ANALYZING AND FORECASTING OF TEA PRICES AT THE COLOMBO TEA AUCTION USING FINANCIAL TIME SERIES

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208608M

Master of Science in Financial Mathematics

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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).

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The supervisor should certify the Thesis with the following declaration.

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: Ms.W.A.A.D.WIKRAMASINGHE

Signature of the Supervisor: Date:

DEDICATION

To my family, whose steadfast support and encouragement have been the pillars of my academic journey. Your belief in my potential and sacrifices made for my education have been my greatest motivation. To my lecturers and advisors, who have imparted invaluable knowledge and guidance throughout this Master of Science program. Your expertise in financial time series analysis has shaped my analytical skills and fueled my passion for research. I dedicate this thesis to the pursuit of excellence in the field of financial time series analysis. May it contribute meaningfully to the advancements in quantitative finance and serve as a testament to the rigorous academic standards of our Master of Science program. This work is also dedicated to the dynamic world of finance and the constant evolution of markets. May our endeavors in understanding time series dynamics contribute to better decision-making and risk management in financial institutions. Finally, to my fellow researchers, who have shared insights, challenges, and the joy of discovery. This thesis represents the collective effort and dedication of those committed to unraveling the intricacies of financial time series.
With gratitude,
T.C.Wijayalath

ACKNOWLEDGEMENT

I sincerely wish to express my deepest gratitude to everyone who supported and guided me in making this project a success. Because without them, it would not be possible to success this research project. First and foremost, I have been very grateful to my supervisor Ms.W.A.A.D.Wickramasinghe, for giving me great encouragement, guidance, support, insightful comments and suggestions. She made me strong, motivated to do a better job in the project context and enabled the success of my work balancing the stressful situations. My special gratitude goes to Mr.A.R.Dissanayake, Senior lecturer , Department of Mathematics, Faculty of Engineering, University of Moratuwa and Dr.Muran Dencil J.A.D, Senior lecturer, Department of Mathematics, Faculty of Engineering, University of Moratuwa and Mr.G.A.C.M.Karunanandha, Senior lecturer, Department of Mathematical Sciences, Faculty of Applied Sciences, Wayamba University of SriLanka. Moreover, I gratefully acknowledge to my parents, brothers, sister, teachers, and friends who were ever behind me to encourage and help to identify my potentials in my life. Finally, thank you all those who have crossed my path in my post graduate days.

ABSTRACT

Tea industry plays major role in national economy of Sri Lanka and it is the world's fourth-largest tea producer. Tea auction market in Sri Lanka is mature and therefore, the leading tea producing countries such as China, India, Indonesia and Kenya concern about Sri Lanka. Sri Lankan tea is sold through the Colombo tea auction. This study conducted in order to analyze and model the weekly tea auction prices at the Colombo tea auction based on time series analysis. The secondary data of weekly tea auction prices over the period 2015 to 2021 which collected from official website of Sri Lanka Tea Board used for this study. The tea dataset is specific to the black tea prices. The analysis is done by using R Programming. This paper employs asymmetric GARCH model to investigate the volatility and model the volatility on the tea prices at the Colombo tea auction. First of all, descriptive analysis was performed using seasonal decomposition, revealing that the data exhibits only a trend pattern without any seasonal or cyclical components. Then, the stationarity is checked by using ADF test and conditional mean model AR (1) model is fitted to differenced series. After checking residuals of the AR(1) model, conditional heteroscedasticity in residuals of fitted AR (1) model is detected using ARCH LM test. Under this effect, conditional variance model GARCH (1, 1) built to forecast the tea prices. Finally, the AR(1) - APARCH(1,1) is selected as the best for modeling tea prices by comparing information criteria (AIC, BIC and HQIC) and checking parameters and residual of the model. The accuracy of the model is measured using MAPE. MAPE of this model is 13.79% . This model has capable to capture the volatility on the weekly tea auction prices at the Colombo tea auction.

Keywords: SriLanka , Tea auction market, Residuals, Checking parameters, Information criteria

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

Abbreviation	Description
ACF	Autocorrelation function
ADF	Augmented Dickey-Fuller test
AIC	Akaike information criterion
APARCH	Asymmetric Power ARCH
AR	Autoregressive
ARCH	Auto-Regressive Conditionally Heteroscedasticity
ARIMA	Integrated Autoregressive Moving Average
BIC	Bayesian information criterion
EGARCH	Exponential GARCH
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
HQC	Hannan-Quinn criterion
IGARCH	Integrated Generalized Autoregressive Conditional Heteroscedasticity
MA	Moving Average
MAPE	Mean Absolute Percentage Error
PACF	Partial Autocorrelation Function
SAR	Seasonal Autoregressive
SARIMA	Seasonal Integrated Autoregressive Moving Average
SMA	Seasonal Moving Average
TGARCH	Threshold GARCH