FORECASTING TOURIST ARRIVALS IN SRI LANKA

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1. INTRODUCTION

Tourism is one of the most fast-growing industries in Sri Lanka. Sri Lanka has been a popular tourist destination since ancient times due to its natural beauty. This industry is one of the main foreign income generators of the country. The government started the development of the tourism industry in 1937 when the Ceylon Tourist Bureau was established. However, due to the World War II, the tourism industry was closed down. After Sri Lanka regained independence, the government worked on promoting tourism in Sri Lanka by re-establishing the Ceylon Tourist Board. In October 2007, the Sri Lanka Tourist Board was replaced by the Sri Lanka Tourism Development Authority (SLTDA).

In 1966, there were 18,969 tourist arrivals in Sri Lanka and arrivals showed an upward trend until 1982. Tourist arrivals increased by 24% per annum from 1976 to 1982. But after the beginning of the civil war, the growth of arrivals declined, which lasted for over 25 years until the war ended in 2009 when arrivals showed a 300% growth for the next six years.

Nature spots, flora and the climate of the country are some of the more important tourist attractions. Wildlife in Adam's Bridge, Angamedilla, Bundala and Horagolla; beaches in Tangalle, Beruwala, Mirissa, Arugam Bay, Pasikudah, Hikkaduwa and Negombo for swimming, surfing, boating, underwater photography and scuba diving; botanical/ zoological gardens such as the Royal botanical garden and Hakgala botanical garden; and other attractions such as the Pinnawala elephant orphanage, the heritage site of the Temple of the Tooth Relic, Dambulla caves and Anuradhapura ruins, as well as sports and adventure sports and activities such as hiking, diving, deep sea fishing and whale watching contribute to the country's attraction for tourists. Festivals, handicrafts, and local and traditional food are other areas that attract tourists.

By developing the tourism industry, it is possible to bring more foreign income into the country. If information about future tourist arrivals is available, it will be easier for the relevant authorities to manage the facilities they are required. Therefore, this study was conducted to forecast tourist arrivals from the country with the highest number of arrivals to Sri Lanka between 2010 and 2017. For this, tourist arrivals are analysed according to the country of residence and the country from which there was highest number of arrivals in Sri Lanka was selected for the forecast.

1.1. LITERATURE REVIEW

Konarasinghe (2016) studied tourist arrivals from five Western European countries and forecast them using decomposition techniques. Data for this study was taken from the annual reports of the Sri Lanka Tourism Development Authority, and it looked at the monthly arrivals from the United Kingdom, Germany, France, Netherlands and Italy from January 2008 to December 2014. Time series plot and Autocorrelation Function were used to recognise the pattern of arrivals. Residuals plots and the Anderson Darling test was used to validate the model. One-way Analysis of Variance (ANOVA) was used to compare the mean number of arrivals from the selected five countries. Finally, both Additive and Multiplicative Decomposition models were recommended for forecasting.

Gnanapragasam (2018) studied Holt-Winter's and Box Jenkin's methodologies for tourist arrivals in Sri Lanka, and both methodologies were compared. In the study, only the post-conflict series of tourist arrivals was taken. The ADF test was used to test whether the test has a unit root because it helps to determine whether the process is stationary. The Kruskal-Wallis test

was used to check the existence of seasonal patterns while the Autocorrelation Function and Partial Autocorrelation Function were examined to determine the nature of the process. He concluded that Box-Jenkin's method outperforms Holt-Winter's method by considering the accuracy of the two methods. Finally, SARIMA $(0,1,1)$ $(0,1,0)_{12}$ was recommended as the best model for forecasting.

Priyangika et. al. (2016) studied the ARIMA and GARCH models for modelling and forecasting tourist arrivals in Sri Lanka. Data was collected from January 2000 to December 2004, and there was a heteroscedasticity problem. To overcome this problem, Box-cox transform was used in the SARIMA model approach. AIC values were used to select the models and the Mean Absolute Percentage Error, Mean Absolute Error, and Root-mean-square deviation values were used to measure the performance of selected models. SARIMA$(3,1,3)(1,0,1)_{12}$, SARIMA$(3,1,4)(1,0,1)_{12}$ and SARIMA$(0,1,3)(1,0,1)_{12}$ models were selected based on minimum AIC values, and it was suggested that the SARIMA model was not suitable for the forecasting of tourist arrivals for the used dataset. Then ARCH(1) with LAG(2,7,12), ARCH(1) with LAG(2, 12) and ARCH(1) with LAG(4,7,12) were selected using the original dataset. Finally, ARCH(1) with LAG(2,7,12) was selected as the model for forecasting.

Kurukulasooriya & Lelwala (2014) studied time series behaviour of tourist arrivals in Sri Lanka. Data was considered from July 2009 to July 2013, which were extracted from the annual reports of the Tourist Authority in Sri Lanka. The Mann-Kendall test was used to check the existence of the linear trend while the Kruskal-Wallis test was used to check the seasonality of arrivals. A linear trend model and an exponential trend model were obtained, and a linear trend model was selected by comparing them. After the Kruskal-Wallis test, it was concluded that the series is not stationary and that the seasonal concentration for Sri Lanka had declined in the post-war period. South Asia and Western Europe were found to be major sources of tourist arrivals, and some recommendations were given to increase the arrivals and minimise the negative effects in this study.

Kodippili & Senaratne (2017) studied tourist arrivals in Sri Lanka and investigating the seasonal ARIMA model and its usefulness in forecasting monthly arrivals was the main objective of this study. Arrivals data from June 2009 to March 2017 were collected and data was predicted for one year. Finally, Seasonal ARIMA$(4,0,0)(0,1,0)_{12}$ was selected as the best model and forecasted values with a 90% confidence interval were presented.

2. METHODOLOGY

The Box-Jenkins methodology was used in this study. It consists of four steps, which are the identification of the preliminary specification of the model, estimation of the parameters of the model, diagnostic checking of the model adequacy and forecasting future realisations.
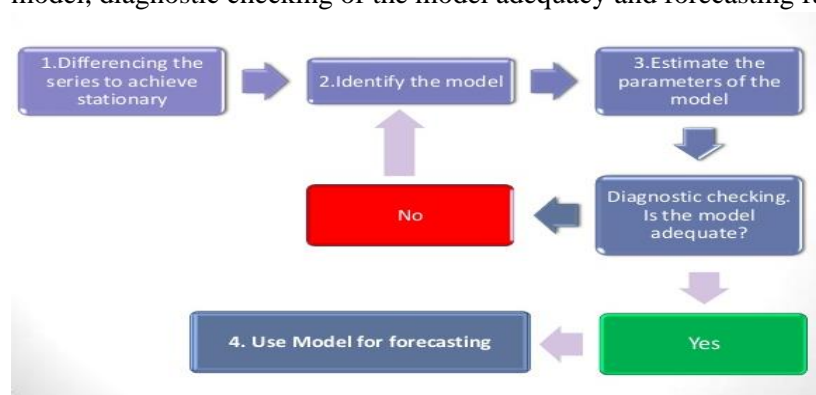

Figure 1: Box-Jenkins Approach

3. RESULTS AND DISCUSSION

The data was obtained from the annual reports of the Sri Lanka Tourism Development Authority and annual arrivals between 2010 and 2017 were analysed by the country of residence such as North America, Latin America and the Caribbean, Western Europe, Eastern Europe, Africa, Middle East, Asia and Australasia. It is clear that the greatest number of arrivals were from Asian countries. Thus, 11 Asian countries – China, India, Indonesia, Japan, South Korea, Malaysia, Maldives, Pakistan, Philippines, Singapore and Thailand were selected to investigate the country from which Sri Lanka had the most number of tourist arrivals. India demonstrated the highest number o f tourists to Sri Lanka, and the monthly arrivals from 2010 to 2017 were selected to forecast arrivals in Sri Lanka.
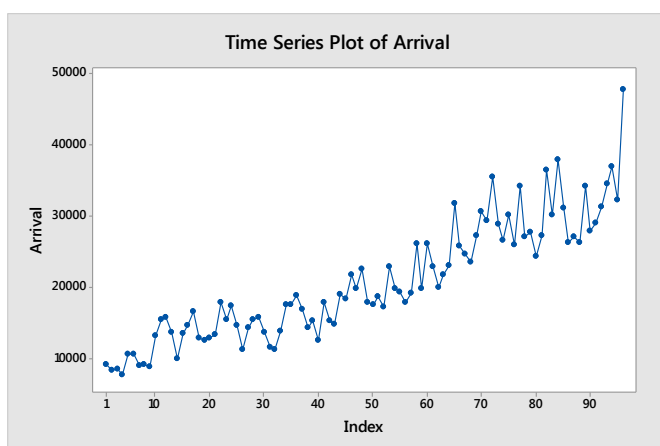

Figure 2: Time Series Plot of Arrivals from India

ACF was considered and it was clear that there was a trend pattern that would need a trend difference to be performed. After that, ACF and PACF were considered and it was concluded that the series was stationary. SARIMA$(1,1,1)(1,0,2)_{12}$ was selected as the tentative model.

The final estimate of parameters concluded that the AR1 term was not significant and then eliminated. The final model for forecasting was identified as SARIMA$(0,1,1)(1,0,2)_{12}$ after considering the randomness of residuals, parameter redundancy and normality of residuals. It was clear that residuals are random, there was no parameter redundancy and residuals are normal. Hence, 5 models were selected to calculate MAPE and MAD values.

Table 1: MAPE and MAD values for selected 5 SARIMA models

Model	MAPE Value	MAD value
SARIMA$(0,1,1)(1,0,2)_{12}$	12.8024	3930
SARIMA$(0,1,0)(1,0,2)_{12}$	16.14806	4883
SARIMA$(0,1,1)(0,0,2)_{12}$	9.50763	3044
SARIMA$(0,1,1)(1,0,1)_{12}$	9.854343	3109
SARIMA$(0,1,1)(1,0,0)_{12}$	8.763863	2864

By looking at Table 1, it is clear that SARIMA$(0,1,1)(1,0,0)_{12}$ has the minimum MAPE and MAD value. Hence, it was concluded that the best model is SARIMA$(0,1,1)(1,0,0)_{12}$ to forecast tourist arrivals from India.

Table 2: Forecast Arrivals and Actual Arrivals for 2 years

Month	2018		2019	
	Forecast Arrivals	**Actual Arrivals**	**Forecast Arrivals**	**Actual Arrivals**
January	36987.3	37936	42500.3	40049
February	32385.9	32914	38137.4	32286
March	33101.8	30583	38816.1	34812
April	32388.8	29860	38140.1	23431
May	39826.1	42073	45191.9	11246
June	33823.3	32971	39500.3	15048
July	34932.7	31032	40552.1	18309
August	37031.9	32115	42542.5	37568
September	40123.9	32300	45474.2	28917
October	42508.5	38169	47735.2	33217
November	38001.9	39137	43462.2	31677
December	52741.0	45797	57437.3	48442

4. CONCLUSIONS/ RECOMMENDATIONS

This study was undertaken to forecast tourist arrivals from the country that produced the highest number of tourists to Sri Lanka between 2010 and 2017. It found that most arrivals were from Asian countries and from among the selected 11 Asian countries, India indicated the greatest number of arrivals to Sri Lanka within the period from 2010 to 2017. According to the results obtained, $SARIMA(0,1,1)(1,0,0)_{12}$ is the best model to forecast tourist arrivals from India.

In this study forecasting was done for only two years – 2018 and 2019. The actual arrivals in the years 2018 and 2019 were compared with the forecasted values. Therefore, this study will help to identify the strategies outlined in the "Tourism Strategic Plan 2017-2020" that will affect the actual arrival and to look for reasons not to influence them with a better approach.

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