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**MODELING AND FORECASTING DAILY GOLD
PRICES IN SRI LANKA**

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MSc in Business Statistics

Department of Mathematics
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Dissertation submitted in partial fulfillment of the requirements for the
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DECLARATION

I declare that this is my own work and this Dissertation 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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Date: 29.04.2025

The supervisor should certify the Dissertation with the following declaration.

The above candidate has carried out research for the MSc in Business Statistics Dissertation under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor: Dr. (Ms.) Samanthi Mathugama

Signature of the Supervisor:

Date: 29-04-2025

DEDICATION

I dedicate this dissertation to my family since I couldn't have done it without their encouragement and support. To my husband, his continuous motivational words, endless support and encouragement have made this achievement possible.

ACKNOWLEDGEMENT

First and foremost, I would like to thank Dr. (Ms.) Samanthi Mathugama, Senior Lecturer, Institute of Technology University of Moratuwa, my supervisor and advisor, for her invaluable guidance, support, knowledge and expertise throughout this research.

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ABSTRACT

Gold, a popular and precious metal, is used in a variety of industries. Its demand has significantly impacted the global economy, making it a valuable financial instrument and a low-risk, safe investment for many investors. Crises such as the 2019 Easter Sunday attacks and the 2020 COVID-19 pandemic significantly impacted the Sri Lankan economy, leading to a major economic crisis. In 2022, the Sri Lankan economy faced its most challenging period, and 2023 is seen as a year of recovery from the deepest economic crisis. As a safe-haven investment, the uncertainty and instability in the financial markets have led to increased demand for gold during this economic crisis. Therefore, it is better to approach a new model for forecasting gold prices in Sri Lanka. Accordingly, daily gold price data from January 1, 2019, to May 31, 2023, which includes the period of the economic crisis, was used for this research. This research aims to develop a high-accuracy model to forecast daily gold prices in Sri Lanka using time series analysis. First, various Autoregressive Integrated Moving Average (ARIMA) models were taken into consideration. Based on the minimum value of the Akaike's Information Criterion (AIC and AICc) with significant coefficients, the ARIMA (2,1,4) model was selected as the best one. However, it has autocorrelation and ARCH effects, proving that it is not appropriate for fully describing data. The exploring volatility clustering, using residuals of ARIMA (2,1,4), selected Autoregressive Conditional Heteroskedasticity (ARCH) model was fitted. However, the ARCH effect remains in ARCH model. Then various Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models were fitted, and the selected GARCH(2,1) model was based on the minimum value of Information Criterion (AIC and BIC) with significant coefficients. Finally, combining these two best models the ARIMA(2,1,4)-GARCH(2,1) hybrid model was fitted. Accordingly, it was identified as the best model for forecasting, based on significant coefficients and proven assumptions. The selected fitted model with 1.815% (< 10%) of Mean Absolute Percentage Error (MAPE) indicates high accuracy, and suitability for predicting future daily gold price fluctuations in Sri Lanka.

Keywords: ARIMA, GARCH, Hybrid model, Mean Absolute Percentage Error, Economic crisis, Gold price

TABLE OF CONTENTS

Declaration of the Candidate & Supervisor	i
Dedication	ii
Acknowledgement	iii
Abstract	iv
Table of Contents	v
List of Figures	viii
List of Tables	ix
List of Abbreviations	ix
List of Appendices	xi
1 Introduction	1
1.1 Background of the Study	1
1.2 Data Description	3
1.3 Significance of the Study	3
1.4 Objectives	4
1.5 Outline of the Thesis	4
2 Literature Review	5
2.1 A Review of Foreign Literature	5
2.1.1 ARIMA Model	5
2.1.2 SARIMA Model	6
2.1.3 ARCH Model / GARCH Model / ARIMA-GARCH Hybrid Models	6
2.1.4 ARIMA Model / ARIMA-GARCH Hybrid Models	7
2.2 A Review of Local Literature	8
2.2.1 ARIMA and VAR Model	8
2.2.2 GARCH Models	9
2.3 Summary	9

3	Methodology	11
3.1	ARIMA model	11
3.1.1	Data Pre-Processing, Stationary and Non-Stationary Checking	11
3.1.2	Stationarity in Linear Time Series Analysis	11
3.1.3	Augmented Dicky – Fuller Test	12
3.1.4	Differencing	13
3.1.5	Log Transformation	13
3.1.6	Autocorrelation Function (ACF)	13
3.1.7	Autoregressive Integrated Moving Average Model	14
3.2	Conditional Heteroscedastic Models	15
3.2.1	Autoregressive Conditional Heteroskedastic (ARCH) Model	15
3.2.2	Generalized ARCH (GARCH) Model	16
3.3	ARIMA-GARCH Hybride Model	16
3.4	Statistical Model Checking	17
3.4.1	Jarque-Bera Test	17
3.4.2	Ljung-Box Q Statistic Test	17
3.4.3	Testing ARCH Effect	18
3.5	Model Selection	18
3.5.1	Akaike’s Information Criterion (AIC)	18
3.5.2	Corrected Akaike’s Information Criteria (AICc)	18
3.5.3	Bayesian Information Criterion (BIC)	19
3.6	Accuracy Measures	19
4	Results and Discussion	20
4.1	Descriptive Analysis of Data Set	20
4.1.1	Evaluating Stationarity	22
4.1.2	ARIMA Model Selection	24
4.1.3	Model Diagnostics	27
4.2	Check for Heteroscedasticity (ARCH Effects)	29
4.2.1	ARCH Model Analysis	29
4.2.2	GARCH Model Analysis	30
4.3	ARIMA-GARCH Hybrid Model	33

4.4	Forecasting	34
5	Conclusion And Recommendations	36
5.1	Conclusion	36
5.2	Recommendations	36
5.3	Further Works	37
	References	38
Appendix A	R codes-Descriptive analysis of data set	40
Appendix B	R codes-Evaluating Stationarity	42
Appendix C	R codes-ARIMA Model Selection	43
Appendix D	ARCH,GARCH and ARIMA-GARCH Model Analysis	45
Appendix E	R codes-Forecasting	49

LIST OF FIGURES

Figure	Description	Page
Figure 4.1	Time series plot of daily gold price from 01/01/2019 to 31/05/2023	20
Figure 4.2	Histogram of daily gold price from 01/01/2019 to 31/05/2023	21
Figure 4.3	Time series plot of log-transformed daily gold price from 01/01/2019 to 31/05/2023	22
Figure 4.4	Time series plot of daily gold price after applying 1st difference for log-transformed data set	23
Figure 4.5	ACF plot of daily gold price after applying 1st difference for log-transformed data set	26
Figure 4.6	PACF plot of daily gold price after applying 1st difference for log-transformed data set	26
Figure 4.7	Time plot, ACF plot and Histogram for ARIMA(2,1,4) Residuals	28
Figure 4.8	ACF plot for squared residuals of ARIMA(2,1,4)	28
Figure 4.9	Test result of McLeod-Li test	29
Figure 4.10	PACF plot for squared residuals of ARIMA(2,1,4) model	30
Figure 4.11	The plot of Forecasted gold prices with Actual prices and Prediction intervals	35

LIST OF TABLES

Table	Description	Page
Table 4.1	Descriptive Statistics of Daily Gold Prices (2019-2023)	21
Table 4.2	Augmented Dickey-Fuller Test Results for Log-Transformed Gold Price Data	22
Table 4.3	Augmented Dickey-Fuller Test Results for First-Differenced Log-Transformed Gold Price Time Data	23
Table 4.4	ARIMA Model Selection Results Based on BIC, AIC and AICC	24
Table 4.5	Estimated Coefficients for ARIMA(4,1,4) Model	25
Table 4.6	Estimated Coefficients for the Selected ARIMA(2,1,4) Model	27
Table 4.7	Ljung-Box Test Results for ARIMA(2,1,4) Residuals	27
Table 4.8	Jarque-Bera Test Results for ARIMA(2,1,4) Residuals	28
Table 4.9	LM Test results with p-value	30
Table 4.10	Comparison of GARCH Model Information Criteria	30
Table 4.11	Diagnostic Test Results for GARCH(2,2) Model	31
Table 4.12	GARCH(2,2) Model Coefficients	31
Table 4.13	GARCH(2,1) Model Coefficients	32
Table 4.14	Diagnostic Test Results for GARCH(2,1) Model	32
Table 4.15	ARIMA(2,1,4)-GARCH(2,1) Model Coefficients with p-values	33
Table 4.16	Diagnostic Test Results for ARIMA(2,1,4)-GARCH(2,1) Model	33
Table 4.17	Forecasted Gold Prices and Accuracy Results	35
Table D.1	ARCH(1) Model Coefficients	45
Table D.2	Diagnostic Test Results for ARCH(1) Model	45
Table D.3	ARCH(2) Model Coefficients	46
Table D.4	Diagnostic Test Results for ARCH(2) Model	46
Table D.5	GARCH(1,1) Model Coefficients	47
Table D.6	Diagnostic Test Results for GARCH(1,1) Model	47
Table D.7	GARCH(1,2) Model Coefficients	47
Table D.8	Diagnostic Test Results for GARCH(1,2) Model	48

LIST OF ABBREVIATIONS

Abbreviation	Description
ACF	Autocorrelation Function
ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criterion
AICc	Corrected Akaike's Information Criteria
ARCH	Autoregressive Conditional Heteroskedasticity
ARIMA	Autoregressive Integrated Moving Average
ARMA	Autoregressive Moving Average
BIC	Bayesian Information Criterion
C-ARCH	Component ARCH
EGARCH	Exponential GARCH
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
MAE	Mean Absolute Error
MAPE	Mean Absolute Percentage Error
Max AE	Maximum Absolute Error
MCX	Multi Commodity Exchange
PGARCH	Power GARCH
RMSE	Root Mean Square Error
SARIMA	Seasonal Autoregressive Integrated Moving Average
USD	United States Dollar
VAR	Vector Auto Regressive

LIST OF APPENDICES

Appendix	Description	Page
Appendix -A	R codes-Descriptive analysis of data set	40
Appendix -B	R codes-Evaluating Stationarity	42
Appendix -C	R codes-ARIMA Model Selection	43
Appendix -D	ARCH,GARCH and ARIMA-GARCH Model Analysis	45
Appendix -E	R codes-Forecasting	49