Sri Lanka – the wonder of Asia: analyzing monthly tourist arrivals in the post-war era

Nyoni, Thabani

University of Zimbabwe (UZ), Department of Economics

15 October 2019

Sri Lanka – The Wonder of Asia: Analyzing Monthly Tourist Arrivals in The Post-War Era

NYONI, Thabani

Department of Economics

Faculty of Social Studies

University of Zimbabwe

Harare, Zimbabwe

Email: nyonithabani35@gmail.com

Abstract: Using the monthly time series data, ranging over the period June 2009 to December 2018, the study applied the generalized Box-Jenkins SARIMA approach in an attempt to model and forecast international tourist arrivals in Sri Lanka. The ADF tests indicate that the tourism series is I (1). The study identified the minimum MAPE value and subsequently presented the SARIMA $(0, 1, 1)(0, 1, 1)_{12}$ model as the optimal model to forecast tourist arrivals in Sri Lanka. Analysis of the residuals of the SARIMA $(0, 1, 1)(0, 1, 1)_{12}$ model indicate that the selected model is stable and acceptable for forecasting tourism demand in Sri Lanka. The forecasted international tourist arrivals over the period January 2019 to December 2020 show a generally upward trend. In order to accommodate the forecasted growing numbers of international tourists, there is need for the construction of more infrastructure facilities.

Key Words: Forecasting, International tourism, SARIMA, Sri Lanka, Tourism, Tourist arrivals.

JEL Codes: L83, Z31, Z32, Z38

Introduction & background

Tourism has become one of the largest and fastest growing industries in the world (Amstrong *et al*, 1974; Milne & Ateljevic, 2001; Naude & Saayman, 2005; Tosun, 2001; Neto, 2003; Central Bank of Sri Lanka, 2006; UNWTO, 2014; WTTC, 2014; Geethika & Gnanapala, 2015; Sandaruwani & Gnanapala, 2016; Unhapipat & Unhapipat, 2018; Pathmananda, 2018; Dogru & Bulut, 2018). This is attributed to rising global incomes, increasing leisure time, a rising world population, fall in real transport costs, reduced travel time and globalization (Sharpley, 2000). Tourism accounts for up to 10% of the global GDP, making it the world's largest economic sector (Sloan *et al*, 2005; UNWTO, 2015). Globally, the export value of tourism has been growing over the last two decades and tourism exports exceeded $1.4 trillion in 2013. Tourism as an export sector represents approximately 6% of total global exports and ranks 4th of all economic sectors behind fuels, chemicals and automotive products as an export sector (UNWTO, 2014).

Tourism industry in Sri Lanka was formally activated in 1960s by the government in Sri Lanka (Miththapala, 2010; Ranasinghe & Deyshappriya, 2010). Today, tourism is one of the major foreign exchange generating industries in Sri Lanka (ICRA Lanka & IMACS, 2011; Fernando & Shariff, 2013) and approximately 150 000 people directly or indirectly depend on the industry for their livelihood (Fernando & Shariff, 2013). Sri Lanka tourism has recorded the highest tourism growth rate in Asia after the three decades of terrorist problems (UNWTO, 2012) and the tourism industry in Sri Lanka is considered and treated as the most promising industry in the process of development (Central Bank of Sri Lanka, 2012). The tourism industry in Sri Lanka is responsible for about 2% of the GDP and employs 0.7% of the total labour force and the industry has maintained the 4^{th} position in foreign exchange earnings (Lelwala & Gunaratne, 2008). One of the chief reasons that governments support and promote tourism through out the world is that it has a positive impact on economic growth and development (Ivanov & Webster, 2006). In the same line of thought, the nature of the tourism – economic growth nexus in Sri Lanka is better explained through the Tourism-led Growth Hypothesis (TGH) (Gamage, 1978; Tisdell & Bandara, 2004; Wickramasinghe & Ihalanayake, 2006; Ranasinghe & Deyshappriya, 2010; Srinivasan *et al*, 2012; Sriyantha *et al*, 2012; Lelwala & Kurukulasooriya, 2013; Jayathilake, 2013; Suresh & Senthilnathan, 2014; Ravinthirakumaran, 2015; Welgamage & Perera, 2015) and is well above board. Surely, there is no doubt on the positive impact of tourism on economic growth in Sri Lanka.

Sri Lanka is one of the best tourism destinations (World Travel Market, 2011; National Geographic Traveler Magazine, 2012; Lonely Planet Survey, 2012; British Airways Survey, 2012). Asian poets describe Sri Lanka as the "pearl upon the brow of India" (Konarasinghe, 2016). Sri Lanka is a beautiful tropical island in the Indian Ocean, situated at the Southern tip of India between 6^0 and 10^0 North and 80^0 to 82^0 East. It is separated from India by the Palk Strait, which is 32km wide at its narrowest (UNDP & WTO, 1993). The land area of the island is 65 610 square km with a maximum length of 432km and maximum width of 224km (Sri Lanka Info, 2011). The Southern half of the island is dominated by rugged hill country, while the Northern half is a large plain. Sri Lanka is also characterized by palm-fringed beautiful beaches on the South Western, Southern and South Eastern coastlines (Lai, 2002). As a tourism destination, Sri Lanka can compete successfully with other destinations due to its naturally strategic geographical location (Fernando, 2017). Its strategic location in the Indian Ocean on the major air and sea routes between Europe and the Far East is an advantage to the country's positioning as a global logistics hub (Sri Lanka Info, 2011). Sri Lanka boasts of a myriad of options for tourists, among them; beach destinations, favourable climate, rich cultural heritage, national parks and wildlife (Lai, 2002).

Forecasting future is one of the strongest cognitive desires of a modern human (Konarasinghe, 2016). Forecasting is very important in tourism industry (Khairudin *et al*, 2018). Accurate forecasts build the foundation for better tourism planning and administration (Yu *et al*, 2017; Wongsathan, 2018). Accurate forecasts of the demand situation in the tourism sector of the economy will help governments in formulating and implementing appropriate medium-long term tourism strategies (Song & Witt, 2006). Accurate forecasting provides direct assistance to the government and industry players to help them in making important decisions, avoiding waste and inefficiency of tourism resources, thus reducing the risk and uncertainty (Chen *et al*, 2011; Chen *et al*, 2014). Private sector actors need accurate tourism forecasts to make managerial decisions on matters such as pricing and operating strategies (Wu *et al*, 2017). The perishable nature of tourism products makes forecasting even more important especially for the player in this industry. Unoccupied hotel room and unsold flight ticket will be lost revenue. The forecast on tourist arrivals and demands enable the business to craft a better planning. For example, the hotel management can plan the best time to hire additional staff and the airline business can plan which route to be added or terminated. Long term and short term forecasting serve many purposes from determining staff and other resources, to the investment in public infrastructure and equipment (Gunter & Onder, 2014). Therefore, the prediction of tourist arrivals forms an essential part of project evaluation (Song & Witt, 2006). The forecast of international tourist arrivals in Sri Lanka is very important, especially to industry players; who need such information for decision making purposes, such as hotel chain expansion and opening of new retail branches.

The end of a three decade civil war in May 2009 begins a new chapter in Sri Lanka in general and tourism in particular (Fernando, 2016; Fernando *et al*, 2016) because the economy has bounced back strongly as evidenced by an impressive growth of approximately 8 to 6% for 2010 to 2013 (Fernando *et al*, 2016; Pathmananda, 2018). The tourism sector had already exhibited persistent resilience during the war period as evidenced by the continuous existence of tourist hotels, even though the occupancy ratio was quite low for a long period of time (O'Hare & Barrett, 1994; Tisdell & Bandara, 2004; Fernando *et al*, 2016). The present peaceful environment is greatly appreciated and is in fact a necessary condition for tourism growth (Sri Lanka Tourism Development Authority, 2016).

Objectives of the Study

i. To analyze the trends of international tourists arrivals in SriLanka over the period Jan 2013 – December 2018.
ii. To determine the optimal SARIMA model for monthly tourist arrivals in Sri Lanka.
iii. To forecast international tourists arrivals in SriLanka over the period Jan 2019 – December 2020

Relevance & Timeliness of the Study

Tourists tend to have disposable income that they are able to spend during their visits to different locations and countries (Kumar & Sharma, 2016) and by so doing, contribute significantly to economic growth of many countries and regions (Song *et al*, 2010). Tourism income indirectly improves production and results in an increase in national income (Thano, 2015). Tourism promotes job opportunities since it is highly labour intensive (Chu, 2009); promotes investment in a country's infrastructure, transfers both new technological and managerial skills into an economy as well as producing foreign currency earnings that are not only essential to import consumer goods but also to import capital and intermediate goods (Oh, 2005). Positive developments in the tourism sector can cause direct and indirect growth of household incomes and government revenues by means of multiplier effects, improving balance of payments and promoting tourism-based government policies (Khalil *et al*, 2007). Tourism consumption directly stimulates the development of traditional industries such as civil aviation, railway, highway, commerce, food, accommodation and further promotes the development of modern services such as international finance, logistics, information consultation, cultural originality, movie production, entertainment, conferences and exhibitions (Wang *et al*, 2012).

Even though tourism is paramount to economic growth and development, in SriLanka, the sector has nonetheless, received limited attention in terms of scholarly research, especially in line with SARIMA forecasting and yet it is through this model that policy makers can learn and appreciate the seasonality dynamics of international tourist arrivals in Sri Lanka. Such information is quite important for policy formulation in the tourism sector in Sri Lanka. Therefore, this lack of scholarly work on forecasting monthly tourists arrivals in Sri Lanka is the main motive behind this paper. Since tourism is the economic powerhouse of Sri Lanka, estimating monthly tourist arrivals can potentially play a pivotal role in improving the management of the Sri Lankan tourism industry. This is a timely study, especially in line with the government's target of achieving 4.5 million tourists to the country by 2020. This study is also in line with the objectives of the Sri Lanka Tourism Development Authority (SLTDA) which is currently encouraging industrialists to focus on value chain and new value creation in the tourism sector. This paper has also come at a time when Sri Lanka is poised to achieve Vision 2025, which is "to make Sri Lanka an Upper-Middle Income country by 2025". This paper will offer insights on the feasibility of this vision. This research also is also envisaged to go a long way in improving Sri Lanka's Tourism Development Strategy, especially in light of the country's new slogan "Sri Lanka: The Wonder of Asia".

Literature Review

Related Previous Studies

Kurukulasooriya & Lelwala (2014) analyzed international tourist arrivals in Sri Lanka using the Decomposition Approach with a data set covering the period July 2009 – June 2013 and basically concluded that tourism is booming after the civil war in Sri Lanka with an approximate increase of 1200 tourists per month. Konarasinghe (2016) investigated tourist arrivals in Sri Lanka using Decomposition Techniques with a data set covering the period January 2008 – December 2014 and concluded that the Additive Decomposition models are the most suitable models for forecasting tourist arrivals to Sri Lanka from Western European countries. Priyangika *et al* (2016) modeled and forecasted tourist arrivals in Sri Lanka using ARIMA and GARCH models with a data set covering the period January 2000 – December 2014 and finalized that the ARCH (1) model with optimal lag (2, 7 and 12) is the best model to forecast the future values of tourist arrivals in Sri Lanka. Gnanapragasan & Cooray (2016) analyzed international tourist arrivals in Sri Lanka using a Dynamic Transfer Function (DTF) modeling technique with a data set ranging over the period June 2009 – June 2016 and concluded that the fitted DTF model explained over 90% accuracy in terms of forecasting tourist arrivals in Sri Lanka.

In a most recent study in Sri Lanka, Thushara *et al* (2017), forecasted international tourist arrivals using the SARIMA approach with a data set covering the period January 1984 – June 2016 and found out that the SARIMA $(2, 1, 2)(1, 0, 2)_{12}$ model was the best model to forecast international tourist arrivals to Sri Lanka. In another, most recent study in Sri Lanka, Ishara & Wijekoon (2017) predicted international tourist arrivals in Sri Lanka using ARIMA and MDA approaches, with a data set covering the period January 2000 – February 2016 and concluded that the MDA model obtained from the post-war series has high predictive ability. Subedi (2017) analyzed tourist arrivals in Nepal using AR models and Biquadratic functions with a data set covering the period January 1990 – December 2016 and concluded that the AR model combined with the polynomial function outperforms other models. Khairudin *et al* (2018) forecasted international tourist arrivals in Penang using ARIMA models with a data set covering the period January 1995 – December 2008 and found out that the trend projection with seasonal effects model outperformed the trend projection model. In India, Mishra *et al* (2018) analyzed tourist arrivals using Holt-Winters' and SARIMA models with a data set ranging over the period January 2001 – June 2018 and found out that the Holt-Winters' model was better than the SARIMA approach. Zahedjahromi (2018) forecasted tourist arrivals to the USA using SARIMA models, with a data set spanning over the period January 1998 – December 2011 and found out that the SARIMA (0, 1, 2)(0, 1, 1)$_{12}$ is the optimal model for forecasting the number of tourists who enter the US.

As shown in the literature review, a number of approaches have been employed to analyze tourist arrivals in different places around the world and these include Decomposition Approach (Kurukulasooriya & Lelwala, 2014; Konarasinghe, 2016), GARCH (Priyangika *et al*, 2016), DTF (Gnanapragasan & Cooray, 2016), MDA models (Wijekoon, 2017), AR models and Biquadratic Functions (Subedi, 2017), Holt-Winters' Method (Mishra *et al*, 2018) as well as SARIMA models (Priyangika *et al*, 2016; Thushara *et al*, 2017; Wijekoon, 2017; Khairudin *et al*, 2018; Mishra *et al*, 2018; Zahedjahromi, 2018). It is quite clear that most researchers have applied the SARIMA approach due to its simplicity, reliability and popularity forecasting monthly tourist arrivals. In the same line of thought, this paper utilizes the SARIMA approach in modeling and forecasting monthly tourist arrivals in Sri Lanka. This study is quite different from previous studies such as Priyangika *et al* (2016), Thushara *et al* (2017) and Wijekoon (2017) amongst others; in the sense that this study considers, strictly, the post-war period only, thus we do not analyze tourist arrivals that took place in Sri Lanka before May 2009. It is quite important, at this juncture, to remember that the civil war was a big a setback to tourism growth in Sri Lanka and therefore, it is not surprising to notice large numbers of tourist arrivals during the post-war era. Because the paper relies only on post-war data, the results of the study are envisioned to stimulate fresh thoughts on the way forward, in terms of policy formulation in the tourism sector in Sri Lanka.

Materials & Methods

The SARIMA Model

Tourism forecasts may be generated by either quantitative approaches or qualitative approaches (Flechtling, 2001). SARIMA models are useful for modeling seasonal time series, in which the mean and other statistics for a given season are not stationary across the years (Chatfield, 2000; Chatfield, 2016). The characterization of seasonal series occurs by a significant serial correlation at the seasonal lag. The classical decomposition of the time series is composed of the trend component, a seasonal component as well as a random noise component. SARIMA models allow for randomness in the seasonal pattern from one cycle to another (Brockwell & Davis, 2006). SARIMA models are quite popular in modeling and forecasting tourism demand since they help in identifying the patterns and seasonality on tourist arrivals (Song & Li, 2008). In fact, SARIMA models give better forecasts (Junttila, 2001; Ismail & Mahpol, 2005; Pufnik & Kunovac, 2006; Schulz & Prinz, 2009; Saayman & Saayman, 2010; Suleman & Sarpong, 2012; Etuk, 2012; Omane *et al*, 2013; Saayman & Botha, 2015; Song *et al*, 2019), especially when compared to seasonal naïve forecasts (Saayman & Botha, 2015) and are suitable for short-term forecasts (Saayman & Saayman, 2010; Saayman & Botha, 2015). Box & Jenkins (1970) define a general multiplicative SARIMA model shown as ARIMA (p, d, q)x(P, D, Q)$_s$, where the lowercase letters; p, d, q; indicate the non-seasonal orders and the upper-case letters, P, D, Q; indicate the seasonal orders of the process with period s, that is; the number of observations per year. The parentheses mean that the seasonal and non-seasonal elements are multiplied (Pankratz, 1983; Wei, 1990; Hamaker & Dolan, 2009). A general SARIMA model may, thus, be specified as shown in equation [1] below:

$$\Phi_p(B)\emptyset_p(B^s)T_t = \theta_q(B)\Theta_q(B^s)\varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots [1]$$

Where B is the backshift operator, $\phi_p, \emptyset_p, \theta_q$ and Θ_q are polynomials of order p, P, q and Q respectively. ε_t is a white noise process and $T_t = \nabla_d \Delta_s^D Y_t$ is the differenced tourist arrivals series. This study adopts the Exact Maximum Likelihood Estimation (EMLE) criteria and consequently applies equation [1].

The Box – Jenkins Technique

The first step towards model selection is to difference the series in order to achieve stationarity. Once this process is over, the researcher will then examine the correlogram in order to decide on the appropriate orders of the AR and MA components. It is important to highlight the fact that this procedure (of choosing the AR and MA components) is biased towards the use of personal judgement because there are no clear – cut rules on how to decide on the appropriate AR and MA components. Therefore, experience plays a pivotal role in this regard. The next step is the estimation of the tentative model, after which diagnostic testing shall follow. Diagnostic checking is usually done by generating the set of residuals and testing whether they satisfy the characteristics of a white noise process. If not, there would be need for model re – specification and repetition of the same process; this time from the second stage. The process may go on and on until an appropriate model is identified (Nyoni, 2018i). The Box – Jenkins technique is accredited to Box & Jenkins (1970) and is widely applied in many forecasting contexts and in this research; it will be used for analyzing monthly tourist arrivals in Sri Lanka in the post-war era.

Data Measurement & Sources

Tourism is a composite of activities, services and industries that deliver a travel experience; transportation, accommodation, eating and drinking establishments, shops, entertainment, activity facilities and other hospitality services available for individuals or groups that are traveling away from home (Goeldner & Ritchie, 2009). International tourism comprises the activities of persons travelling to and staying at places outside their usual permanent places of residence for a period not exceeding 12 months for leisure, business and other purposes (SESRIC, 2010). The term international tourist refers to an international visitor who stays at least one night (but not more than 365 nights consecutively) in a collective or private accommodation in the country visited (Department of Census & Statistics, 2015). This study is based on monthly observations of international tourist arrivals in Sri Lanka over the post-war period from June 2009 to December 2018. Our out-of-sample forecast ranges over the period January 2019 to December 2020. All the data employed in this research was gathered from the Sri Lanka Tourism Development Authority.

Diagnostic Tests and Model Evaluation

Stationarity Tests: Graphical Analysis

Figure 1: Graphical Analysis

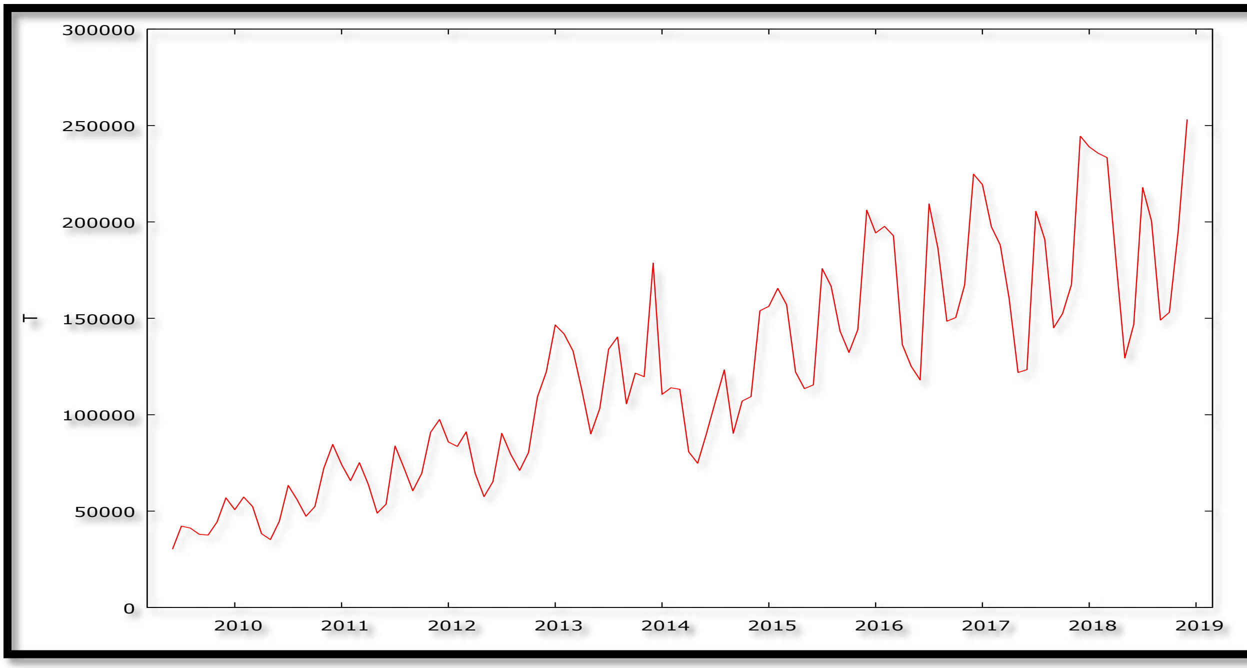
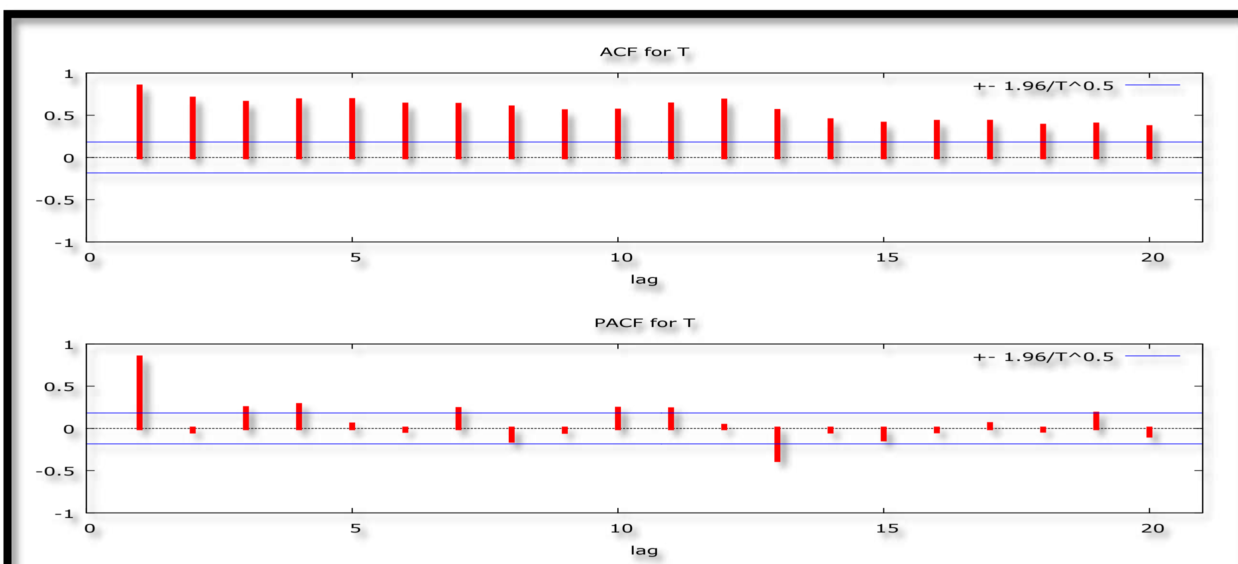


Figure 1 indicates that monthly international tourist arrivals in Sri Lanka follow an upward trend, pointing to the importance of peace and tranquility since the end of the civil war in May 2009. Since then, tourism has become an economic powerhouse in Sri Lanka because it now generates millions and millions of the much needed foreign exchange in Sri Lanka. Since the tourism series has an upward trend, we can reasonably suspect that it is non-stationary. Below, we attempt to verify this using the correlogram as well as the ADF tests.

The Correlogram in Levels

Figure 2: Correlogram in Levels



The ADF Test

Table 1: Levels-intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
T_t	-0.505186	0.8659	-3.495677	@1%	Not stationary
			-2.890037	@5%	Not stationary
			-2.582041	@10%	Not stationary

Table 2: Levels-trend & intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
T_t	-2.566709	0.2963	-4.050509	@1%	Not stationary
			-3.454471	@5%	Not stationary
			-3.152909	@10%	Not stationary

Table 3: without intercept and trend & intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
T_t	2.203480	0.9933	-2.587831	@1%	Not stationary
			-1.944006	@5%	Not stationary
			-1.614656	@10%	Not stationary

The Correlogram at 1st Differences

Figure 3: Correlogram at 1st differences

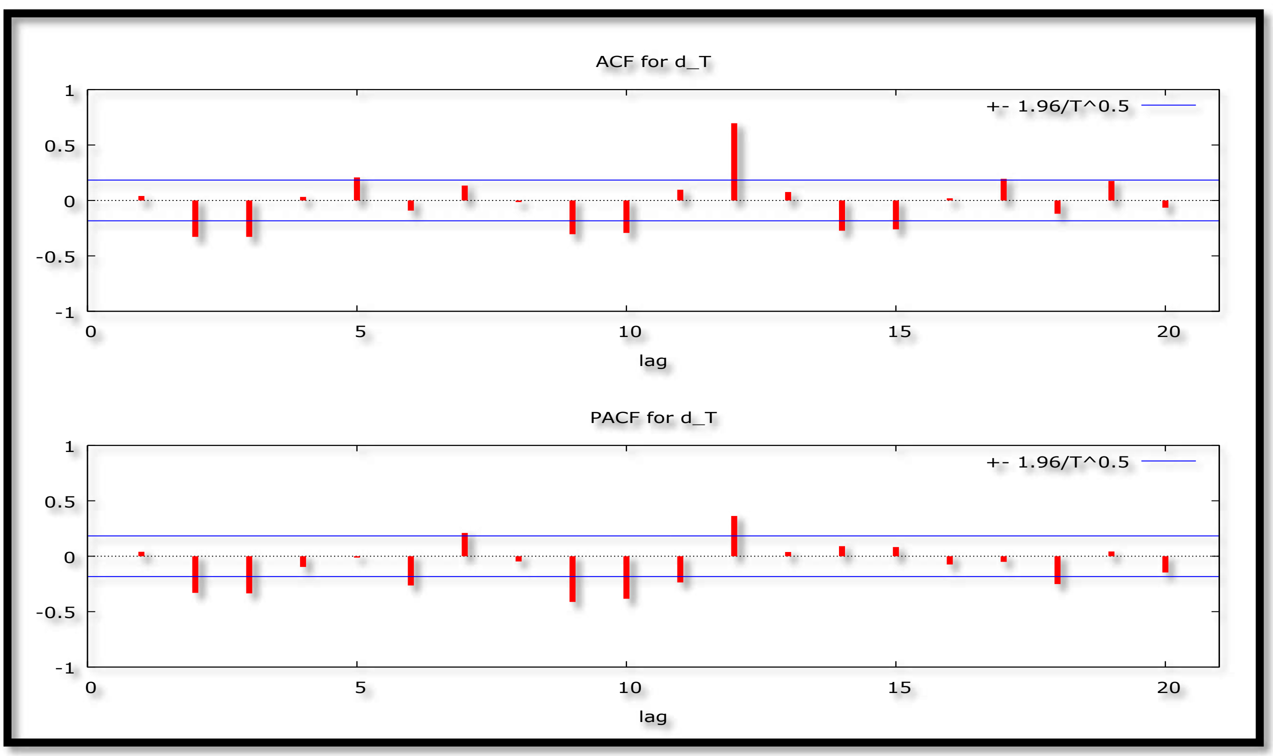


Table 4: 1st Difference-intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
$D(T_t)$	-3.035939	0.0350	-3.496346	@1%	Non-stationary
			-2.890327	@5%	Stationary
			-2.582196	@10%	Stationary

Table 5: 1st Difference-trend & intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
$D(T_t)$	-3.020583	0.1319	-4.051450	@1%	Non-stationary
			-3.454919	@5%	Non-stationary
			-3.153171	@10%	Non-stationary

Table 6: 1st Difference-without intercept and trend & intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
$D(T_t)$	-2.190745	0.0281	-2.588059	@1%	Non-stationary
			-1.944039	@5%	Stationary
			-1.614637	@10%	Stationary

Figures 1, 2 and 3 and tables 1 to 6 indicate that T is an I (1) variable.

Evaluation of SARIMA Models (without a constant)

Table 7: Evaluation of SARIMA models

Model	AIC	U	ME	MAE	RMSE	MAPE
SARIMA $(1, 1, 1)(1, 0, 1)_{12}$	2538.175	0.58485	1775.7	10648	14897	9.3604
SARIMA $(1, 1, 1)(1, 0, 0)_{12}$	2551.339	0.60464	2284.7	10864	16164	9.4013
SARIMA $(1, 1, 1)(0, 0, 1)_{12}$	2604.134	0.75848	3872.8	14702	21005	12.083
SARIMA $(1, 1, 1)(1, 1, 1)_{12}$	2260.791	0.50816	-89.742	10874	14818	8.7906
SARIMA $(1, 1, 1)(2, 1, 2)_{12}$	2263.744	0.51169	-163.22	10869	14727	8.8415
SARIMA $(1, 1, 1)(2, 1, 0)_{12}$	2260.631	0.50839	-95.409	10879	14801	8.7959
SARIMA $(2, 1, 2)(1, 0, 1)_{12}$	2539.34	0.58365	1780.7	10502	14646	9.3674
SARIMA $(2, 1, 0)(1, 0, 1)_{12}$	2544.92	0.58645	404.75	10874	15254	9.8569
SARIMA $(0, 1, 2)(1, 0, 1)_{12}$	2541.044	0.57009	547.84	10725	15052	9.5716
SARIMA $(2, 1, 0)(1, 1, 1)_{12}$	2262.651	0.52201	-21.476	10967	14986	8.944
SARIMA $(0, 1, 1)(0, 1, 1)_{12}$	2259.783	0.51168	-41.01	10750	15077	**8.6877**
SARIMA $(0, 1, 1)(1, 1, 1)_{12}$	2258.827	0.50925	-80.648	10902	14825	8.8163
SARIMA $(0, 1, 2)(1, 1, 1)_{12}$	2260.807	0.50862	-85.6	10886	14821	8.8018
SARIMA $(2, 1, 2)(2, 1, 2)_{12}$	2264.085	0.50578	-225.25	10682	14432	8.7738
SARIMA $(2, 1, 0)(2, 1, 2)_{12}$	2264.874	0.5245	-110.35	10934	14821	8.98
SARIMA $(0, 1, 2)(2, 1, 2)_{12}$	2263.824	0.50984	-165.94	10.856	14732	8.8169

A model with a lower AIC value is better than the one with a higher AIC value (Nyoni, 2018n) Theil's U must lie between 0 and 1, of which the closer it is to 0, the better the forecast method (Nyoni, 2018l). However, the MAPE is quite popular in most papers, for example; Yeung & Law (2005), Saayman & Saayman (2010), Loganathan & Ibrahim (2010), Song *et al* (2011) and Saayman & Botha (2015); when it comes to evaluating tourism models. In this paper, we rely mainly on the MAPE as the criteria for choosing the best model. The best model is the SARIMA $(0, 1, 1)(0, 1, 1)_{12}$, which is also affectionately reffered to as the "catch-all" model because it is usually the best model in a number of scenarios involving SARIMA model application.

Analysis of the Residuals of the SARIMA (0, 1, 1)(0, 1, 1)$_{12}$ Model

Residual Correlogram of the SARIMA (0, 1, 1)(0, 1, 1)$_{12}$ Model

Figure 4: Residual Correlogram

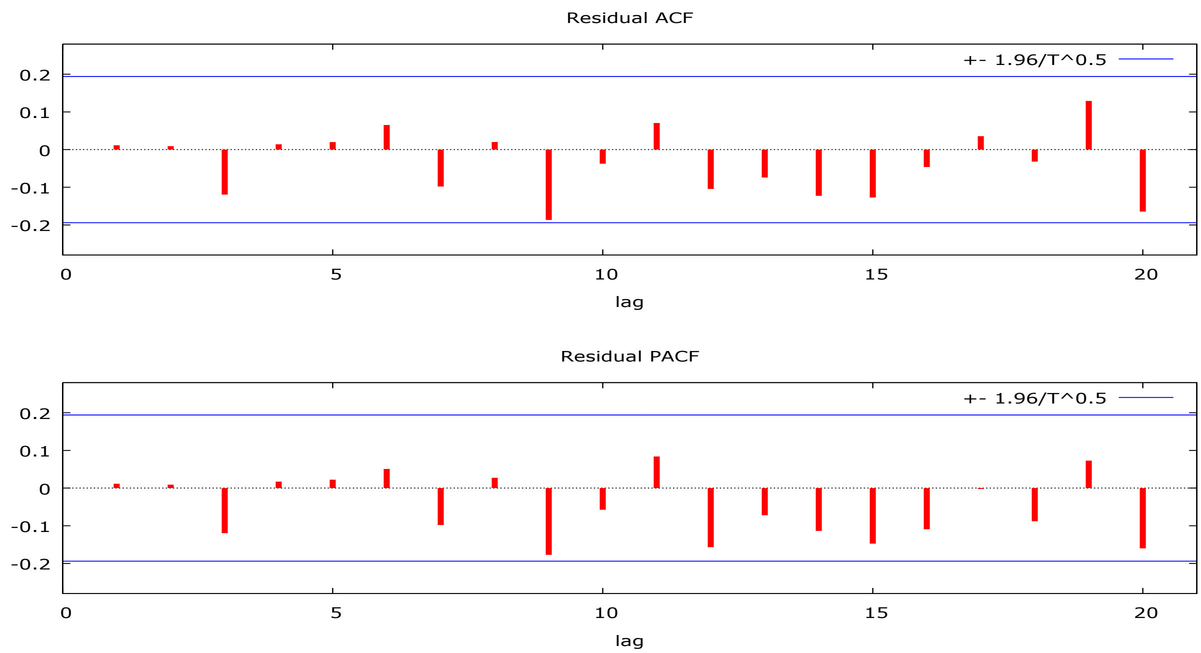


Figure 4 above shows that the residuals of the selected optimal model are stationary since the ACFs at various lags lie within the bands. This also implies that our optimal model is stable and acceptable for forecasting monthly tourist arrivals in Sri Lanka.

Findings of the Study

Descriptive Statistics

Table 8: Descriptive Statistics

Description	Statistic
Mean	120940
Median	154470
Minimum	30234
Maximum	253170
Standard deviation	56543
Skewness	0.3896
Excess kurtosis	-0.75462

As shown in table 12 above, the mean is positive, i.e 120940. The median is 154470. The maximum is 253169. The minimum is 30234. Since skewness is 0.3896, it implies that the tourist arrivals series is positively skewed and non-symmetric. Excess kurtosis is -0.75462 and simply indicates that T is not normally distributed.

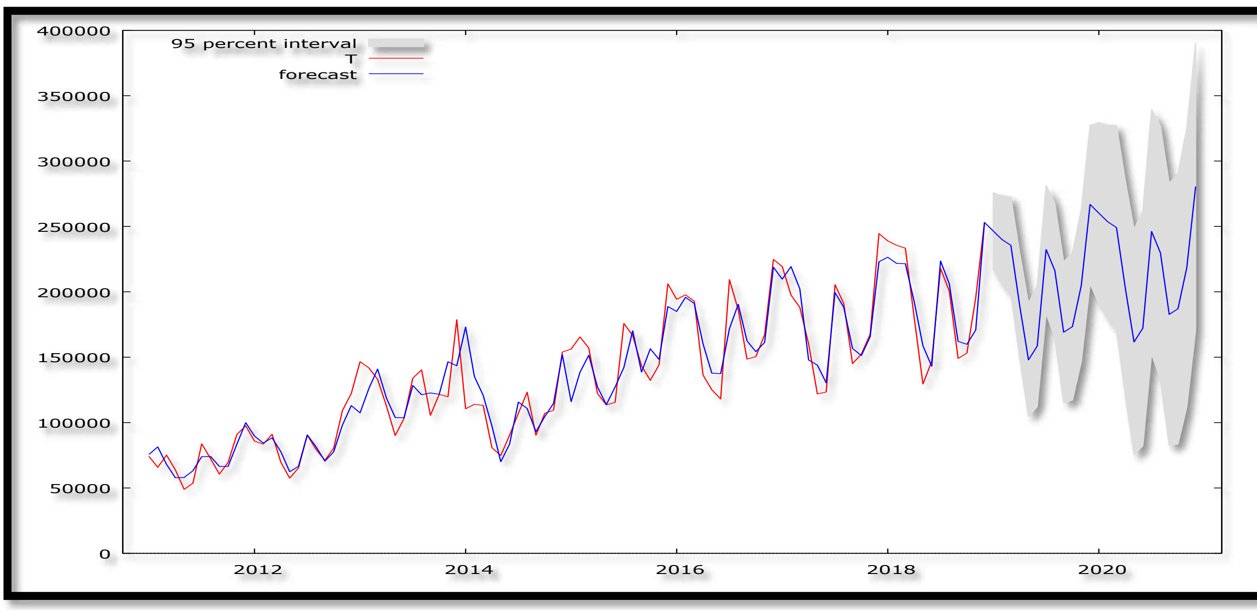
Results Presentation[1]

Table 9: Main Results of the SARIMA (0, 1, 1)(0, 1, 1)$_{12}$ Model

The SARIMA (0, 1, 1)(0, 1, 1)$_{12}$ model can be shown as follows: $(1-B)(1-B^{12})T_t = (1+\theta B)(1+\Theta B^{12})\varepsilon_t$ … [2]				
Variable	Coefficient	Standard Error	z	p-value
θ_q	-0.457634	0.0882367	-5.186	0.0000214***
Θ_q	-0.39626	0.102207	-3.877	0.00001***

Forecast Graph

Figure 5: Forecast Graph



Out of Sample Forecasts

Table 10: Out-of-sample forecasts

Year: Month	Prediction	Std. Error	95% Confidence Interval
2019:01	246473.	15030.2	(217014, 275932.)
2019:02	239937.	17098.5	(206425, 273450.)
2019:03	235510.	18942.3	(198384, 272637.)
2019:04	189548.	20621.9	(149129, 229966.)
2019:05	147937.	22174.7	(104475, 191398.)
2019:06	158513.	23625.6	(112207, 204818.)
2019:07	232478.	24992.5	(183494, 281463.)
2019:08	216158.	26288.3	(164633, 267682.)
2019:09	169048.	27523.2	(115103, 222992.)

[1] ****, ** and * means significant at 1%, 5% and 10% level of significance, respectively.*

2019:10	173384.	28705.1	(117123, 229645.)
2019:11	204786.	29840.1	(146300, 263271.)
2019:12	266821.	30933.6	(206192, 327449.)
2020:01	260149.	35406.6	(190754, 329545.)
2020:02	253614.	37743.1	(179639, 327589.)
2020:03	249187.	39943.2	(170900, 327474.)
2020:04	203224.	42028.3	(120850, 285598.)
2020:05	161613.	44014.6	(75346.1, 247880.)
2020:06	172189.	45915.2	(82197.1, 262181.)
2020:07	246155.	47740.1	(152586, 339724.)
2020:08	229834.	49497.8	(132820, 326848.)
2020:09	182724.	51195.2	(82383.6, 283065.)
2020:10	187061.	52838.1	(83500.0, 290622.)
2020:11	218462.	54431.4	(111779, 325146.)
2020:12	280497.	55979.4	(170780, 390215.)

Graphical Presentation of the Predicted Monthly Tourist Arrivals (Out-of-Sample)

Figure 6: Graphical presentation of out-of-sample forecasts

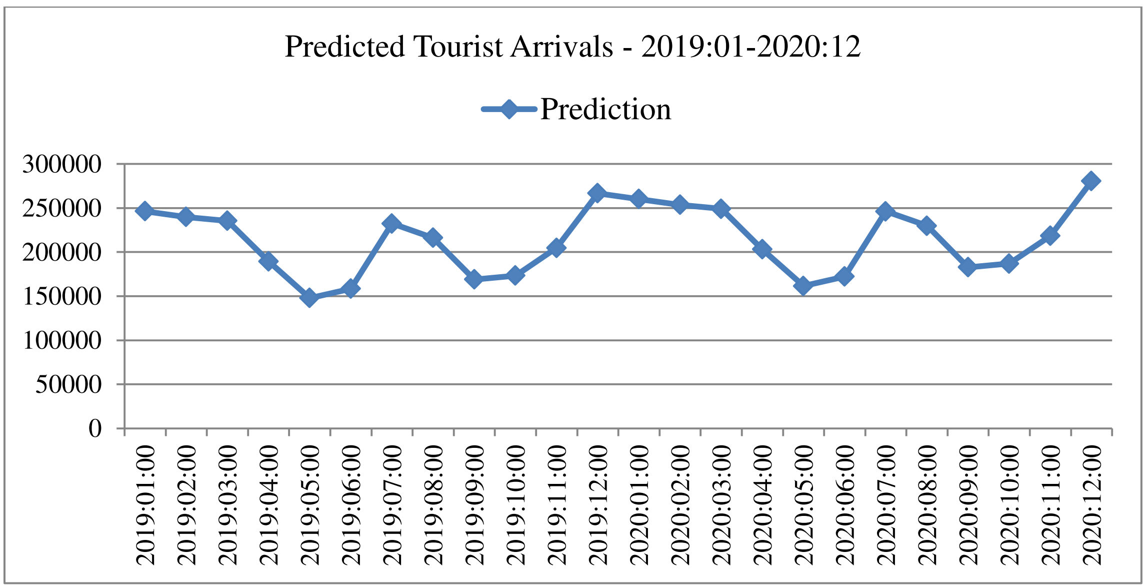


Table 9 shows the main results of the best model, the SARIMA $(0, 1, 1)(0, 1, 1)_{12}$ and is mathematically shown by equation [2]. The most striking feature of this model is that all the components of the model (the non-seasonal MA (1) and the seasonal MA (1)) are negative and statistically significant at 1% level of significance; hence indicating the relevance of the components in explaining tourist arrivals in Sri Lanka. In fact, the non-seasonal MA component points to the importance of unobserved shocks such as unanticipated terrorist attacks that negatively affect tourist flows into Sri Lanka. The seasonal MA (1) component points to the importance of destructive rains or cyclones in Sri Lanka and this tends to reduce the number of tourist inflows. Sri Lanka remains prone to terrorist attacks and natural disasters such as exceedingly heavy rains. It is quite essential to remember that this optimal model has been adopted based on the MAPE forecast evaluation statistic shown in table 7 above. It is clear that the chosen optimal model has a good forecast accuracy as measured in terms of the MAPE. As long as the MAPE is less than 10%, a forecast is deemed accurate and acceptable. Our model has a MAPE of 8.6877%. Figure 5, table 10 as well as figure 6 show the out-of-sample forecasts in different ways. The out-of-sample period is January 2019 to December 2020. From table 10, it is much easier to analyze the feasibility of the government's target of achieving 4.5 million tourists into Sri Lanka by 2020: our forecasts show that this target is too ambitious, although it is achievable, especially if relevant policy makers implement the policy prescriptions suggested below. However, Vision 2025, which is: "to make Sri Lanka an Upper-Middle Income country by 2025" is likely to be achieved given the perpetual growth of the tourism sector in Sri Lanka as shown in figure 1, figure 5 and figure 6 above. Considering the current political stability in Sri Lanka, we expect to see more growth in the tourism industry. The results of this study are not quite surprising because tourists are increasingly becoming selective, in the sense that they prefer countries where there is peace and tranquility, of which Sri Lanka is one such country since the end of a three-decade civil war.

Recommendations

i. To ensure sustainable international tourist arrivals in Sri Lanka, there is need to maintain peace and tranquility.
ii. The SLTDA ought to carry out massive marketing of tourism products in order to attract more customers (tourists). In this regard, there is need to up-grade or improve tourism products in order to enhance the image of Sri Lanka as tourist destination.
iii. In order to accommodate the forecasted growing numbers of international tourists, there is need for the construction of more infrastructure facilities.

Conclusion

The tourism industry has now become an important contributor to the Sri Lankan economic growth and development, especially in the post-war period. Indeed, the government of Sri Lanka ought to continue maintaining the existing peace and tranquility. This study employed the Box-Jenkins SARIMA approach to model and forecast international tourist arrivals in Sri Lanka. After carrying all the necessary diagnostic examinations, the SARIMA $(0, 1, 1)(0, 1, 1)_{12}$ model was selected as the best model to forecast international tourist arrivals in Sri Lanka. Results basically point to a continuous increase in international tourist inflows in Sri Lanka and apparently justify the need to prioritize the tourism industry as a strategic sector in Sri Lanka.

REFERENCES

[1] Armstrong, W. E., Daniel, S., & Francis, A. A. (1974). A Structural Analysis of the Barbados Economy, *Social and Economic Studies*, 22 (4): 1 – 24.

[2] Box, G. E. P., & Jenkins, G. M. (1970). Time Series Analysis: Forecasting and Control, *Holden Day*, San Francisco.

[3] British Airways Surveys (2012). Top 13 Destinations for 2013. http://www.traveldailynews.com/news/article/52596

[4] Brockwell, P. J., & Davis, R. A. (2006). Time Series: Theory and Methods, 2nd Edition, *Springer*, New York.

[5] Central Bank of Sri Lanka (2006). Annual Report, *Central Bank of Sri Lanka*, Colombo.

[6] Central Bank of Sri Lanka (2012). Annual Report, *Central Bank of Sri Lanka*, Colombo.

[7] Chatfield, C. (2000). Time Series Forecasting, *Chapman & Hall*, London.

[8] Chatfield, C. (2016). The Analysis of Time Series: An Introduction, *CRC Press*, London.

[9] Chen, C. F., Lai, M. C., & Yeh, C. C. (2011). Forecasting Tourism Demand Based on Empirical Mode Decomposition and Neural Network, *Knowledge Based Systems*, 26 (2011): 281 – 287.

[10] Chen, R., Liang, C. Y., Hong, W. C., & Gu, D. X. (2014). Forecasting Holiday Daily Tourist Flow Based on Seasonal Support Vector Regression with Adaptive Genetic Algorithm.

[11] Chu, F. (2009). Forecasting Tourism Demand With ARMA-based Methods, *Tourism Management*, 30 (2009): 740 – 751.

[12] Department of Census and Statistics (2015). Statistical Abstract – Tourism. http://www.statistics.gov.lk.Abstract2015/index.asp?Page=chap17

[13] Dogru, T., & Bulut, U. (2018). Is Tourism an Engine for Economic Recovery? Theory and Evidence, *Tourism Management*, 67 (2018): 425 – 434.

[14] Etuk, E. H. (2012). Predicting Inflation Rates of Nigeria Using a Seasonal Box-Jenkins Model, *Journal of Statistical and Econometric Methods*, 1 (3): 27 – 37.

[15] Fernando, J. L. S., & Shariff, N. M. (2013). Wetland Ecotourism in Sri Lanka: Issues and Challenges, *Malaysian Journal of Society and Space*, 9 (4): 99 – 105.

[16] Fernando, S. (2016). Managing the Post-war Tourism Development in Sri Lanka, *International Journal of Business and Social Science*, 7 (2016): 1 – 11.

[17] Fernando, S. (2017). Tourism Demand Volatility and Post-war Tourism in Sri Lanka, *Grin Verlag*, Munich.

[18] Fernando, S., Bandara, J. S., & Smith, C. (2016). Tourism in Sri Lanka, In Hall, M. C., & Page, S. J. (eds), The Routledge Handbook of Tourism in Asia, pp: 251 – 264, *Routledge Publishers*, Abingdon.

[19] Flechtling, D. (2001). Forecasting Tourism Demand, Methods and Strategies, *Butterworth Heinemann*, Oxford.

[20] Gamage, A. (1978). Tourism in the Economy of Sri Lanka, *Master Thesis*, Scottish Hotel School, Scotland.

[21] Geethika, N., & Gnanapala, A. (2015). Socio-economic Impacts on Local Community Through Tourism Development with Special Reference to Heritance Kandalama, *Tourism, Leisure and Global Change*, 2 (2015): 57 – 73.

[22] Gnanapragasam, S. R., & Cooray, T. M. J. A. (2016). Forecasting Post-war Tourist Arrivals to Sri Lanka Using Dynamic Transfer Function Modeling Method, *International Journal of Multidisciplinary Studies*, 3 (2): 1 – 12.

[23] Goeldner, C. R., & Ritchie, J. R. B. (2009). Tourism: Principles, Practices and Philosophies, *John Wiley & Sons*, New York.

[24] Gunter, U., Onder, I. (2014). Forecasting International City Tourism Demand for Paris: Accuracy of Uni- and Multi-variate Models Employing Monthly Data, *Tourism Management*, 46 (2014): 123 – 135.

[25] Hamaker, E. L., & Dolan, C. V. (2009). Idiographic Data Analysis: Quantitative Methods – From Simple to Advanced, Dynamic Process Methodology in the Social and Development Series, In Valsiner, J., Molenaar, P. C. M., Lyra, C. P. D., & Chaudhary, N. (eds), pp: 191 – 216, *Springer-Verlag*, New York.

[26] ICRA Lanka & IMACS (2011). Industry Report on Sri Lanka, *ICRA Lanka Ltd*, Colombo.

[27] Ishara, D. K., & Wijekoon, P. (2017). Time Series Analysis for Modeling and Forecasting International Tourist Arrivals in Sri Lanka, *International Journal of Economics and Management*, 20 (5): 1 – 9.

[28] Ismail, Z., & Mahpol, K. A (2005). SARIMA Model for Forecasting Malaysian Electricity Generated, *Matematika*, 21 (2005): 143 – 152.

[29] Ivanov, S., & Webster, C. (2006). Measuring the Impact of Tourism on Economic Growth, *Proceedings of GEOTOUR 2006 Conference*, 7 – 8 October 2006, Kosice.

[30] Jayathilake, B. (2013). Tourism and Economic Growth in Sri Lanka: Evidence from Co-integration and Causality Analysis, *International Journal of Business, Economics and Law*, 2 (2): 22 – 27.

[31] Junttila, J (2001). Structural Breaks, ARIMA Model and Finnish Inflation Forecasts, *International Journal of Forecasting*, 17 (2): 203 – 230. https://www.dx.doi.org/10.1016/S0169-2070(00)00080-7

[32] Khairudin, S., Ahmad, N., Razali, A., Japeri, A. Z. U. S. M., & Azmi, A. B. (2018). Forecasting International Tourist Arrivals in Penang Using Time Series Models, *International Journal of Academic Research in Business and Social Sciences*, 8 (16): 38 – 59. http://dx.doi.org/10.6007/IJARBSS/v8-i16/5117

[33] Khalil, S., Kakar, M., Waliullah, W. (2007). Role of Tourism in Economic Growth: Empirical Evidence From Pakistan Economy, *The Pakistan Development Review*, 46 (4): 985 – 995.

[34] Konarasinghe, K. M. U. B. (2016). Decomposition Techniques on Forecasting Tourist Arrivals from Western European Countries to Sri Lanka, *13th International Conference on Business Management*, pp: 544 – 559.

[35] Kumar, M., & Sharma, S. (2016). Forecasting Tourist Inflow in South East Asia: A Case of Singapore, *Tourism & Management Studies*, 12 (1): 107 – 119. http://www.dx.doi.org/10.18089/tms.2016.12111

[36] Kurukulasooriya, N., & Lelwala, E. (2014). Time Series Behaviour of Burgeoning International Tourist Arrivals in Sri Lanka: The Post-war Experience, *Ruhuna Journal of Management and Finance*, 1 (1): 1 – 14.

[37] Lai, T. W. (2002). Promoting Sustainable Tourism in Sri Lanka, *Asian Productivity Organization*, Colombo.

[38] Lelwala, E. I., & Gunarathe, L. H. P. (2008). Modelling Tourism Demand Using Cointegration Analysis: A Case Study for Tourists Arriving From United Kingdom to Sri Lanka, *Tropical Agricultural Research*, 20 (2008): 50 – 59.

[39] Lelwala, E. I., & Kurukulasooriya, N. (2013). Time-series Evidence for Tourism-led Growth Hypothesis: A Study of Tourism Expansion and Long-run Economic Growth in Sri Lanka, *Ruhuna University Journal of Social Sciences*.

[40] Loganathan, N., & Ibrahim, Y. (2010). Forecasting International Tourism Demand in Malaysia Using Box-Jenkins SARIMA Application, *South Asian Journal of Tourism and Heritage*, 3 (2): 50 – 60.

[41] Lonely Planet Survey (2012). Best in Travel: Top Ten Countries. http://www.lonelyplanet.com/themes/best-in-travel

[42] Milne, S., & Ateljevic, I (2001). Tourism, Economic Development and the Global-local Nexus: Theory Embracing Complexity, *Tourism Geographies*, 3 (4): 369 – 393.

[43] Mishra, P. K., Rout, H. B., Pradhan, B. B. (2018). Seasonality in Tourism and Forecasting Foreign Tourist Arrivals in India, *Iranian Journal of Management Studies*, 11 (4): 629 – 658. https://www.dx.doi.org/10.22059/IJMS.2018.239718.672776

[44] Miththapala, S. (2010). Value Addition to the National Resource Base – Key Note Address, Research Symposium, *Uva Wellassa University*, Sri Lanka.

[45] National Geographic Traveller Magazine (2012). Best Tips – 2012. http://www.travelnationalgeographic.com

[46] Naude, W. A., & Saayman, A. (2005). The Determinants of Tourist Arrivals in Africa: A Panel Data Regression Analysis, *Tourism Economics*, 11 (2005): 365 – 391.

[47] Neto, F. (2003). A New Approach to Sustainable Tourism Development: Moving Beyond Environmental Protection, *DESA*, Discussion Paper No. 29.

[48] Nyoni, T. (2018i). Box-Jenkins ARIMA Approach to Predicting net FDI Inflows in Zimbabwe, *University Library of Munich*, MPRA Paper No. 87737, Germany.

[49] Nyoni, T. (2018l). Modeling and Forecasting Naira / USD Exchange Rate in Nigeria, A Box-Jenkins ARIMA Approach, *University Library of Munich*, MPRA Paper No. 88622, Germany.

[50] Nyoni, T. (2018n). Modeling and Forecasting Inflation in Kenya: Recent Insights From ARIMA and GARCH Analysis, *Dimorian Review*, 5 (6): 16 – 40.

[51] O'Hare, G., & Barret, H. (1994). Effects of Market Fluctuations on the Sri Lanka Tourist Industry: Resilience and Change, *International Journal of Economics*, 85 (1): 39 – 52. https://www.dx.doi.org/10.1111/ji1467-966.31994.tb00672x

[52] Oh, C. (2005). The Contribution of Tourism Development to Economic Growth in the Korean Economy, *Tourism Management*, 26 (2005): 39 – 44.

[53] Omane, A. M., Oduro, F. T., & Oduro, S. D. (2013). Determining the Better Approach for Short-term Forecasting of Ghana's Inflation: Seasonal ARIMA vs Holt-Winters', *International Journal of Business, Humanities and Technology*, 3 (1): 69 – 79.

[54] Pankratz, A. (1983). Forecasting With Univariate Box-Jenkins Model: Concepts and Cases, *John Wiley and Sons*, New York.

[55] Pathmananda, K. V. (2018). Potentials, Challenges and Opportunities for Tourism Development in the Eastern Province, Sri Lanka, *Journal of Tourism and Hospitality*, 7 (2): 1 – 5. http://www.dx.doi.org/10.4172/2167-0269.1000343

[56] Priyangika, J. H., Pallawala, P. K. B. N. M., & Sooriyaarachchi, D. J. C. (2016). Modeling and Forecasting Tourist Arrivals in Sri Lanka, *Symposium on Statistical & Computational Modeling with Applications*, pp: 14 – 18.

[57] Pufnik, A., & Kunovac, D. (2006). Short-term forecasting of Inflation in Croatia With Seasonal ARIMA Processes, *Croatia National Bank*, Working Paper No. 16.

[58] Ranasinghe, R., & Deyshappriya, R. (2010). Analyzing the Significance of Tourism on Sri Lankan Economy: An Econometric Analysis, *Faculty of Management*, Uva Wellassa University, Sri Lanka.

[59] Ravinthirakumaran, K. (2015). Tourism and Economic Growth Nexus in Sri Lanka, *Griffith Business School*, Griffith University.

[60] Saayman, A., & Botha, I. (2015). Evaluating Non-Linear Approaches in Forecasting Tourist Arrivals, *ERSA*, Working Paper No. 492.

[61] Saayman, A., & Saayman, M. (2010). Forecasting Tourist Arrivals in South Africa, *Acta Commerci*, 10 (1): 281 – 293. https://www.dx.doi.org/10.4102/ac.v10i1.141

[62] Sandaruwani, J. A. R. C., & Gnanapala, W. K. A. C. (2016). The Role of Tourists Guides and Their Impacts on Sustainable Tourism Development: A Critique on Sri Lanka, *Tourism, Leisure and Global Change*, 3 (2016): 62 – 73.

[63] Schulz, P. M., & Prinz, A. (2009). Forecasting Container Transshipment in Germany, *Applied Economics*, 41 (22): 2809 – 2815. https://www.dx.doi.org/10.1080/00036840802260932

[64] SESRIC (2010). International Tourism in OIC countries: Prospects and Challenges, *SESRIC*, Ankara.

[65] Sharpley, R. (2000). The Influence of Accommodation Sector on Tourism Development: Lessons from Cyprus, *Hospitality Management*, 19 (2000): 275 – 293.

[66] Sloan, P., Legrand, W., & Chen, J. S. (2005). Factors influencing German hoteliers' attitude towards environmental impact, *Advances in Hospitality and Leisure*, pp: 177 – 188.

[67] Song, H., & Li, C. (2008). Tourism Demand Modeling and Forecasting – A Review of Recent Research, *Tourism Management*, 29 (2): 203 – 220. https://www.dx.doi.org/10.1016/j.tourman.2007.07.016

[68] Song, H., & Witt, S. F. (2006). Forecasting International Tourist Arrivals to Macau, *Institute for Tourism Studies*, School of Hotel and Tourism Management, The Hong Kong Polytechnic University, Hong Kong.

[69] Song, H., Li, G., Witt, S. F., & Athanapoulos, G. (2010). Forecasting Tourist Arrivals using Time-varying Parameter Structural Time Series Models, *International Journal of Forecasting*, 30 (6), 565 – 578.

[70] Song, H., Wen, L., & Liu, C. (2019). Density Tourism Demand Forecasting Revisited, *Annals of Tourism Research*, 75 (2019): 379 – 392.

[71] Song, Z., Kjetil, S., & Fabrizio, Z. (2011). Growing Like China, *American Economic Review*, 101 (1): 196 – 233. https://www.dx.doi.org/10.1257/aer.101.1.196

[72] Sri Lanka Info (2011). Geographical Location, *Sri Lanka Info*. http://www.icta.lk/si/component/content/article/74.html

[73] Sri Lanka Tourism Development Authority (2016). Annual Report – 2016, *STDA*, Colombia.

[74] Srinivasan, P., Santhosh, K. P., & Ganesh, L. (2012). Tourism and Economic Growth in Sri Lanka: An ARDL Bounds Testing Approach, *The Romanian Economic Journal*, XV (45): 211 – 226.

[75] Sriyantha, F., Jayatilleke, S. B., & Smith, C. (2012). Regaining Missed Opportunities: The Role of Tourism in Post-war Development in Sri Lanka, *Asia Pacific Journal of Research*, 18 (7): 685 – 711.

[76] Subedi, A. (2017). Time Series Modeling on Monthly Data of Tourist Arrivals in Nepal: An Alternative Approach, *Nepalese Journal of Statistics*, 1 (2017): 41 – 54.

[77] Suleman, N., & Sarpong, S. (2012). Forecasting Milled Rice Production in Ghana Using Box-Jenkins Approach, *International Journal of Agricultural Management and Development*, 2 (2012): 79 – 84.

[78] Suresh, J., & Senthilnathan, S. (2014). Relationship Between Tourism and Economic Growth in Sri Lanka, 7th Book Chapter – Economic Issues in Sri Lanka, Vijayakumar, S. (eds)., pp: 115 – 132.

[79] Thano, R. (2015). The Impact of Tourism on Balance of Payments, *American Journal of Economics, Finance and Management*, 1 (5): 529 – 536.

[80] Thushara, S. C., Su, J. J., & Bandaralage, J. (2017). Forecasting International Tourist Arrivals to Sri Lanka Using SARIMA Approach, *Business Management and Economic Studies*, 1 (2017): 13 – 23.

[81] Tisdell, C., & Bandara, R. (2004). Tourism as a Contributor to Development in Sri Lanka: An Overview and Case Study, *University of Queensland*, Working Paper No. 94.

[82] Tosun, C. (2001). Challenges of Sustainable Tourism Development in Developing World: The Case of Turkey, *Tourism Management*, 22 (2001): 289 – 303.

[83] UNDP & WTO (1993). Tourism Master Plan – Sri Lanka, (SLR/89/006), *UNDP & WTO*, Madrid.

[84] Unhapipat, C., & Unhapipat, S. (2018). ARIMA Model to Forecast International Tourist Visit to Bumthang, Bhutan, *Journal of Physics*, 1039 (2018): 1 – 11. https://www.dx.doi.org/10.1088/1742-6596/1039/1/012023

[85] UNWTO (2012). Annual Report, *UNWTO*, Madrid.

[86] UNWTO (2014). Annual Report of UNWTO, *UNWTO*, New York & Madrid.

[87] UNWTO (2014). Tourism Highlights, 2014 Edition, *UNWTO*, Madrid.

[88] UNWTO (2015). Tourism Highlights, 2015 Edition, UNWTO, Madrid.

[89] Wang, L., Zhang, H., & Li, W. (2012). Analysis of Causality Between Tourism and Economic Growth Based on Computational Econometrics, *Journal of Computers*, 7 (9): 2152 – 2159.

[90] Wei, W. W. S. (1990). Time Series Analysis, *Addison-Wesley*, New York.

[91] Welgamage, L., & Perera, P. (2015). Tourism Economics in Sri Lanka: An Econometric Analysis, *International Journal of Business and Social Research*, 5 (1): 90 – 101.

[92] Wickremasinghe, G. B., & Ihalanayake, R. (2006). The Causal Relationship Between Tourism and Economic Growth in Zimbabwe: Some Empirical Evidence, *School of Applied Economics*, Working Paper Series.

[93] Wongsathan, R. (2018). *Asia-Pacific Journal of Science and Technology*, 23 (4): 1 – 14.

[94] World Travel Market (2011). Industrial Report, *WTM*, London.

[95] WTTC (2014). Travel and Tourism Economic Impact Report – 2014 Report, *WTTC*, New York.

[96] Wu, D. C., Song, H., & Shen, S. (2017). New Development in Tourism and Hotel Demand Modeling and Forecasting, *International Journal of Contemporary Hospitality Management*, 29 (1): 507 – 529.

[97] Yeung, M., & Law, A. (2005). Forecasting US Air Travellers to Europe, Caribbean and Asia, *Asia Pacific Journal of Tourism Research*, 10 (2): 137 – 149. https://www.dx.doi.org/10.1080/10941660500135852

[98] Yu, Y., Wang, Y., Gao, S., & Tang, Z. (2017). Statistical Modeling and Prediction for Tourism Economy Using Dendritic Neural Network, *Computational Intelligence and Neuroscience*, pp: 1 – 10. https://www.dx.doi.org/10.1155/2017/7436848

[99] Zahedjahromi, M. (2018). Forecasting Tourist Arrivals to the USA With SARIMA Models, *University of Northern Colorado*, Paper No. 61.