money supply, treasury bill rate, exchange rate, inflation rate and stock market performance indicators such as All share price index and market capitalization in the Sri Lankan market. Further analyses show that money supply and inflation are positively related with stock market performances and exchange rate, GDP and treasury bill rate are negatively related to the stock market performances. This study contributes to the literature on the relationship between stock market performances and macro economic factors focused on Sri Lanka which is an emerging economy.

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