FORECASTING TOURIST ARRIVALS TO SRI LANKA FROM WESTERN EUROPE

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INTRODUCTION

Sri Lanka was re-emerging after defeating terrorism, ending Sri Lanka's 30-year conflict, investing in infrastructure and emphasizing its natural beauty. Over the past years international tourism in Sri Lanka has shown growth in two ways; volume and value. This study concerns about the growth of volume. The Sri Lankan tourism market consist all regions in the world. The Western Europe is one of the highest tourist producers to Sri Lankan tourist market. Tourist arrivals from Western Europe have increased from 105748 in second half of 2009 to 278402 in second half of 2014 (SLTDA, 2014). The boom is clearly shown by Figure 1.

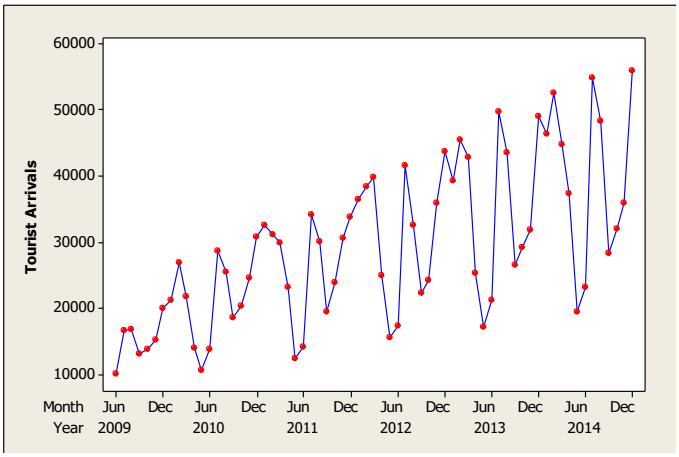

Figure 1. Time Series Plot of arrivals from Western Europe

Research Problem

Forecasting is an essential planning tool that helps any industry to cope with the uncertainty of the future. Finding appropriate forecasting techniques is essential for planning at all levels in any organization (Witt and Witt, 1995); (Song and Li, 2008); (Song and Witt, 2006). With the increasing of tourist arrivals from Western Europe, it is important to find a suitable method of forecasting tourist arrivals. It has been observed that rare attempts were made to forecast tourist arrivals from Western Europe to Sri Lanka. Therefore, the current study was focused on identifying the suitable, statistical model for forecasting tourist arrivals from Western Europe to Sri Lanka.

METHODOLOGY

Yi-Yi (2010) and Chau, (1970) have applied the Auto Distributed Lag Model (ADLM) approach for forecasting tourism income and employment. Konarasinghe (2015) has used the same technique for forecasting tourism income of Sri Lanka. The objective of the study is to fit a suitable forecasting technique. The study concerned ADLM on transformed data. The tested model is;

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$$\ln Y_t = \alpha + \beta_1 \ln Y_{t-1} + \varepsilon_t \quad (1)$$

Monthly tourist arrival data from Western Europe from the year 2009 to 2014 were obtained from statistical reports of 2009 and 2014, Sri Lanka Tourism Development Authority (SLTDA). The study concerned the period of post-war, which is after June; 2009. One way Analysis of Variance (ANOVA) technique was used for overall model testing and t-test was used for individual parameter testing. The residual plots, Anderson-Darling, and Durbin-Watson tests used to test the independence and normality of residuals in model validation criterion. Forecasting ability of the models was assessed by Mean Absolute Percentage Error (MAPE), Mean Square Error (MSE) and Mean Absolute Deviation (MAD).Three measurements of errors as follows;

$$MAPE = \frac{1}{n}\sum \left| \left(\frac{Y_t - F_t}{Y_t} \right).100 \right| \quad (2)$$

$$MAD = \frac{1}{n}\sum \left| \left(Y_t - F_t\right) \right| \quad (3)$$

$$MSE = \frac{1}{n}\sum \left(Y_t - F_t\right)^2 \quad (4)$$

Where; Y_t = Observed value of time t, F_t= Forecasted value of time t

RESULTS AND DISCUSSION

Box and whisker plot showed no outliers. A number of lags for the model were decided with the help of, Auto Correlation Function (ACF). The ACF confirmed that only one lag is significant. Then the model tested with one lag, as follows:

$$\ln Y_t = \alpha + \beta_1 \ln Y_{t-1} + \varepsilon \quad (5)$$

The ANOVA output of the above model presented in Table 1.

Table 1. ANOVA table for model

Source	DF	SS	MS	F	P
Regression	1	2.8343	2.8343	27.35	0.000
Residual Error	47	4.8703	0.1036		
Total	48	7.7046			

P value of ANOVA (0.000) is less than the significance level (α =0.05). It clearly showed that there is a linear relationship between the variables $\ln Y_{t-1,}$ with $\ln Y_t$. The next step of the study was to test the individual regression coefficient. The results available in table 2.

Table 2. Summary table for regression Coefficients

Predictor	Coef	SE Coef	T	P
Constant	3.862	1.187	3.25	0.002
$\ln Y_{t-1}$	0.6143	0.1175	5.23	0.000

The results of table 2 revealed that variable with lag one was significant. The residual plot shows the independence of residuals. The Durbin-Watson test also supported the same. The Anderson-Darling test results were P = 0.156. It confirmed the normality of residuals. It is clear that the model completed all validation criterions. The fitted model is;

$$\ln Y_t = 3.86 + 0.614 \ln Y_{t-1} \quad (6)$$

Table 3 gives the summary outputs of the model. According to the results, the MAPE of the model was 2.6% in fitting and 2.7% in verification. The MAD and MSE also very small. But the Adjusted R^2 value is not satisfactory.

Table 3. Summary outputs of model fittings and model verifications

Model	Model Fitting		Model Verification	
$\ln Y_t = 3.86 + 0.614 \ln Y_{t-1}$	R-Sq(adj)	35.4%		
	MAPE	2.64	MAPE	2.73
	MAD	0.263708	MAD	0.289752
	MSE	0.0993932	MSE	0.130226
	Normality	0.156		
	Independence	Yes		

Figure 2 shows that actual arrivals and fits are closer to each other. Figure 3 shows the same in actual and forecast.

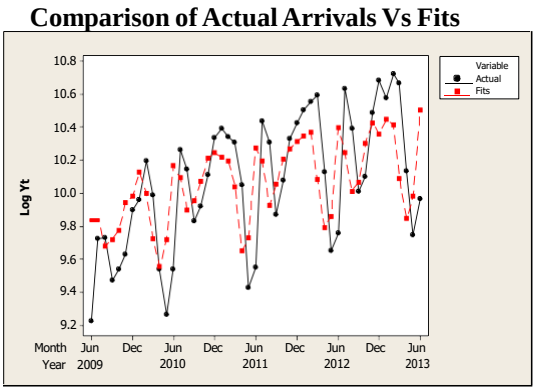

Figure 2. Actual Arrivals Vs Fits

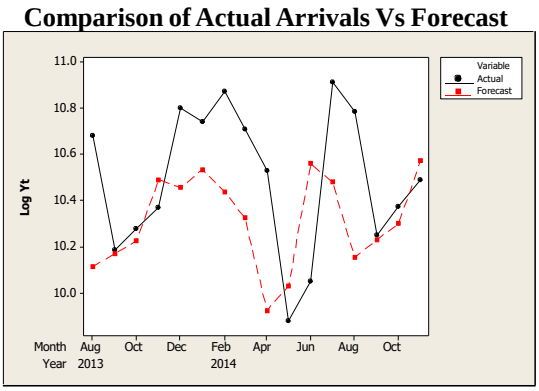

Figure 3. Actual Arrivals Vs Forecast

CONCLUSIONS / RECOMMENDATIONS

This study was focused on fitting a suitable model on forecasting tourist arrivals from Western Europe to Sri Lanka. The ADLM was tested with log transformation for the post-war period in Sri Lanka. The model with lag one completed all model validation criterions. The MAPE is below 3%other measurements of errors also shown small deviations. The study concluded that ADLM with log transformation with lag one is suitable in forecasting tourist

arrivals from Western Europe in Sri Lanka. Further, it is recommended to test the Circular Model in order to capture the seasonal or cyclical patterns, if any.

REFERENCES

Chau, L. C. (1970). An econometric model for forecasting income and employment in Hawaii. Economic Research Center, University of Hawaii.

Konarasinghe, K.M.U.B. (2015). Model-Based Analysis of International Tourism Income of Sri Lanka: Post-War Period: Conference Proceedings of the Annual Academic Sessions – 2015, the Open University of Sri Lanka, 73. ISSN: 2012 -9912.

Song, H. & Witt, S. F. (2006). Forecasting international tourist flows to Macau. Tourism Management, 27: 214-224.

Sri Lanka Tourism Development Authority. (2013). Tourism Research and Statistics. Retrieve from http://www.sltda.lk/sites/default/files/Annual_Statistical_Report_2013.pdf

Witt, S.F. & Witt, C.A. (1995). Forecasting tourism demand: a review of empirical research. International Journal of Forecasting, 11: 447–475.

Yi-Yi, Chen. (2010). Autoregressive Distributed Lag (ADL) Model. Retrieved from http://mail.tku.edu.tw/chenyiyi/ADL.pdf