TIME SERIES FORECASTING OF POST-WAR TOURISM PROSPECTS FOR SRI LANKA

Sebastian Reyalt Gnanapragasam

(148377 K)

Dissertation submitted in partial fulfillment of the requirements for the degree Master of Science in Operational Research

Department of Mathematics

University of Moratuwa

Sri Lanka

June 2016

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.

Also, I hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my dissertation, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature: Date: 22-06-2016

The above candidate has carried out research for the Masters Dissertation under my supervision.

Name of the supervisor: Mr. T. M. J. A. Cooray

UOM Verified Signature

Signature of the supervisor: Date: 23/06/2016

ABSTRACT

Tourism plays a big role in the development of a country in terms of economics as it is one of the biggest and fastest-growing economic sectors in the world. It accounts for a large part of Gross Domestic Product of any country through Foreign Exchange. This study focused on international tourist arrivals to Sri Lanka. In the past, nearly three decades, Sri Lanka had to face conflict within the country. Tourists had less interest of visiting Sri Lanka, mainly due to the uncertainty of security. Nevertheless, the internal conflict is over and tourist arrivals have dramatically increased over last six years.

The aim of this study is to investigate the impact of internal conflict in Sri Lanka for tourist arrivals by splitting the entire time frame by *before* and *after* the conflict as two windows. Further this study discusses the factors which are influenced by tourism in Sri Lanka. The data for the study is extracted from the annual reports of the Sri Lanka Tourism Development Authority.

Time series models are developed in two separate time windows by using the methods: Holt-Winters' Exponential Smoothing, Seasonal Autoregressive Integrated Moving Average (ARIMA) modeling, State Space modeling and Dynamic Transfer Function modeling. All necessary tests are carried out for model development, diagnostic checking and forecast.

In the empirical study, behavior of arrivals with its trend and seasonal patterns are analyzed, best models are developed based on the accuracy of fitted models in terms of Mean Absolute Percentage Error (MAPE) values and the impact of the factors influenced by tourism are deeply discussed. MAPE values for the recommended models for *after* the conflict are less than 7%. In both windows, Seasonal ARIMA method performs the best. Moreover it is estimated by ex-post forecast that, 2.085 million international tourist arrivals can be expected in the year 2016.

Key words: ARIMA, Dynamic Transfer Function, State Space, Tourist Arrivals

Dedicated to my Father

ACKNOWLEDGEMENT

Behind the success of my research work, there are many people who deserve my wholehearted gratitude.

To begin with I extend my sincere thanks to my advisor Mr. T. M. J. A. Cooray, Senior Lecturer in the Department of Mathematics, University of Moratuwa, who stood like a shadow, for his scholarly guidance and encouragement. His advice and narration provided an excellent environment for me to conduct my research successfully.

I would like to be grateful to the Head of the Department of Mathematics, Programme Coordinator and the Teaching Panel of the M. Sc in Operational Research degree programme at the University of Moratuwa.

My sincere thanks also goes to the Vice Chancellor of the Open University of Sri Lanka, Dean of the Faculty of Natural Sciences, Head of the Department of Mathematics and Computer Science for granting permission to follow this Master degree programme. Furthermore, I must thank all the staff members in the Department of Mathematics and Computer Science for their support in numerous ways to complete this post graduate study on time.

It would not be possible for me to do this research work without the support of my family. Therefore, I take this opportunity to thank my dearest wife S. Parimala Devi, who was there to render help whenever I felt so downhearted and always being there for me.

Finally, I offer my sincere gratitude for everyone else of whose name I might have forgotten to mention.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

Abbreviation	Description
ACF	Auto Correlation Function
AD	Anderson Darling
ADF	Augmented Dickey Fuller
AIC	Akaike information criterion
AR	Autoregressive
ARMA	Autoregressive and Moving Average
ARIMA	Autoregressive Integrated Moving Average
D1Y	1^{st} difference of Y
D12D1Y	12^{th} differences of D1Y
DES	Double Exponential Smoothing
DTF	Dynamic Transfer Function
DW	Durbin Watson
FE	Foreign Exchange
GDP	Gross Domestic Product
HW	Holt Winters
KS	Kolmogorov Smirnov

LM	Lagrange's Multiplier
LOG	Logarithm
MA	Moving Averages
MAPE	Mean Absolute Percentage Error
PACF	Partial Auto Correlation Function
SAS	Statistical Analysis Software
SBC	Schwartz's Bayesian Criterion
SES	Single Exponential Smoothing
SLTDA	Sri Lanka Tourism Development Authority
SQRT	Square root
SS	State Space
SSE	Sums of Squares of Residuals
VAR	Vector Autoregressive

LIST OF APPENDICES