Ruhuna Journal of Management and Finance
Volume 1 Number 1 - January 2014
ISSN 2235-9222

Time Series Behaviour of Burgeoning International Tourist Arrivals in Sri Lanka: The post-war experience

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Abstract

This research provides a comprehensive study of time series behavior of the post-war international tourist arrivals. The empirical study is carried out based on out-bound tourist arrivals from all origins that create a demand for tourism in Sri Lanka. The time span is covers from July 2009 to June 2013. In the modeling exercise, classical time series decomposition approach is employed. Mann-Kendall test evidenced for existing linear trend while Kruskal-Wallis tests confirmed the seasonality in tourism. Thus, linear trend component and seasonal fluctuations are the two prominent components whereas multiplicative model is comparatively the most accurate model in forecasting. Tourism sector is booming after the war in Sri Lanka with an approximate increase of 1200 tourists per month. Seasonality accounts for over 85 percent of seasonal variation in arrivals and the seasonal pattern which prevailed within the war period has considerably changed to a new behaviour. According to the Gini coefficient, seasonality reached to an equilibrium after the war and hence June, July and October are tourism months. Since the seasonality is a prominent component in international tourist arrivals, the results of the study recommend necessary arrangements to minimize the negative impact of seasonality in arrivals in respective months. Therefore, different categories of travellers should be focused in low demand periods to alleviate negative impact of seasonality.

Keywords: *forecasting; seasonality; time series decomposition; tourist arrivals*

1. Introduction

Over the past six decades, world tourism has developed with continued expansion and diversification, becoming one of the largest and fastest-growing economic sectors in the world. It has been creating a positive growth for national economies for both developed and developing countries. In the same way, international tourism continued to grow in 2011, despite the global economy with increasing uncertainty, political changes in the Middle East and North Africa and natural disasters around the world. International tourist arrivals reached a record of 982 million with an increase of 4.6 percent in 2010, while receipts grew by 3.8 percent to US$ 1.03 billion (United Nations World Tourism Organization, 2011, p.7). Asia and the Pacific and Europe were the best performers in 2011.

Tourism is an important sector in most developing economies as well. It is a major source of foreign currency and makes an enormous contribution to employment due to its labor intensive nature. As such, tourism has been identified as a key sector of an economy (Tse, 2001). Wanhill (1994) argues that tourism is a demand-led industry and its influence pervades in different sectors of the economy. Basically, Tourism plays an important role in Sri Lankan economy as well as in contributing to government revenue, foreign exchange earnings, employment generation and initiation of business opportunities (Lelwala & Kurukulasooriya, 2013; Wickremasinghe & Ihalanayake, 2006). Tourism industry in Sri Lanka dates back to 1960s and has grown with uneven swings over the years. During the last three decades Sri Lankan tourism has had many setbacks mainly due to the uncertain security situation that prevailed over 30 years in the country. This situation has been further worsened by the Tsunami in 2004. The global economic recession has also had a major impact on the industry. At present, all these setbacks are resolved and the industry is booming heralding a new era. Consequently, Sri Lanka has become a globally reemerging destination with the new slogan of "Sri Lanka The Wonder of Asia"

In such a situation, a study of tourist arrival patterns i.e. time series behavior of tourist arrivals is crucial for tourism related firms to be able to take appropriate decisions for future planning. It is widely recognized that one of the most important functions of a manager at all levels in an organization is planning, and planning requires substantial information regarding the related phenomenon. The tourism demand related information (behaviour of tourist arrivals) is important for tourism planning at all levels in the tourism industry from the government to a single tourist business. The analysis of seasonal patterns, seasonal growth rates as well as trending patterns of tourist arrivals provide information to reduce the loss caused by disparities between demand and supply. In order to provide satisfactory services to tourists, market destinations need to obtain reliable forecast of future arrivals with the changing pattern of seasonality and trend.

However, still there is no such an attempt to discuss the post war tourism experience in Sri Lanka and thus the current study addresses this research issue with the aim of filling this research gap in the tourism sector in Sri Lanka. Accordingly, the key objective of this research is to study the time series behaviour of international tourist arrivals (hereafter tourist arrivals) and thereby to investigate the trend pattern and the pattern of seasonality of tourist arrivals. One of the alternative objectives is to select an appropriate forecasting model which has the capacity of accommodating trend and seasonality. Finally, it is aimed at generating three months ahead ex post forecasts.

This paper is organized as follows. The next section is a review of the relevant literature. The subsequent section describes the contextual setting and the data used in the statistical work. Then, the comments on empirical results are presented and the final section presents the conclusions.

2. Literature Review

Over the past three decades, both tourism researchers and practitioners were engaged many studies of international tourism that focus on forecasting. Fundamentally, the literature on modeling and forecasting tourism demand is huge with various types of empirical analyses. Some of the researchers apply cross-sectional data, but the majority of studies used pure time-series analytical models where the objective is for forecasting tourism demand. The literature review is in line with the objectives of this study covering some major areas as follows.

Analysis of time series behavior

Modeling trend and seasonal time series has been one of the main research endeavors for decades. In the early 1920s, the decomposition model along with seasonal adjustment was the major research focus due to work on decomposing a seasonal time series. (Holt, 1957 & Winter, 1960, as cited in Delurgio, 1998) developed a method for forecasting trend and seasonal time series based on the weighted exponential smoothing. There are various ways to estimate these components, using both parametric and non-parametric approaches (Makridakis, Wheelwright, & Hyndman, 1998). Such decomposition then allows an interpretation of the dynamic behavior of visitor arrivals in terms of the estimated components.

A variety of time series forecasting techniques has been used in analyzing tourism arrivals from a variety of sources to particular destinations. These models vary from simple naive models to more complex models such as advanced econometric models. Chu (1998) uses six time series approaches (Naïve I, Naïve II, Linear Trend, Sine Wave, Holt-Winters and ARIMA) in order to forecast tourism demand in ten countries (Japan, Taiwan, South Korea, Hong-Kong, Philippines, Indonesia, Singapore, Thailand, Australia and New Zealand), where the ARIMA method was the most accurate for nine of the ten countries in the study, when using MAPE (Mean Absolute Percentage Error) as the criteria for accuracy. Song and Li (2008) provides a comprehensive review of published studies on tourism demand modeling and forecasting since 2000. One of the key findings of this review is that the methods used in analyzing and forecasting the demand for tourism are more diverse. However, it is hard to find a study which uses classical time series decomposition in a tourism context. Wang and Lim (2005) is such a study and it explicitly compares different time series models in forecasting tourism using quarterly data and they show that weaker performance in the particular approach for quarterly data.

For short term forecasting with prominent seasonal and trend components, decomposition approach performs well (Patel, Tiwari, & Dubey, 2013; Bokhari & Ansari, 2009). Literature supports the argument that simple models outperform more complex models in time series forecasting especially for monthly data (De Gooijer & Hyndman, 2006; Suhartono, Subanar, Guritno, & Suryo, 2005). There is a research gap in applying decomposition time series approach in the context of forecasting tourism demand for Sri Lanka and thus one of the objectives of this study is to fill this research gap to some extent.

The variable, tourist arrivals is still the most popular measure of tourism demand over the past few years. Specifically, this variable is measured by total tourist arrivals from a particular origin to an exact destination. The current study proposes the same variable since the analysis of tourist arrivals give some insights in to the dynamic behavior of tourist flows.

Evaluation of forecast accuracy

Various measures of forecasting accuracy are reported in the literature. This review briefly gives some information on the evaluation of tourism demand forecasts. Makridakis and Wheelwright (1978), and Song, Stephen, and Witt (1992) are good references in the literature regarding the forecasting accuracy. Associated definitions and mathematical formulas were amended in Delurgio (1998). According to Archer (1980), different techniques have been used to make short, medium, and long-term forecasts in the endeavor of tourism forecasting. Meanwhile, in order to choose an appropriate method, forecasters need to know the time horizon required by policy makers and policy planners.

Some of the most important forecast accuracy techniques, which are widely used in the tourism literature (Wang & Lim, 2005; Petropoulos, Nikolopoulosb, Patelisa & Assimakopoulos, 2005; Kurukulasooriya & Lelwala, 2011), are MAE (Mean Absolute Error), RMSE (Root Mean Square Error), and MAPE (Mean Percentage Absolute Error). The MAPE is a relative measure that corresponds to the MAE. Lewis (1982) emphasized that the MAPE is the most useful measure to compare the accuracy of forecasts between different items or products since it measures relative performance.

3. Methods and Materials

This study entirely based on secondary data, monthly international tourist arrivals to Sri Lanka, extracted from annual statistical reports of Tourist Authority in Sri Lanka. Data consist of a time series which comprises monthly observations for the period from July 2009 to July 2013.

Time series trend analysis, seasonal factor analysis and time series forecasting are the main procedures of data analysis. It is generally believed that time-series data are composed of four elements: trend, cyclicality, seasonality, and irregularity. Not all time-series data have all these elements as in the present study. The data properties propose two main procedures for data analysis trend analysis and seasonality analysis.

Trend analysis

The long-term general direction of data is referred to as trend. This may be upward movement or downward movement in the long run. The existing trend of a time series can be determined with several statistical tools and the most simple but important is the time series plot. Time series plot visibly helps to identify not only the trend but some other time series components such as seasonality, cyclical patterns and irregular fluctuations etc. There are several ways to determine the trend in time-series data and one of the simpler but powerful tests is Mann-Kendall test.

Nonparametric Mann-Kendall test

The Mann-Kendall test is a non-parametric test for identifying trends in time series data. There are two advantages of using this test. First, it is a non parametric test and does not require the data to be normally distributed. Second, the test has low sensitivity to abrupt breaks due to in homogeneous time series. The test compares the relative magnitudes of sample data rather than the data values themselves.

The data values are evaluated as an ordered time series. Each data value is compared to all subsequent data values. The initial value of the Mann-Kendall statistic, S, is assumed to be 0 (e.g., no trend). According to this test, the null hypothesis H_0 assumes that there is no trend (the data is independent and randomly ordered) and this is tested against the alternative hypothesis H_1, which assumes that there is a trend. If a data value from a later time period is higher than a data value from an earlier time period, S is incremented by 1. On the other hand, if the data value from a later time period is lower than a data value sampled earlier, S is decremented by 1. The net result of all such increments and decrements yields the final value of S. The Mann-Kendall S Statistic is computed as given in equation (1):

$$S = \sum_{i=1}^{n-1} \sum_{J=i+1}^{n} Sign\left(T_j - T_i\right) \qquad (1)$$

Where; $$Sign\left(T_j - T_i\right) = \begin{cases} 1 \ if \ T_j - T_i > 0 \\ 0 \ if \ T_j - T_i = 0 \\ -1 \ if \ T_j - T_i < 0 \end{cases}$$

Where T_j and T_i are the values in months *j* and *i, j > i,* respectively. For $n \geq 10$, the statistic S is approximately normally distributed with the mean E(S) = 0 and with the variance.

$$\sigma^2 = \frac{n(n-1)(2n+5) - \sum t_i(i)(i-1)(2i+5)}{18}$$

Where, t_i denotes the number of ties to extent i. The summation term in the numerator is used only if the data series contains tied values. The standard test statistic Z_s is given equation (2);

$$Z_s = \begin{cases} \dfrac{S-1}{\sigma} & for \quad S > 0 \\ 0 & for \quad S = 0 \\ \dfrac{S+1}{\sigma} & for \quad S < 0 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(2)}$$

The test statistic Z_s is used as a measure of significance of trend. In fact, this test statistic is used to test the null hypothesis, H_0 . If $[Z_s]$ is greater than Zα/2, where α represents the chosen significance level, then the null hypothesis is invalid implying that the trend is significant.

The Mann-Kendall test just provides the evidence for the availability of linear trend and it is essential to estimate the trend component in statistical sense. One such prominent method is the regression analysis. A regression based trend analysis is conducted using both linear and exponential trend models that are given in equations (3) and (4).

The linear trend model:

$$Y_t = \beta_0 + \beta_1 t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3)}$$

In this model, β_1 represents the average change from one period to the next. The *exponential growth trend model* accounts for exponential growth or decay as given in equation (2).

$$Y_t = \beta_0 \times \beta_1{}^t \times \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(4)}$$

The accuracy of these trend models are determined by using mean absolute percentage error (MAPE) which is given in equation (5).

$$MAPE = \frac{1}{n}\sum\left|\left(Y_t - \hat{Y}_t\right)/\,Y_t\right| \times 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(5)}$$

Where Y_t equals the actual value at time t, $\acute{Y}_t$ equals the fitted value, and n equals the number of observations considered. If β_1 is different from zero in the above models, the trend is significant.

Analysis of seasonality

Seasonal effects depict the behavior patterns of data that occur in the periods of time of less than a year. The presence of seasonal component can be confirmed by inspecting the plot of the data and by the prior knowledge of the behavior of the time series. However, there are certain time series where the presence of a significant seasonal component is questionable. In such a situation, it requires something more than a visual inspection of the time series plot. One such method is to apply the non-parametric Kruskal-Wallis test for the outcomes that were obtained by subtracting or dividing the time series by its centered moving averages. These outcomes are supposed to contain just the seasonal and error components. If there is no specific seasonal component, the outcomes should consist of nothing but random error and thus their distribution should be the same for all seasons. The test can be conducted by using the statistics given in equation (6).

$$H = \frac{12}{N(N+1)} \sum \frac{R_i^2}{n_i} - 3(N+1) \text{ .... } (6)$$

Where; N is for the total number of rankings, R_i is for the sum of the rankings in a specific season and n_i is for number of rankings in a specific season.

According to the focus of this study, it pays remarkable attention to the analysis of monthly seasonal patterns and distributions of tourist arrivals that are observed sequentially over the post war period. If quarterly observations are used, it would be difficult to determine whether tourist arrivals for each month in any quarter had the same seasonal effects. In some quarters, we could have a mixture of high and low monthly seasonal arrivals. However, before embarking the analysis of monthly seasonal behaviour of tourist arrivals, it is unambiguously useful to examine the overall contributions and significance of seasonality to the growth in tourist arrivals over the period. Such analyses optimistically use seasonal dummy variables in time series regressions to capture deterministic monthly seasonal effects on tourist arrivals. The tourist arrival time series in Sri Lanka shows a trending pattern (see figure 1). In such cases the statistical assumptions may hold by taking the logarithmic transformation of the series, and obtain the first differences in order to remove the existing trend. It is possible to transform the original series into its growth rates by regressing the first difference of the logarithmic values of the tourist arrivals on seasonal dummy variables. The regression model to be estimated in this context is given in equation (7).

$$\Delta \log y_t = \sum_{s=1}^{12} \delta_s D_{st} = \delta_1 D_{1t} + \delta_2 D_{2t} + ... + \delta_{12} D_{12t} + \varepsilon_t \quad ...(7)$$

Where, y_t denotes monthly tourist arrivals at time t; D_{st} denotes dummy variable for seasons; δ_s denotes coefficient of the seasonal dummy variable, which measures tourist growth rate in season s; ε_t denotes independently and identically distributed stationary error term.

The dummy variable for season s is equal to 1 for observations corresponding to that season and 0 otherwise, and δ_s is a coefficient of the seasonal dummy which measures the monthly growth rate of tourist arrivals in seasons. As monthly time series data are used in this study, the total number of seasons is equal to 12. The constant term of the model is removed to avoid the dummy variable trap. Then, it can clearly be searched for monthly seasonal variation around the year.

One of the main techniques for isolating the effects of seasonality is decomposition. The decomposition methodology presented here uses the multiplicative model as its basis. The multiplicative model is given in equation (8).

$$Y_t = T \times S \times I \times C \qquad (8)$$

Where, T = trend, C = cyclicality, S = seasonality and I = irregularity.

The process of isolating the seasonal effects begins by determining T * C for each value and dividing the time-series data (T×C × S × I) by T × C.

$$Y_t = \frac{T \times S \times I \times C}{T \times C} = S \times I \qquad (9)$$

The resulting expression encompasses seasonal effects along with irregular fluctuations. After refining the time-series to result the effects of SI (Seasonality and Irregularity), a method for eliminating the irregular fluctuations can be applied, leaving only the seasonal effects. The influence of the seasonal component of time series values is identified by determining the seasonal index number associated with each season (a month in this study) of the year. The most frequently used procedure to determine seasonal index is the ratio-to-moving-average method. This method, first determined the ratio of each monthly value to the moving average centered in that month, because a moving average based on monthly (or quarterly) data for an entire year would average out the seasonal and irregular fluctuations, but not the longer-term trend and cyclical influences. Tourism months, or high seasons, are defined as months that have the corresponding average indices exceed 100.

Seasonality is often associated with seasonal demand patterns and it is important to determine how tourism demand is distributed over the years. Use of such measures like coefficient of seasonal variation and the seasonal ratio has been criticized due to the deficiency that they do not take into account the skewness of the distribution of the variable of interest (or tourist arrivals, in this case). For this reason, Wanhill (1980), Lundtorp (2001) and Nadal, Font, and Rosselo (2004) recommended the estimation and use of the Gini coefficient. The Gini coefficient and the Lorenz curve, which are well known tools for measuring income distribution or inequality, can be used to provide evidence on distribution of tourist arrivals. While the Lorenz curve is a graphical representation of the degree of inequality of the tourist arrival distribution from a particular market in any given year, the Gini coefficient provides a measurable index of inequality. Lundtorp (2001) has provided the Lorenz curve in combination with the Gini estimates. The calculation procedure can be summarized as follows.

The monthly tourist arrivals are ranked from the lowest to the highest frequency to obtain the Lorenz curve. Precisely, the Lorenz curve shows the relationship between the cumulative relative frequency of arrivals from the lowest to the highest month (y-axis) and their cumulative month (x-axis). The diagonal line represents the tourist arrival distribution, whereby all months have exactly the same number of arrivals. The tactile distribution of tourist arrivals produces the Lorenz curve for a particular year. In the extreme case where all the tourist arrivals are concentrated in one month of the year (and other months have zero tourist), the Lorenz curve would be represented by the horizontal axis and the vertical axis on the right side of the figure. Thus, the area between the Lorenz curve of a tourist arrivals and the line of equality represents the unequal seasonal distribution of tourist arrivals. The larger the area, the greater is the unequal distribution of tourist arrivals.

Theoretically, the Gini coefficient lies between 0 and 1. The closer the ratio to 0, the more equally distributed will be the tourist flows or the lower will be the degree of seasonal concentration. The Gini coefficient of a particular market can be calculated for any given year as illustrated n equation 10.

$$G = \frac{2}{n}\sum_{i=1}^{n}(x_i - y_i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

Where; n = number of fractiles (12 for monthly arrivals); x_i= rank of the fractiles; y_i= cumulative relative frequency of tourist arrivals in rank by ascending order.

Forecasting

Three-month ahead ex post forecasts are generated to validate the accuracy of the multiplicative decomposition model and then three month ahead ex anti forecasts are generated. Forecasting process involves the removing of seasonal component from the data first, and then estimating the trend component. Estimated seasonal indices and forecasted trend estimates are then used to produce three month ahead forecasts. Equation (11) can be used to derive the so called forecasts.

$$\hat{Y}_{t+1} = \hat{T} \times \hat{S} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Where $\acute{Y}_{t+1}$ the forecasted value for the $t + 1$ is time period, T and $\hat{S}$ represents trend forecast and seasonal indices respectively. Following the literature, this study utilizes the MAPE for evaluating accuracy in modeling and forecasting activity of tourist arrivals.

4. Empirical Analysis and Discussion

The empirical analysis begins with examining the time series plot of foreign tourist arrivals for the considered time period and the figure 1 illustrates the relevant time series plot. The visual impression of the figure 1 depicts that approximate linear trend pattern is existing while the obvious seasonal pattern is recognized. It further reveals that the absence of cyclical and significant irregular variations. According to the Mann-Kendall (see table 1) test for the confirmation of linear trend, the null hypothesis of "No trend" is rejected against the alternative hypothesis of "linear trend" with zero p value. The equation (12) and (13) illustrate the estimated equations for linear and exponential trend lines respectively.

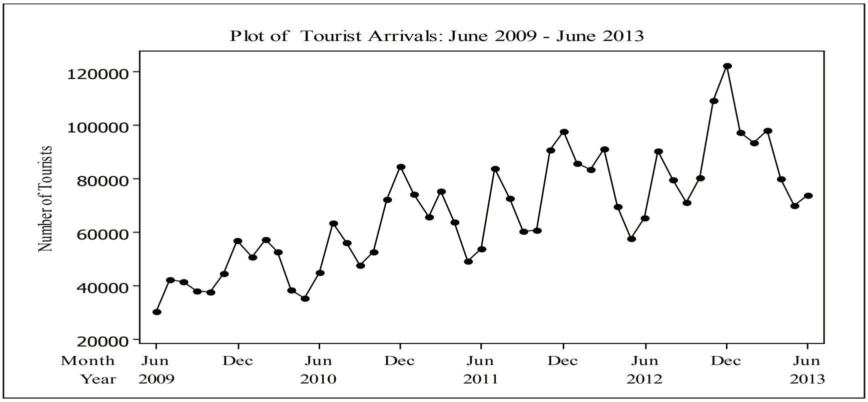

Figure 1: Plot of Tourist Arrivals from January 2009 to June 2013

Table 1: Results of Mann-Kendall Test

Hypotheses	H_0: No Linear Trend vs. H_1: Upward Linear Trend
Test Statistic	5.9560
P-Value	0.0000
Kendall Tau Statistic	0.5880

$$\hat{Y}_t = 38881 + 1146\,t \quad \ldots\ldots (12)$$

$$\hat{Y}_t = 40794.1 \times 1.01834^{\,t} \quad \ldots\ldots (13)$$

The comparison between two trend models is made using the MAPE. The value of MAPE is 7 for linear model and 18 for the exponential model. Thus, linear trend model is acceptable to describe the long-term movements of international tourist arrivals in Sri Lanka.

The next step is to evaluate the seasonality of tourist arrivals. The Kruskal-Wallis non parametric test was performed on smoothed data by taking 12 months as different treatments in the test to confirm the seasonal factor in the series and it evidently justifies the existing seasonal component at 5 percent level of significance by rejecting the null hypothesis of no seasonal difference among 12 months with p value of 0.049.

The equation (7) is estimated to analyze the monthly seasonal behavior of tourist arrivals. Since the original data is non-stationary, the first difference values are obtained to make the data stationary i.e. to obtain the data that do not contain the long term movements.

Table 2: Seasonal Growth Rates of Tourists Arrivals over the Period 2009 – 2013

Variable[1]	**Coefficient**[2]	**Std. Error**	**p-value**
D1	-0.1502	0.03744	0.0003***
D2	-0.0376	0.03349	0.2694
D3	0.0355	0.03349	0.2959
D4	-0.2439	0.03349	0.0000***
D5	-0.1447	0.03349	0.0001***
D6	0.1416	0.03349	0.0001***
D7	0.3633	0.03744	0.0000***
D8	-0.1057	0.03744	0.0073**
D9	-0.1359	0.03744	0.0008***
D10	0.0546	0.03744	0.1524
D11	0.2997	0.03744	0.0000***
D12	0.1477	0.03744	0.0003***
R-squared	0.8800	Adjusted R-squared	0.8500
F(11, 41)	27.6100	P-value	0.0000
Analysis of Residuals			
Durbin-Watson	2.0910	P-value	0.6639
Chi-Square	0.3500	P-Value	0.8366

*** indicates significance at any reasonable level of significance

Note : [1] Dummy variables represents seasonal span of 12 months in the year

[2] Seasonal growth rates

The regression line depicted in equation (7) usually requires k-1 number of dummy variables; where K is the number of regressors. In this exercise, the 12 dummy variables are included to the model and the model is estimated without the constant term to avoid the dummy variable trap. Table 2 illustrates the empirical results of equation (7).

The ordinary least squares estimates obtained for equation (7) are significant for nine out of twelve seasons (or months). There is no autocorrelation present at the model since Durbin Watson statistic is around 2 while *F* ratio is also highly significant. The residual analysis does not reject the null hypothesis of normally distributed residuals of equation (7) with the values and 0.8366 for test statistic and *p* value respectively. Therefore, the estimated model can be used to elucidate the overall seasonal behavior of tourist arrivals. Since the *R*-squared value $X^2 = 0.35$ indicates the amount of deterministic seasonality that is present in the tourist arrivals, it can be interpreted as the seasonal dummies account for over 85 percent of the variation in the growth in tourist arrivals for Sri Lanka.

Figure 2 illustrates the distribution of monthly seasonal index of tourist arrivals during the year. The visual impression of figure 2 confirms the discussion produced in the previous paragraph. It can be observed that there is an increment of tourist arrivals from January to February and April to July. For all other months there are some reductions in tourist arrivals compared to the monthly averages. The high hit is reported in July each year within the post war period while the lowest record is in December. The high hit of July contributes the highest growth rate of seasonal tourist arrivals and this maybe due to the world famous *"Kandy procession"*.

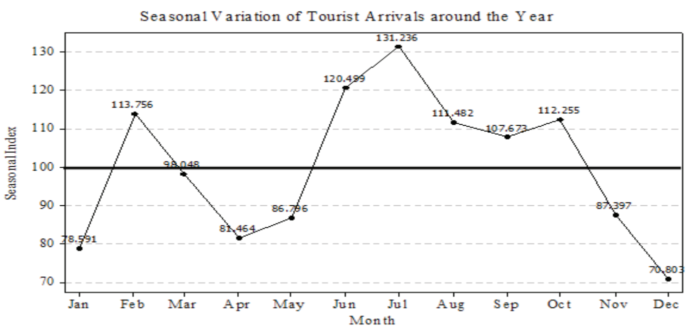

Figure 2: Distribution of the Seasonal Index of Tourist Arrivals during the Year

Tourist arrivals has significantly risen in the months of February, June, July and August while months of September and October were identified as mini peak for arrivals. The highest number of arrivals was recorded in July, with the seasonal index 131, which has moved up, recording 31 percent increase over the monthly average. Accordingly, the seasonal component is significant issue in managing tourist related businesses and thus this information is explicitly valuable for those who are engaged in tourist related industries.

Table 3: Gini Coefficients of Tourist Arrivals 2009 - 2012

Year	**2009**	**2010**	**2011**	**2012**
Gini Coefficient	0.12	0.13	0.11	0.11

The Gini coefficient was calculated for post war period to examine the seasonal pattern and values are illustrated in table 3. Gini coefficients vary from 0.11 to 0.13 and they indicate a substantial seasonal variation of the tourist arrivals distribution for the given years. However, it seems that seasonality is reaching to an equilibrium point over time.

The empirical results hitherto discussed confirm that the linear trend component and seasonal fluctuations are significant components of international tourist arrivals to Sri Lanka for the period from July 2009 to June 2013. Accordingly, three month ahead ex post forecasts are generated using the multiplicative model of classical time series decomposition approach as proposed earlier. However, these forecasts are compared with the additive model which assumes that four time series components additively form a time series observation. The comparative results are given in table 4.

Table 4: The ex post Forecasts of Time Series Decomposition in 2013

Month in 2013	**Model**	
	Multiplicative	**Additive**
July	83740.2	86425.1
August	68727.3	77702.7
September	77270.9	82343.2
	MAPE = 4	MAPE=7

These results illustrate that additive model is not appropriate for generating potential tourist arrivals since it has the highest MAPE for its accuracy compared to the multiplicative model. Moreover, additive model comparatively overestimate the future tourist arrivals. Therefore, multiplicative model is the most appropriate model in this context which makes evidence for higher accuracy than the additive model.

Accordingly, three month ahead ex ante forecasts were generated for the next three months covering July (110,961), August (98,849) and September (82,911) in 2013. The ex ante forecasts suggest that the flow of international tourists to Sri Lanka for each respective month will continue to increase and follow similar patterns of seasonal arrivals.

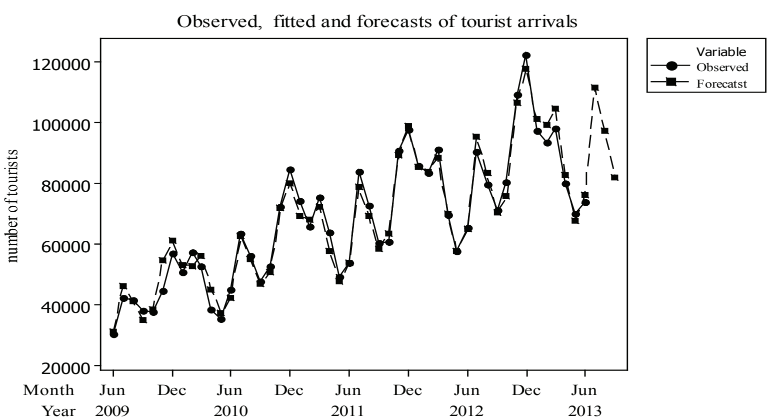

Figure 3: Fitted and Forecasts of International Tourist Arrivals

Figure 3 illustrates the relationship between actual, fitted and last three forecast values. The visual impression of the figure 2 depicts a more consistent pattern between actuals and fits while forecasts tend to remind the past patterns of international tourist arrivals. It is obvious that a similar pattern remains for future arrivals as per the ex anti forecasts. Planning is a crucial aspect of tourism management and it is vital for policy-makers and thus the importance of studying the time series behaviour of international tourism arrivals cannot be overlooked. Especially, investigation of post war international tourism demand in Sri Lanka is crucial in many respects and thus the current study is devoted for this purpose. The classical decomposition approach of time series was employed to study the behaviour of post war international tourist arrivals to Sri Lanka for the period from July 2009 to June 2013.

5. Conclusions

Tourism sector is booming after the war in Sri Lanka. Long term secular trend and seasonality are the leading components of the tourist arrival patterns in Sri Lanka within the post war period. For the forecasting endeavour, the multiplicative decomposition is the most appropriate technique when compared to its additive formation for analyzing time series behaviour of tourist arrivals. Various measures have been used to analyze seasonality. The time series regression model has shown that monthly seasonality was significant. The empirical findings further revealed that seasonality in terms of intra year monthly variations in tourist arrivals have not remained constant during the 4 year period after the war. The normalized monthly seasonal indices indicated that some of the months are tourism seasons (such as July). According to the empirical analysis, monthly seasonality in tourism demand has changed over time. This paper has also estimated alternative seasonal indicators for a comparative analysis, including the Gini coefficient. The Gini coefficient estimates indicated that the seasonal concentration for Sri Lanka is declining over the Post War period.

Just as social policy makers are interested in income distribution, tourism destination policy-makers should be concerned about tourism demand patterns and seasonal distributions, in general, and of the major tourist markets, in particular. Besides increasing marketing expenditure to attract more tourists, it is important to build a more sustainable tourism demand destinations within the country. This requires a better understanding of seasonality to enhance the operational decisions, such as capacity planning and development in many related area and planning the human resource for the peak demand periods. Alternatively, some attention should also be paid to providing off-seasonal offerings. Thus, recommendations can be made to minimize off seasonal negative impact focusing on different categories of travellers. One of the strategies may be to organize conventions and exhibitions during off peak periods. Further, forecasting of tourist arrivals can be utilized to develop an overall strategic plan specially focusing on the national level plan for sustainable tourism.

It was observed that there is a linear trend in tourist arrivals and it is more prominent compared to the exponential growth of tourist arrivals. Approximately, an increase of 1200 heads can be expected in each month. This information is crucial for tourism management bodies for their healthy survival within the industry. Therefore, developing effective marketing strategy and appropriate tourism products are vital for reviving the international tourism market.

The findings of this study can be used by authorities of tourism in Sri Lanka to produce a better tourism plan for the development of the industry. However, it should always be kept in mind that the nature of the stochastic processes may change with time and current time series model may not be appropriate for a longer time span. Therefore, it is recommended to have a periodic monitoring of the data series as well as forecasts. Forecasts should be updated whenever new information becomes available.

Current tourism arrival pattern in Sri Lanka depicts a pattern very similar to the arrival patterns in emerging markets around the world. South Asia and the Western Europe are the major current sources of tourist arrivals. Thus, some recommendations can be made for further research in this context. One such alternative is to study the tourist arrivals from an angle of the tourist's country of origin.

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