MODELING USD/LKR EXCHANGE RATE USING TIME SERIES TECHNIQUES

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Degree of Master of Science

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Thesis submitted in partial fulfillment of the requirements for the degree Master of Business Statistics

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DECLARATION

I declare that this is my own work and this thesis/dissertation 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.

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ABSTRACT

Modeling Exchange Rate is one of the most vital and essential parts of financial econometrics. This study aimed to formulate time series models using both univariate and multivariate time series techniques. The macro-economic factors of Inflation Rate, Trade balance, Net Foreign Assets, and Foreign Remittances have been used in this study which were chosen by an extensive literature survey. Data from January 2015 to October 2022 was used in this study. A univariate model was formulated using ARIMA and ARCH/GARCH modeling techniques. The GARCH model with the mean equation which is estimated by an ARIMA (1,1,1) Model along with a dummy variable and the variance equation which is estimated by GARCH (1,0) Model was selected as the best-fitted univariate model with a R-square value 81.8%. Using ARDL modeling technique associated with ARDL bound tests for cointegration was used to formulate the multivariate model. The ARDL (3,4,3,0,0) was selected as the best-fitted model which satisfied all the assumptions along with model specifications. It was identified that there exists significant co-integration among the exchange rate and the selected macro-economic factors. Error correction model was formulated based on the selected ARDL model and according to the results, the speed of adjustment is -5.78% which means that the short-run model will be converged to the long-run equilibrium by 5.78% for each period moving forward. Among the two models selected from univariate and multivariate analysis, ARDL (3,4,3,0,0) model was selected as the final best fitted model.

Key Words: Exchange Rate, Advanced Time Series Analysis, ARIMA, ARCH/GARCH, ARDL, Cointegration

DEDICATION

This Thesis is dedicated to all the lecturers, family members and friends who encouraged and supported me through out!

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LIST OF ABBREVIATIONS

ACF	Auto Correlation Function
ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
AR	Auto Regressive
ARCH	Autoregressive Conditionally Heteroscedastic
ARDL	Auto Regressive Distributed Lag
ARIMA	Auto Regressive Integrated Moving Average
ARMA	Auto Regressive Moving Average
CPI	Consumer Price Index
CBSL	Central Bank of Sri Lanka
D(Exchange Rates (-n))	First difference of the nth lagged Exchange Rate series
D(Inflation (-n))	First difference of the nth lagged Inflation series
D(LOG_EXCHANGE_RATES)	Differenced series of log transformed exchange rates
D(NET_FOREIGN_ASSETS__LKR _BN_(-n))	First difference of the nth lagged Net Foreign Assets series
DW	Durbin Watson
ECM	Error Correction Model
Exchange Rates (-n)	nth lagged series of Exchange Rates
GARCH	Generalized Autoregressive Conditionally Heteroscedastic
GDP	Gross Domestic Product
HQC	Hannan Quinn criterion
Inflation (-n)	nth lagged series of Inflation
FIT	Flexible Inflation Targeting
LKR	Sri Lankan Rupee

MA	Moving Average
MAE	Mean Absolute Error
MAPE	Mean Absolute Percentage Error
MSE	Mean Square Error
NET_FOREIGN_ASSETS__LKR_ BN_(-n)	nth lagged series of Net Foreign Assets
PACF	Partial Auto Correlation Function
RMSE	Root Mean Square Error
SBC	Schwartz Bayesian Criterion
USD	United States Dollar
VAR	Vector Auto Regressive