MODELLING EXCHANGE RATE OF USD TO SRI LANKAN RUPEES WITH OIL PRICES, GOLD PRICES, SILVER PRICES AND RETURN OF ALL SHARE PRICE INDEX OF SRI LANKA

M. H. Shanika

(188867B)

Degree of Master of Science

Department of Mathematics

University of Moratuwa

Sri Lanka

November 2022

MODELLING EXCHANGE RATE OF USD TO SRI LANKAN RUPEES WITH OIL PRICES, GOLD PRICES, SILVER PRICES AND RETURN OF ALL SHARE PRICE INDEX OF SRI LANKA

Menikpura Hewage Shanika

(188867B)

Thesis Submitted in partial fulfillment of the requirements for the degree Master of Science in Financial Mathematics

Department of Mathematics

University of Moratuwa

Sri Lanka

November 2022

Declaration

The work described in this dissertation was carried out by me in association with my supervisors and the Department of Mathematics, University of Moratuwa, Sri Lanka under the guidance of coordinator and has not been submitted elsewhere.

Signature: Date: 23-11-2022

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

Name of the supervisor: Dr. (Mr).P.M.Edirisinghe

Signature of the supervisor: Date: 23-11-2022

Name of the supervisor: Dr. (Mrs).S.C.Mathugama

Signature of the supervisor: Date: 23-11-2022

Abstract

This report contains the analysis of secondary values of US dollar foreign exchange rate (LKR per USD), Gold price (LKR per Troy ounce), Oil price (LKR per barrel), Silver price (LKR per Metric Ton), and Stock return (All Share Price Index) in Sri Lanka. The purpose of this study is to find the relationship among these variables and forecast the US dollar foreign exchange rate in Sri Lanka. This study has used the EViews8 data analysis package to develop time series models to identify the significance of the relationship between exchange rate and other factors using monthly data from October 2000 to December 2019. Log transformed first differenced series were used in Autoregressive Conditional Heteroskedasticity/ Generalized Autoregressive Conditional Heteroskedasticity modeling. The best model fits for the exchange rate was an exponential GARCH model with EGARCH (2,2). All variables were significant at the 5% level of significance and free from the serial correlation/ heteroskedasticity. The model is sufficient but residuals are not normal. Finally, USD forecasting was done for January to December 2019 using the best fitted model. The mean average percentage error value (5.27%) is in between the highly accurate range (0%-10%).

Key Words: US dollar, ARCH, GARCH, EGARCH, conditional heteroskedasticity

Acknowledgement

The successful completion of this project would not have been possible without the kind support and efforts of many dedicated personals. I would like to extend my sincere thanks to all of them.

My heartfelt gratitude is extended to my supervisor, Dr. Pasan Edirisinghe, Senior Lecturer in Mathematics, Faculty of Engineering University of Moratuwa and Dr. Samanthi Mathugama, Senior Lecturer in Mathematics and Statistics, Division of Interdisciplinary Studies, Institute of the Technology University of Moratuwa for the continuous support given to my research related work, for their patience, motivation, and immense knowledge.

I would like to convey my sincere thanks to Dr. Miuran Dencil, Senior Lecturer, in the Department of Mathematics, the University of Moratuwa for providing this valuable opportunity to conduct this research.

Finally, I would like to express my gratitude to my parents and all of my colleagues at the University of Moratuwa for their cooperation in the successful completion of this study.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

Abbreviation	Description
ACF	Auto Correlation Functions
ADF	Augmented Dickey and Fuller
APGARCH	A power of Generalized Autoregressive Conditional Heteroskedasticity
ARCH	Autoregressive Conditional Heteroskedasticity
ARMA	Autoregressive Moving-average
ASPI	All Share Price Index
CCGARCH	Conditional Correlation Generalized Autoregressive Conditional Heteroskedasticity
EGARCH	Exponential Generalized Autoregressive Conditional Heteroskedasticity
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
GARCH-M	Generalized Autoregressive Conditional Heteroskedasticity in Mean
GED	Genaralized Error Distribution
MAPE	Mean Absolute Percentage Error
PACF	Partial Auto Correlation Functions
SVAR	Structural Vector Autoregressive
TGARCH	Threshold Generalized Autoregressive Conditional Heteroskedasticity
USD	United States Dollar
VAR	Vector Autoregressive
VECM	Vector Error Correction Model