

A COMPARATIVE STUDY OF EXCHANGE RATE VOLATILITY IN SRI LANKA AND INDIA

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Master of Science in Financial Mathematics

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Thesis submitted in partial fulfillment of the requirements for the degree
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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. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature:

Date: 24-Mar-2024

The above candidate has carried out research for the Master of Science in Financial Mathematics Thesis under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor: Dr. L.P.N.D. Premarathna

Signature of the Supervisor:

Date: 24-March-2024

DEDICATION

First of all this research study is dedicated to my parents, for their immense support in every way possible to achieve my academic goals. They have been supporting me to overcome the challenges on the way and protecting me from the hardship I went through during my academic journey. Second I would like to dedicate this work to My friends and colleagues who have been giving me the encouragement and emotional support needed during this whole time. For always advising me and helping in improving this study in every way possible I would like to further dedicate this to the senior staff members of my workplace.

With deepest gratitude: G.A.P.Kethmi

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ABSTRACT

Exchange rate is identified as one of the most discussed financial variables in financial time series literature. Exchange rate can be recognized as the key driving factor in the global market as the exchange rate is the financial measurement of the value of one currency in terms of another currency. Therefore, exchange rate acts as the financial medium between the countries that interact in the global market platform in the form of trade, investments etc. Exchange rate volatility can be described as the risk or the uncertainty in the exchange rate values. Anyone who is engaged in the activities of the global market would benefit from information on the future behaviour of exchange rate volatility. Hence this research aims to forecast exchange rate volatility of the US dollar Sri Lankan rupee and the US dollar Indian rupee in a multivariate framework. The predictor variables are selected under three major categories; variables representing the current account, variables representing the capital account and variables representing the volatility of the local market and foreign market. Data is collected for the period covering from December 2011 to April 2023 and according to the statistical test results, stationary behaviour, dynamic correlation behaviour and the presence of causality from each independent variable to dependent variables are exhibited in the data series. DCC-GARCH (1,1) model which captures the dynamic behaviour of the volatile time series variables is employed to forecast the exchange rate volatility of the US dollar Sri Lankan rupee and the US dollar Indian rupee. The results model result showed that US dollar Sri Lankan rupee exchange rate volatility is more sensitive to the uncertainty of the own market, while US dollar Indian rupee exchange rate volatility is more sensitive to the variables representing the current account of the country. Further, the economic uncertainty or the risk from the Western part of the world is more persistent on both of the exchange rate volatility. Model prediction accuracy results showed that the DCC-GARCH model provides more accurate results in predicting US dollar Sri Lankan rupee exchange rate volatility where Sri Lanka is an Asian frontier market compared to the DCC-GARCH prediction of US dollar Indian rupee exchange rate volatility where India is an Asian emerging market.

Keywords: Exchange Rate, Multivariate Time series, BOP, DCC-GARCH, Forecasting

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LIST OF ABBREVIATIONS

Abbreviation	Description
ACF	Autocorrelation Function
ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criterion
ANN	Artificial Neural Networks
APARCH	Assymetric Power GARCH
ARCH	Autoregressive Conditional Heteroscedasticity
ARCH-LM	ARCH Lagrange Multiplier
ARFIMA	Autoregressive Fractional Integration Moving Average
ARIMA	Autoregressive Integrated Moving Average
ARMA	Autoregressive Moving Average
ASEAN	Association of Southeast Asian Nations
ASP	All Share Price Index Returns
BIC	Bayesian Information Criterion
BOP	Balance of Payment
COi	Crude Oil Price of India
COs	Crude Oil Price of Sri Lanka
CV	CBOE Volatility index of India
DA	Deutscher Aktien Index (DAX)returns
DBN	Deep Belief Network
DCC-GARCH	Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroscedasticity
DW	Dow Jones Industrial Average returns

Abbreviation	Description
EPU	Economic Policy Uncertainty
ER	Exchange Rate
ERi	Dollar Indian Rupee Exchange Rate
ERs	Dollar-Sri Lankan Rupee Exchange Rate
FDI	Foreign Direct Investment
FFNN	Feed Forward Neural Network
FIGARCH	Fractionally Integrated GARCH
FXi	3-month Dollar Indian Rupee Exchange Rate
FXs	3-month Dollar Sri Lankan Rupee Exchange Rate
GARCH	Generalized AutoRegressive Conditional Heteroskedasticity
GJR-GARCH	Glosten Jagannathan Runkle-GARCH
GMM	Generalized method of moments
GMME	Generalized Method of Moments Estimator
HOWMA	Heavy Ordered Weighted Moving Average
HS	Hang Seng returns
IGARCH	Integrated GARCH
IRP	Interest Rate Parity
IRR/USD	Iranian Rial/USD
KNN	K-Nearest Neighbors
KPSS	Kwiatkowski–Phillips–Schmidt–Shin
LHS	Left Hand Side
LSTM	Long Short-Term Memory
MLFFNN	Multilayer Feed Forward Neural Network

Abbreviation	Description
MS	MSI Sri Lanka Index
MSE	Mean Square Error
NARX	Nonlinear Autoregressive models with Exogenous Input
NF	Nifty Returns
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Square
OWA	Ordered Weighted Averaging
POLS	Poled Ordinary Least Square
PP	Phillip and Perron
PPP	Parity Purchasing Power
PSM	Propensity Score Matching
RAR	Robust Linear Autoregressive
REER	Real Effective Exchange Rate
RHS	Right Hand Side
RLSR	Regularized Least-squares Regression
RMSE	Root Mean Square Error
RNN	Robust Neural Network
RW	Random Walk

Abbreviation	Description
SMAPE	Symmetric Mean Absolute Percentage Error
SP	S&P 20 Sri Lanka Index
SV	Stochastic Volatility
SVR	Support Vector Regression
SVX	Stochastic Volatility with Exogenous variables
TGARCH	Threshold GARCH
TVECM	Threshold VECM
UIP	Uncovered Interest Rate Parity
USD/AUD	USD Australian dollar
USD/CAD	USD Canadian dollar
USD/CED	USD Ghanian Cedi
USD/CHF	USD Swiss Franc
USD/EUR	USD Euro
USD/GBP	USD Pound
USD/IND	US Dollar Indian Rupee
USD/JPY	USD Japanese Yen
USD/LKR	US dollar Sri Lankan Rupee
USD/MXN	USD Mexican peso
VAR	Vector Autoregressive
VAT	Value Added Tax
VI	India Volatility Index

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