

**TIME SERIES ANALYSIS FOR MODELLING
EARNINGS THROUGH TOURISM AND WORKERS'
REMITTANCES IN SRI LANKA**

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

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February 2024

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. 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 above candidate has carried out research for the Master's thesis/dissertation under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor:

Signature of the Supervisor:

Date:

DEDICATION

The thesis is dedicated to all who helped and encouraged me through this journey.

ACKNOWLEDGMENT

First, I would like to express my thankfulness to the people who supported me in finishing this thesis and especially very grateful to my supervisor Dr. Samantha Mathugama Senior Lecturer of the Institute of Technology University of Moratuwa, for her guidance and support during the entire period.

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ABSTRACT

Sri Lanka is considered as a middle-income country with a negative trade balance and the main foreign cashflows through workers' remittances, exports, foreign direct investments, and tourism. These key sources play a major role in the Sri Lankan economy and the COVID-19 pandemic became a massive threat because Sri Lanka is hugely dependent on foreign reserves. This study was conducted to analyze the characteristics of workers' remittances and earnings from tourism before and after the COVID-19 pandemic, then to forecast workers' remittances and tourist earnings to get some idea of loss of foreign income and its relationship with economic growth. The official web database of the Central Bank of Sri Lanka was used as the data source for modeling workers' remittances and tourist earnings (monthly 2010-2022). To identify the relationship between workers' remittances and tourist earnings to economic growth, yearly data from 1998 to 2018 was extracted using annual reports of the Central Bank of Sri Lanka and Sri Lankan Tourism Development Authority statistical reports. EViews and Minitab software were used for the analysis and the ARIMA Box-Jenkins approach was followed to find the best fitted models. SARIMA(3,1,3)(1,1,1)₁₂ - GARCH(1,0) model was found to be the best-fitted model for forecasting tourist earnings and SARIMA(0,1,1)(0,1,1)₁₂ was for workers' remittances. Based on the fitted models, estimated earnings loss of US\$ 1277, 4973 and 5782 million in 2019, 2020 and 2021 years respectively from tourism. The best-fitted model for workers' remittances was not enough for predictions after 2019 because the model only contained the moving average process part. It has to be remodeled using predicted values. When considering the relationship between workers' remittances and tourist earnings to economic growth (GDP), no indication of causation between GDP, workers' remittances and tourism earnings. To identify the long and short-run relationship and to check the stability of the long-run relationship, the Vector Error Correction Model was fitted. The long-run cointegration equation coefficients were significant and not stable according to the VECM results. Therefore, it was not suitable for policy-making decisions and needed to be tested using other variables.

Keywords: Workers' Remittances, Tourism Earnings, Time Series Analysis, VECM

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LIST OF ABBREVIATIONS

Abbreviation	Description
ACF	Autocorrelation Function
ADF	Augmented Dickey-Fuller
ADS	Average Duration of Stay
AIC	Akaike Information Criteria
ANN	Artificial Neural Networks
AR	Autoregressive
ARCH	Autoregressive Conditional Heteroscedasticity
ARDL	Autoregressive Distributed Lag
ARIMA	Autoregressive Integrated Moving Averages
ARMA	Autoregressive Moving Averages
ASTD	Average Spending per Tourist per Day
BIC	Bayesian information criteria
CPI	Consumer Price Index
DW	Durbin-Watson Statistic
ECM	Error Correction Model
EFT	Earnings from Tourism
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GDP	Gross Domestic Production
GNP	Gross National Product
HQ	Hannan-Quinn information criterion
KPSS	Kwiatkowski-Phillips-Schmidt-Shin
MA	Moving Average
MAE	Mean Absolute Error
NTA	Number of Tourist Arrivals
MAPE	Mean Absolute Percentage Error
OLS	Ordinary Least Squares
PACF	Partial Autocorrelation Function

PP	Phillips-Perron
RMSE	Root Mean Squared Error
SARIMA	Seasonal Autoregressive Integrated Moving Average
SC	Schwarz Criterion
SMA	Seasonal Moving Average
TTCI	Travel and Tourism Competitive Index
VAR	Vector Autoregressive
VEC	Vector Error Correction
VECM	Vector Error Correction Model