

MACRO-ECONOMIC FACTORS AFFECTING THE
UNEMPLOYMENT RATE AND ITS EFFECT ON THE
SRILANKAN GDP

Bimali Lakshini Dias Weerasekara

179089N

Degree of Master of Science

Department of Mathematics

University of Moratuwa

Sri Lanka

March 2023

MACRO-ECONOMIC FACTORS AFFECTING THE
UNEMPLOYMENT RATE AND ITS EFFECT ON THE
SRILANKAN GDP

Bimali Lakshini Dias Weerasekara

179089N

Thesis submitted in partial fulfilment of the requirements for the Master of Business
Statistics

Degree of Master of Science

Department of Mathematics

University of Moratuwa

Sri Lanka

March 2023

DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgment 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 acknowledgment is made in the text.

Also, I hereby grant to the University of Moratuwa the non-exclusive right to reproduce and distribute my thesis, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature:

Date:

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

Name of the supervisor (1): Dr (Mrs) S C Matugama

Signature of the supervisor:

Date:

ABSTRACT

Underutilization of human capital which is also known as Unemployment is a critical factor that is essential to the growth of economies. Unemployment of youth in the country is a severe and sensitive problem in Sri Lanka throughout the last few decades. As a result, Sri Lanka is facing various issues including youth unrest due to the unemployment and poverty. A proper analysis of the reasons for unemployment within the country would lead to better decision making at the higher levels. Various advanced time series techniques can be used to identify the factors which affect unemployment.

In this study, the focus was to improve the decision-making process of the government while focusing on the components which influence the unemployment rate within the country. The data related to unemployment, inflation, GDP Growth, Population Growth and Exchange rate were extracted for the analysis. The study was done using Advanced Time series analysis. In the advanced time series analysis, Cointegration analysis, ARDL Bound Cointegration testing, Error Correction Modelling and VAR Modeling were used. Long term relationship between unemployment and the cluster of macroeconomic factors: inflation, GDP Growth, Population Growth and Exchange rate was identified by the ARDL Bound Cointegration analysis. Based on the residual analysis carried out, the fitted ARDL (1,0,1,0,1) model was determined as the best fitted model for the selected data. Finally, the long run association between Unemployment and GDP Growth was identified via the Johanson Cointegration Analysis and a VAR Model was fitted since there was no long run relationship between Unemployment and GDP Growth.

Key Words: Unemployment, Advanced Time Series Analysis, Cointegration, ARDL

DEDICATION

This Thesis is dedicated to all those who helped me and encouraged me in numerous ways!

ACKNOWLEDGMENT

I would like to take this opportunity to thank my supervisor Senior Lecturer in Mathematics and Statistics, Division of Interdisciplinary Studies, Institute of Technology, University of Moratuwa, Dr. Samanthi Mathugama and the joint Coordinators of the MSc/PGD in BS Program, Department of Mathematics, Faculty of Engineering, University of Moratuwa, Ms D R T Jayasundara & Dr J A B U Jayasinghe.

Also my family and friends who have been always with me!

TABLE OF CONTENTS

1.	Introduction	1
1.1	Overview	1
1.2	Background of the Study	1
1.2.1	Long Term vs Short-Term Unemployment	2
1.2.2	Effect of Unemployment on GDP Growth of a country	2
1.2.3	Most Common Causes for Unemployment	3
1.3	Unemployment in Sri Lanka	4
1.4	Significance of the Study	5
1.4.1	Macroeconomic Factors:.....	5
1.5	Objectives	7
1.6	Data Usage	7
1.7	Chapter Outline	9
2.	Literature Review	10
2.1	Macro-Economic Factors affecting the Unemployment Rate.....	10
2.2	Effect of Unemployment Rate on a country's GDP	12
2.2.1	Global aspects of Unemployment and GDP	12
2.2.2	Local aspects of Unemployment and GDP	13
2.3	Time Series Analysis on identifying the short run and long run relationships among macro-economic factors	14
2.3.1	Statistical Analysis on Macro Economic Factors	14
2.3.2	Cointegration Analysis, Regression Analysis and Time Series Analysis..	14
3.	Methodology	16
3.1	Introduction	16
3.2	Data Sources.....	16

3.3 Descriptive Analysis.....	16
3.3.1 Correlation Analysis	16
3.4 Time Series Analysis.....	17
3.4.1 Box Jenkins Methodology	17
3.4.2 Properties of Time Series Data	19
3.4.5 Method selection framework	21
3.5 Diagnostic tests of the time series model	25
3.5.1 Goodness of fit.....	25
3.5.2 Residual Diagnostics.....	25
4. Data Analysis	27
4.1 Process of the Data analysis	27
4.2 Descriptive Analysis.....	27
4.3 Advanced Time Series Analysis.....	34
4.3.1 Identification of the Factors affecting the Unemployment Rate in Sri Lanka	34
4.3.2 ARDL bound cointegration test model.....	35
4.3.4 Granger Causality among the macroeconomic variables	39
Table 4.9: Granger Causality Results	39
4.3.5 Identifying the effect of Unemployment on the GDP Growth of Sri Lanka	41
4.3.6 long run relationship between Unemployment and GDP Growth of Sri Lanka	41
4.3.7 VAR Model building for the Unemployment and the GDP Growth in Sri Lanka	42
4.3.8: Residual Analysis of the VAR Model	44
4.4 Summary of the Chapter.....	45

5 Conclusions, Recommendations and Future Work	47
5.1 Conclusions	47
5.2 Recommendations	49
5.3 Future Studies	50
Bibliography	51

LIST OF FIGURES

Figure 3.1: Box Jenkins Flow Diagram	18
Figure 3.2: Methodological Framework to select the Time Series Model.....	21
Figure 4.1: Time Series plot of the Annual Unemployment Rate from 1991 to 2020	29
Figure 4.2: Time Series plot of Annual Inflation Rate from 1991 to 2020.....	30
Figure 4.3: Time Series plot of Annual GDP Growth Rate from 1991 to 2020	30
Figure 4.4: Time Series plot of Exchange Rate (USD/ LKR) from 1991 to 2020....	31
Figure 4.5: Time Series plot of Annual Population Growth Rate from 1991 to 2020	32

LIST OF TABLES

Table 1.1: GDP growth rates from 2016 to 2020.....	6
Table 1.2: Exchange rates from 2016 to 2020	7
Table 4.1: Summary Statistics of the Variables	28
Table 4.2: Correlation Analysis of the Variables.....	33
Table 4.3: Augmented Dickey Fuller Test at Level.....	34
Table 4.4: Augmented Dickey Fuller Test at First Difference.....	34
Table 4.5: ARDL Model Estimation Output.....	35
Table 4.6: F-Bounds Test Criteria:.....	36
Table 4.7: Error Correction Model (ECM) for long run	37
Table 4.8: Residual Diagnostic Tests for the ARDL Model.....	38
Table 4.10: Johansen Cointegration Test - Unrestricted Cointegration Rank Test (Trace).....	41
Table 4.11: Johansen Cointegration Test - Unrestricted Cointegration Rank Test (Maximum Eigenvalue)	42
Table 4.12: VAR Lag Order Selection Criteria for Unemployment Rate.....	43
Table 4.13: VAR Model for the Unemployment and the GDP Growth	43
Table 4.15: Heteroscedasticity Test (White Test).....	44
Table 4.16: Normality Test	45

LIST OF EQUATIONS

Equation 3.1: Correlation Coefficient Calculation	17
Equation 3.2: AR(p) model	19
Equation 3.3: MA(q) model	20
Equation 3.4: Simple VAR Model	22
Equation 3.5: Johansen Cointegration Test	23

LIST OF ABBREVIATIONS

ADF: Augmented Dickey Fuller

AIC: Akaike Information Criterion

AR: Auto Regressive

ARDL: Auto Regressive Distributed Lag

ARIMA: Auto Regressive Integrated Moving Average

D(Exchange Rate): First differenced series of the Exchange Rate

D(Inflation Rate): First differenced series of the Inflation rate

ECM: Error Correction Model

Exchange Rate (-1): First lagged series of the Exchange Rate

GDP Growth Rate (-1): First lagged series of the Annual GDP Growth Rate

GDP: Gross Domestic Product

HQC: Hannan Quinn criterion

Inflation rate (-1): First lagged series of the Inflation rate

MA: Moving Average

OLS: Ordinary Least Squares

Pop Growth Rate (-1): First lagged series of the Pop Growth Rate

Pop Growth Rate: Population Growth Rate

SBC: Schwartz Bayesian Criterion

Unemployment Rate (-1): First lagged series of the Unemployment Rate

VAR: Vector Auto Regressive