

LB/D012/06/2018

**RELATIONS BETWEEN MACROECONOMIC
VARIABLES AND THE STOCK MARKET INDEX:
EVIDENCE FROM SRI LANKA**

LIBRARY
UNIVERSITY OF MORATUWA, SRI LANKA
MORATUWA

G. M. L. M. Aponsu

(148375D)

Degree of Master of Science

Department of Mathematics

University of Moratuwa
Sri Lanka

November 2017



TH3501

TH 3501 +
CD ROM

51 "17"
519.8 (043)

TH3501

**RELATIONS BETWEEN MACROECONOMIC
VARIABLES AND THE STOCK MARKET INDEX:
EVIDENCE FROM SRI LANKA**

G. M. L. M. Aponsu

(148375D)

Dissertation submitted in partial fulfillment of the requirements for the degree Master of
Science in Operational Research.

Department of Mathematics

University of Moratuwa
Sri Lanka

November 2017

CD included

DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text and a list of references is given.

Signature : *Abbas*

Date: *26/11/2017*

The above candidate has carried out research for the Masters thesis under my supervision,

Signature of the supervisor

UOM Verified Signature

Date: *26/11/2017*

ABSTRACT

This study examines whether the performance of Colombo Stock Exchange(CSE), as measured by the All Share Price Index (ASPI), is affected by a set of macroeconomic variables namely, Interest rate, Broad money supply, Index of Industrial Production and Inflation by using quarterly data obtained from Central Bank of Sri Lanka from 2004:Q1 to 2016:Q3. The Vector Autoregressive (VAR) framework was adopted by initially looking at the long run and short run relationship between stock market and the macroeconomic variables via the Johansen cointegration technique. To further explore the dynamic co-movement among the variables and the adjustment process towards the long run equilibrium, vector error-correction model (VECM) was used. Finally, Impulse Response Function (IRF) and Variance Decomposition (VDC) are employed in order to illustrate the importance of each macroeconomic variable to the stock market movement when a shock is imposed to the system. The analysis reveals that macroeconomic variables and the stock market index are co-integrated and, hence, a long-run equilibrium relationship exists between them. It is observed that the stock prices positively relate to the industrial production but negatively relate to inflation. The interest rate and money supply are found to be insignificant in determining stock prices in the long run. The results showed that both inflation and money supply significantly and inversely affect stock return in the short run. The results of Granger causality test further indicate that there exists unidirectional causality from inflation to stock return. Furthermore, based on the results of impulse response function and variance decomposition analysis, it is confirmed that that stock market index has stronger dynamic relationship with industrial production index and inflation as compared to money supply and interest rate. Therefore Central Bank of Sri Lanka must undertake pragmatic policies aimed at controlling inflation within acceptable limits, since inflation is seen to inversely affect stock return.

Key Words: All Share Price index, causality, cointegration, Macroeconomic variables

ACKNOWLEDGEMENTS

First and foremost, I would like to express my deepest gratitude to my supervisor, Mr. T.M.J.A. Cooray, senior lecturer, department of Mathematics, Faculty of Engineering, University of Moratuwa for his dedicated guidance, invaluable advice, and constant encouragement throughout my research study. I am also indebted to him for the efforts he has devoted to serious consultations and serious review of this thesis. His enthusiasm and insights in many research problems have provided me with a source of thoughts and actions.

This thesis would not have been completed without the constant support of my wife Mrs. K.M.L.P. Weerasinghe. I would express my wordless thanks to my wife for her deep understanding and encouragement during these years.

Last but not the least; I would like to thank my parents for their endless motivation, and support given me throughout the Masters degree.

TABLE OF CONTENTS

Declaration	i
Abstract	ii
Acknowledgements	iii
List of Tables	vii
List of Figures	viii
List of Abbreviations	ix
CHAPTER 1 INTRODUCTION	1
1.1 Background of the Study	1
1.2 Problem Statement	5
1.3 Objectives	6
1.4 Research Questions	7
1.5 Significance of the Study	7
1.6 Scope of the Study	8
1.7 Outline	8
CHAPTER 2 LITERATURE REVIEW	9
CHAPTER 3 METHODOLOGY	21
3.1 Variables Justification and Hypothesis	21
3.1.1 All Share Price Index (ASPI)	21
3.1.2 Interest Rate	21
3.1.3 Broad Money Supply (M2)	22
3.1.4 Industrial Production	23
3.1.5 Inflation	24

3.2 Data Description and Source.....	24
3.3 Model Specification ..	25
3.4 Research Methodology.....	26
3.5 Theoretical Background	27
3.5.1 Order of a Series	28
3.5.2 Stationarity Test (Unit Root Test)	28
3.5.2.1 Augmented Dickey Fuller (ADF) Test.....	28
3.5.2.2 Phillips-Perron (PP) Test	29
3.5.3 Cointegration Test and Vector Error Correction Model.....	31
3.5.4 Granger-Causality Test.....	33
3.5.5 Innovation Accounting	35
3.5.5.1 Impulse Response Function (IRF).....	35
3.5.5.2 Variance Decomposition (VDC) Test	36
3.5.6 Wald Test.....	38
3.5.7 Distributional Assumptions	38
3.5.8 Diagnostic Tests for the Fitted Models.....	39
3.5.8.1 The CUSUM test	39
3.5.8.2 Ljung-Box Q-Statistics for standardized residuals	40
3.5.8.3 ARCH-LM test	40
3.5.8.4 Breusch-Godfrey Serial Correlation LM Test	41
3.5.9 Information Criterion.....	42
3.5.9.1 Akaike Information Criterion	42
3.5.9.2 Schwarz Information Criterion	42
3.5.9.3 Hannan-Quinn Information Criterion	42
CHAPTER 4 DATA ANALYSIS AND DISCUSSION	43
4.1 Descriptive Statistics	43
4.2 Test for Stationarity - Unit Root Test.....	44
4.3 Testing the Long Run and Short Run Relationship Between the Variables	46

4.3.1 Cointegration Analysis	46
4.3.2 Long Run Relationship.....	49
4.3.3 Vector Error Correction Model (VECM).....	52
4.4 Test of Short Run Relationship Between the Variables.....	54
4.4.1 Short run relationship between interest rate and ASPI.....	55
4.4.2 Short run relationship between money supply and ASPI.....	56
4.4.3 Short run relationship between industrial production and ASPI.....	56
4.4.4 Short run relationship between inflation and ASPI.....	57
4.5 Test of Causal Relationship Among the Variables	58
4.6 Innovation Accounting.....	60
4.6.1 Impulse Response Function Analysis.....	61
4.6.2 Variance Decompositions.....	64
4.7 Residual Diagnostics	65
4.7.1 The CUSUM test	65
4.7.2 Normality Test.....	66
4.7.3 Serial Correlation.....	67
4.7.4 Heteroscedasticity.....	68
4.7.5 Correlogram Q-Statistics of residuals.....	68
4.7.6 Correlogram Q-Statistics of squared residuals	70
4.8 Discussion of Results	71
4.9 Predictive Power of the Vector Error Correction Model	73
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS	75
5.1 Conclusion.....	75
5.2 Recommendations	77
5.3 Suggestion for Further Research	77
5.4 Limitations	78
REFERENCES.....	79
APPENDIX: Vector Error Correction Model Estimates.....	83

LIST OF TABLES

Table 4.1: Descriptive Statistics	43
Table 4.2: ADF and PP unit root test results	45
Table 4.3: Lag order selection criteria.....	47
Table 4.4: Johansen cointegration test	48
Table 4.5: Normalized cointegration coefficients	49
Table 4.6: VECM estimates	53
Table 4.7: Wald test for the relationship between interest rate and ASPI.....	55
Table 4.8: Wald test for the relationship between money supply and ASPI.....	56
Table 4.9: Wald test for the relationship between industrial production and ASPI.....	57
Table 4.10: Wald test for the relationship between inflation and ASPI.....	58
Table 4.11: Pairwise Granger causality tests.....	59
Table 4.12: Response of LNY to one S.D. Innovations	61
Table 4.13: Variance decomposition of ASPI	64
Table 4.14: Breusch-Godfrey serial correlation LM test	67
Table 4.15: Breusch-Pagan-Godfrey heteroskedasticity test	68
Table 4.16: Correlogram of residuals.....	69
Table 4.17: Correlogram of squared residuals	70

LIST OF ABBREVIATIONS

LIST OF FIGURES

Figure 3.1: Conceptual framework of ASPI and macroeconomic variables..... 26

Figure 4.1: Impulse Response Function..... 63

Figure 4.2: Plot of cumulative sum of recursive residuals..... 66

Figure 4.3: Histogram of residuals..... 67

LIST OF ABBREVIATIONS

Abbreviation	Description
ADF	Augmented Dickey–Fuller
AIC	Akaike Information Criterion
AR	Autoregressive
ARCH	Auto Regressive Conditional Heteroscedasticity
ARDL	Autoregressive Distributed Lag
ASPI	All Share Price Index
BP	Balance of Payment
CCPI	Colombo Consumer Price index
CSE	Colombo Stock exchange
DSE	Dhaka Stock Exchange
ECM	Error Correction Mechanism
EGARCH	Exponential Generalized Autoregressive Conditional Heteroskedasticity
ER	Exchange Rate
GDP	Gross Domestic Production
GDS	Gross Domestic Savings
GNP	Gross National Production
HQ	Hannan–Quinn
IIP	Index of Industrial Production
IR	Interest Rate
IRF	Impulse Response Function
ISE	Istanbul Stock Exchange
ISE	Istanbul Stock Exchange
JB	Jarque–Bera
KSE	Karachi Stock Exchange
M2	Broad money Supply
OLS	Ordinary Least Squares
PP	Phillips-Perron
SC	Schwartz Criterion
SMI	Stock Market Index
VAR	Vector Auto Regression
VDC	Variance Decomposition
VECM	Vector Error Correction Model
WPI	Wholesale Price Index