

**ARTICLE****Stock Market Measures and Market Performance****B. J. Liyanapathirana\* R.P.K.C.M. Ranasinghe**

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**ABSTRACT**

Sri Lanka is considered a highly fluctuating economy in the South Asian region. Understanding the behavior of economics is of utmost important to obtain the maximum benefit. Stock market can be considered as one of the key influencers to the economy whereas the behavior of the stock market would highly define the behaviors of the economic system. It is required to identify the stock market measures and their contribution for the market development to recognize the influence of stock market. The immense importance of its actions on the market performance leads to find more about the stock market's measures. This research contains the evidence of the study conducted to identify the stock markets development and behavior measures such as all share price index, market capitalization, dividend yield, price to earnings ratio and shares traded equity. All of these variables were used to obtain a model to describe and predict performance of stock market over the time. The secondary data from the CSE (Colombo Stock Exchange) is studied which the trend analysis was conducted for each series of data and results were used for the analysis. A statistical analysis was carried out to identify the measures of stock market depicts that all the measures of the stock market have influences on the stock market development except for the dividend yield, a useful fact in the process of decision making in many aspects.

**1. Introduction**

Stock market has been identified as one of the key economic indicators in a country, thus it is required to identify the behaviors of the key variables in the stock market<sup>[6]</sup>. Many countries in the world are taking the advantage of stock market performance in order to thrive their economy against various fluctuations. In order to do this, those countries have done various researches on the stock market performance. They have identified key factors in the stock market that contributes to its growth and correlation between each of those factors. However, Sri Lanka is lacking such researches on the stock market

performance<sup>[5]</sup>. Therefore, the gap requires to be filled, making the country to obtain maximum benefit of its prevailing resources for the betterment of economic growth.

Stock market is a well-functioning financial intermediary in which shares of public listed companies are been traded. The relation between the stock market development and economic growth need to be identified to obtain the necessary benefits to have a more favorable growth in the economy. This has been subjected to many theoretical and experimental studies throughout the past years.

Stock market is one of the key influencers towards the economy of a country. It is the primary source of expanding capital for the companies. By giving space to

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issue shares which parts the ownership of the company among shareholders, required capitals are gathered. For the purpose of issuing shares, the company first need to get listed in the stock market. Stock market consists of several stock exchanges. Since Sri Lanka is a developing country, it has only one stock exchange namely Colombo Stock Exchange (CSE). The origin of the Sri Lankan stock exchange dates back to the 19<sup>th</sup> century whereas the Colombo Stock Exchange existing today was established in 1985. This is known to be one of Asia's most functioning stock exchanges. It consists of 297 listed companies with a market capitalization of Rs. 2,793.0Bn as per 31<sup>st</sup> October 2018. These companies are from 20 business sectors which are known as sector indices namely, beverage food and tobacco (BFT), hotels and travels (H&T), bank finance and insurance (BFI), diversified holdings (DIV), chemicals and pharmaceuticals (C&P), footwear and textile (F&T), construction and engineering (C&E), health care (HLT), investment trusts (INV), power & energy (P&E), information technology (IT), telecommunications (TLE), manufacturing (MFG), oil palms (OIL), land and property (L&P), motors (MTR), plantations (PLT), services (SRV), manufacturing (MFG), trading (TRD) and stores supplies (S&S).

## 2. Methodology

This study uses the quantitative methodology since it intends to investigate a quantitatively bounded research question (what) as explained by Dewasiri et al. [7]. Colombo Stock Exchange (CSE) consists of 297 listed companies. Data obtained for the study were the averages of all the listed companies. Annual, monthly, weekly and daily data were available in CSE for the required variables in measuring the market performance. For the purpose of having accurate results, the daily data from January 1996 to December 2016 were used for this study. Therefore, each of the variables has a data series with 5035 points.

A statistical analysis was carried out to study the performance of Stock market development and how these findings are useful in the process of decision making. Granger causality test is used to identify the causal relationship between the independent variables and the dependent variable. The statistical software SPSS and Eviews are used for analyzing and the results have been displayed as the outputs of the software.

### 2.1 Conceptual Frame Work

This is the frame work that demonstrates how the variables in stock market define the stock market performance. Analyzing the performance of the stock market

allows to identify the stock market impact on economic growth.



### 2.2 Variables Utilized

Price indices are fundamentally used to obtain an understanding about the directions and the movement of the stock market. All share price index or ASPI is one of such indices in the stock market. It is a value-weighted index and in Sri Lankan context, ASPI is the most appropriate measure of the level of stock market.

$$\text{All share price index} = \frac{\text{Market capitalization of all share price index}}{\text{Base market capitalization}} * 100$$

The behavior of ASPI is explained in this report using four independent variables namely market price earnings ratio (PER), market capitalization (MC), shares traded equity (STE) and market dividend yield (DY).

Market price earnings ratio is the ratio between market value per share and earnings per share.

$$\text{Market price earnings ratio} = \frac{\text{Market value per share}}{\text{Earnings per share}}$$

Market capitalization is the indicator for the size of the stock market. It is calculated as follows.

$$MC = \text{current market price of a share} * \text{total number of outstanding shares}$$

Dividend yield is the ratio between annual dividend and share price as calculated by Baker et al. [2] and Dewasiri et al. [8].

$$\text{Dividend yield} = \frac{\text{Annual dividend}}{\text{Share price}}$$

It interprets the sum of money paid to the shareholder by the company out of company's profit. This amount is paid as a reward to the shareholder in order to motivate in more investments. Thus, high dividend yields are considered to be more attractive. The sum of money paid by the company according to the dividend yield is not added to the capital unless investor decides to reinvest in the company.

The final independent variable that was added to the model was the shares traded equity. It calculates the sum obtained by the book value of a share multiplied by the number of shares issued per day.

$$STE = \text{book value of a share} * \text{total number of shares}$$

### 2.3 Hypotheses

According to each test, relevant hypotheses were used to arrive at conclusions regarding the study.

For the trend analysis, following hypothesis was used.

$H_0$ : there is no trend in the data series

$H_1$ : there is a trend in the data series

For the Unit root test, following hypothesis was used.

$H_0$ : there is no unit root in the data series

$H_1$ : there is unit root in the data series

For the ANOVA test in Time series regression model, following hypothesis was used to check the existence of at least one coefficient in the regression equation.

$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$

$H_1$ : at least one  $\beta_i \neq 0$  for  $i=1, 2, 3, 4$

For the coefficients table in Time series regression model, following hypothesis was used to check the effectiveness of each variables for the dependent variable in the regression equation.

$H_0: \beta_i = 0$

$H_1: \beta_i \neq 0$  for  $i=1, 2, 3, 4$

For the Granger causality test, following hypothesis was used for each dependent variable separately for the dependent variable All Share Price Index (ASPI)

$H_0$ : (independent variable) does not Granger Cause ASPI

$H_1$ : (independent variable) Granger Cause ASPI

## 3. Results and Discussion

The results obtained by performing the abovementioned statistical tests are described below. For each test, separate results are interpreted along with a discussion relevant to the results. The discussion further describes the conclusion that can be arrived from the tests.

### 3.1 Trend Analysis

The following Eviews outputs show the results obtained for the trend analysis.

#### 3.1.1 All Share Price Index (ASPI)

**Table 1.** Trend analysis output for ASPI

Variable	Coefficient	Std. Error	t-Statistic	Prob.
@Trend	1.260241	0.005396	233.5446	0.0000

The p-value which is indicated as the probability value (Prob.) in the table is equal to zero. Hence there exists strong evidence against the null hypothesis, so it can reject the null hypothesis. Therefore, the data series has a consistent trend.

#### 3.1.2 Market Capitalization (MC)

**Table 2.** Trend analysis output for MC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
@Trend	475.2467	2.514593	188.9954	0.0000

In table 2, the probability value (Prob.) is zero giving strong evidence against the null hypothesis. Thus reject the null hypothesis and conclude the data series has a consistent trend.

#### 3.1.3 Shares Traded Equity (STE)

**Table 3:** Trend analysis output for STE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
@Trend	10.67254	0.193969	55.02181	0.0000

The probability value (Prob.) equals to zero providing that the null hypothesis can be rejected. Therefore, the data series has a consistent trend.

#### 3.1.4 Price Earnings Ratio (PER)

**Table 4.** Trend analysis output for PER

Variable	Coefficient	Std. Error	t-Statistic	Prob.
@Trend	0.004343	2.64E-05	164.4830	0.0000

The probability value (Prob.) in the table 4 is also equal to zero. Thus, strong evidence stands against the null hypothesis, giving the null hypothesis can be rejected. Therefore, the data series has a consistent trend.

#### 3.1.5 Dividend Yield (DY)

**Table 5.** Trend analysis output for DY

Variable	Coefficient	Std. Error	t-Statistic	Prob.
@Trend	0.000886	1.45E-05	61.31158	0.0000

Finally, the table 5 again contains probability value (Prob.) equal to zero providing strong evidence against the null hypothesis, where it can reject the null hypothesis. Thus, the data series has a consistent trend.

Thus, it can be concluded that all the data series have some kind of trend. These results can be used in Unit root testing to obtain more precise test results on data series.

### 3.2 Unit Root Test

The following Eviews outputs show the results obtained for the Unit root test results.

### 3.2.1 All Share Price Index (ASPI)

**Table 6.** Unit root test output for ASPI

		t	Prob.
Augmented Dickey-Fuller test statistic		-56.97638	0.0000
Test critical values	1% level	-3.959861	
	5% level	-3.410697	
	10% level	-3.127134	

The probability value (Prob.) in the table is equal to zero. Hence there exists strong evidence against the null hypothesis;  $H_0$ , hence the null hypothesis can be rejected. Therefore, the data series does not have a unit root making it stationary.

### 3.2.2 Market Capitalization (MC)

**Table 7.** Unit root test output for MC

		t	Prob.
Augmented Dickey-Fuller test statistic		-57.59929	0.0000
Test critical values	1% level	-3.959862	
	5% level	-3.410698	
	10% level	-3.127134	

In table 7, the probability value (Prob.) is zero giving strong evidence against the null hypothesis. Thus reject the null hypothesis and conclude the data series does not have a unit root making it stationary.

### 3.2.3 Shares Traded Equity (STE)

**Table 8.** Unit root test output for STE

		t	Prob.
Augmented Dickey-Fuller test statistic		-32.31236	0.0000
Test critical values	1% level	-3.959864	
	5% level	-3.410699	
	10% level	-3.127135	

The probability value (Prob.) equals to zero providing that the null hypothesis can be rejected. Therefore, the data series does not have a unit root making it stationary.

### 3.2.4 Price Earnings Ratio (PER)

**Table 9.** Unit root test output for PER

		t	Prob.
Augmented Dickey-Fuller test statistic		-68.08561	0.0000
Test critical values	1% level	-3.959861	
	5% level	-3.410697	
	10% level	-3.127134	

The probability value (Prob.) in the table 4 is also equal to zero. Thus, strong evidence stands against the null hypothesis, giving the null hypothesis can be rejected. Therefore, the data series does not have a unit root making it stationary.

### 3.2.5 Dividend Yield (DY)

**Table 10.** Unit root test output for DY

		t	Prob.
Augmented Dickey-Fuller test statistic		-45.72526	0.0000
Test critical values	1% level	-3.959861	
	5% level	-3.410697	
	10% level	-3.127134	

Finally, the table 5 again contains probability value (Prob.) equal to zero providing strong evidence against the null hypothesis, where it can reject the null hypothesis. Thus, the data series does not have a unit root making it stationary.

In this study all the data series are stationary so their statistical properties such as mean, variance, autocorrelation, etc. can be considered as constant over time.

### 3.2.6 Time Series Regression Model

The expected time series regression model is,

$$ASPI = \beta_0 + \beta_1 * MC + \beta_2 * PER + \beta_3 * STE + \beta_4 * DY$$

**Table 11.** Results of Regression analysis- Collinearity Statistics

Model		Collinearity Statistics	
		Tolerance	VIF
1	MC	1.000	1.000
2	MC	0.457	2.189
	PER	0.457	2.189
3	MC	0.445	2.247
	PER	0.411	2.435
	STE	0.676	1.479
4	MC	0.444	2.250
	PER	0.221	4.520
	STE	0.663	1.509
	DY	0.339	2.949

According to the step-wise regression model, the above statistics on the collinearity were obtained. The criterion to select the most suitable model is as follows:

$$VIF = 1 \text{ (not correlated)}$$

$$1 < VIF < 5 \text{ (moderately correlated)}$$

VIF > 5 (highly correlated)

where VIF (Variance Inflation Factor) is the reciprocal of tolerance. Since in the model 4 all the variables have VIF values lesser than 5, the model 4 can be chosen for further analysis.

**Table 12.** Results of Regression analysis- Model Summary

Model	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error of the Estimates
1	0.982	0.982	328.111268
2	0.991	0.991	232.146932
3	0.992	0.992	226.417726
4	0.992	0.992	223.210952

The adjusted R<sup>2</sup> value is high in both model 3 and model 4. But again, the model 4 has the lowest standard error of the estimate which is around 223. 210952. This justifies that model 4 is more appropriate for the analysis. According to the model summary, the predictors in model 4 describe 99.2 % variation of the independent variable.

**Table 13.** Results of Regression analysis- ANOVA (for model 4)

Model	Sum of Squares	df	Mean Square	F	Sig.
4	30401112713 250610339.8 30651723053	4 5030 5034	76000278178 49823.129	152545.179	0.000

Hypothesis tested is,

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$$

$$H_1: \text{at least one } \beta_i \neq 0 \text{ for } i=1, 2, 3, 4$$

The result of the test is significant at 5% level of significance (p < 0.0001). Thus, the null hypothesis can be rejected concluding that the predictors in the regression model explain significant portion of variation in ASPI.

Since model 4 has been already selected for consideration, coefficients of that model have to be tested.

**Table 14.** Results of Regression analysis- Coefficients

Model	Unstandardized Coefficients		Standardized Error	t	Sig.
	B	Std. Error	Beta		
4 (constant)	155.948	24.907		6.261	0.000
MC	0.002	0.000	0.883	461.638	0.000
PER	53.398	1.360	0.106	39.261	0.000
STE	0.002	0.000	0.028	17.861	0.000
DY	-37.718	3.115	-0.027	-12.108	0.000

Coefficients of the variables market capitalization, price earnings ratio, shares traded equity and dividend yield are taken as  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$  and  $\beta_4$  respectively.

$$H_0: \beta_i = 0$$

$$H_1: \beta_i \neq 0 \text{ for } i=1, 2, 3, 4$$

Here all the probability values are 0.00 which is lesser than 0.05. Thus, it can be concluded that all the independent variables that are considered for this study affect the dependent variable.

$$ASPI = 155.948 + 0.002 * MC + 0.002 * STE + 53.398 * PER + (-37.718) * DY$$

This is the regression equation that can be written by substituting the values for coefficients from the table of coefficients.

### 3.3 Granger Causality Test

The following Eviews outputs show the results obtained for the Granger causality test results.

#### 3.3.1 Market Capitalization (MC)

Hypothesis tested are,

$$H_0: MC \text{ does not Granger Cause ASPI}$$

$$H_1: MC \text{ Granger Cause ASPI}$$

**Table 15.** Granger causality test results for MC

Null Hypothesis	Observations	F-Statistic	Probability
MC does not Granger Cause ASPI	4670	1.26608	0.0008
ASPI does not Granger Cause MC		1.54236	1.E-09

Since the probability is 0.0008 which is less than 0.05, the null hypothesis can be rejected. So, there exists evidence to conclude that small shocks on market capitalization have an impact on all share price index.

#### 3.3.2 Shares Traded Equity (STE)

Hypothesis tested are,

$$H_0: STE \text{ does not Granger Cause ASPI}$$

$$H_1: STE \text{ Granger Cause ASPI}$$

**Table 16.** Granger causality test results for STE

Null Hypothesis	Observations	F-Statistic	Probability
STE does not Granger Cause ASPI	4670	2.32483	6.E-35
ASPI does not Granger Cause STE		2.29375	8.E-34

The probability is 6.E-35, providing the null hypothesis can be rejected. So, there exists evidence to conclude that small shocks on shares traded equity have an impact on all share price index.

#### 3.3.3 Price Earnings Ratio (PER)

Hypothesis tested are,

H<sub>0</sub>: PER does not Granger Cause ASPI

H<sub>1</sub>: PER Granger Cause ASPI

**Table 17.** Granger causality test results for PER

Null Hypothesis	Observations	F-Statistic	Probability
PER does not Granger Cause ASPI	4670	1.39087	4.E-06
ASPI does not Granger Cause PER		1.15750	0.0256

By the table 17, probability is 4.E-06, so the null hypothesis can be rejected. So, there exists evidence to conclude that small shocks on price earnings ratio have an impact on all share price index.

### 3.3.4 Dividend Yield (DY)

Hypothesis tested are,

H<sub>0</sub>: DY does not Granger Cause ASPI

H<sub>1</sub>: DY Granger Cause ASPI

**Table 18.** Granger causality test results for DY

Null Hypothesis	Observations	F-Statistic	Probability
DY does not Granger Cause ASPI	4670	0.59406	1.0000
ASPI does not Granger Cause DY		0.39341	1.0000

In the table 18, the probability is 1.0000 which is greater than 0.05. This provides that there is no evidence to reject null hypothesis. So it cannot be concluded whether all share price index has an effect through small shocks on dividend yield.

## 4. Conclusion

It was found that all the data series that represent each variable have a trend and useful in conducting the unit root test. These specific conditions were used while testing for the availability of unit roots in the data series. In the unit root test, it was found that all the data series are stationary.

In the time series regression analysis, All Share Price Index (ASPI) is the response variable. Other variables are considered as the predictor variables and the response variable is affected by these.

The Granger causality test revealed that two-way analyses and it was obvious that all the independent variables, except Dividend Yield (DY), affect the stock market performance but time series regression model reveals a relationship between DY and ASPI.

The time series regression and Granger causality test give those predictors Market Capitalization (MC), Shares Traded Equity (STE) and Price Earnings Ratio (PER)

make an effect the response, All Share Price Index (ASPI). Since the causality relationship, small changes in those independent variables will have considerable impacts on ASPI.

By fluctuating the variables, MC, STE, PER, the direction of the ASPI can be manipulated to a certain extent.

On one hand, these results may help investors, economists and policy makers in making the decisions as the results will help to understand the behavior of the stock market with the fluctuations in these variables.

Also the stake holders can use these results to manipulate the direction of the stock market for the betterment of the economic growth.

This study only identifies the variables that have effects on behavior of the stock market. So, the study can be further continued by conducting tests to identify the form of the effect of each variable.

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