

Long-run relationship between ICT and Tourism Demand in Sri Lanka

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Abstract. ICT is one of the factors encouraging countries' tourism demand. The objective of this study is to test the long-run relationship between ICT and tourism demand in Sri Lanka over the period of 1990 -2018. In this study, exploratory data analysis technique, unit root test, bivariate cointegration technique employed as analytical tools. The test result of exploratory data analysis shows that there is a positive relationship between ICT and tourism demand in Sri Lanka. The unit root test results put forward that the variables used in this study are stationary at their 1st difference. Further, the bivariate cointegration test result points out that ICT in Sri Lanka has a long-run relationship with tourism demand. The estimated coefficients of ICT in the short and long-run highlights a beneficial relationship with tourism demand in Sri Lanka. The estimated coefficient of error correction term informs that 0.9% of error will be adjusted every year. The estimated value of Durbin-Watson test statistic indicates that the estimated model is robust. Further, the test result of Granger causality test confirms one-way Granger causal relationship from ICT to tourism demand.

Keywords: ICT, Tourism Demand, Bivariate Cointegration test, Granger causality test, Sri Lanka.

1 Introduction

Digital tourism expedites the conventional tourism activities of a country, which helps to improve and directive the countries' tourism by sharing the tourism-related information through various digital sources [10-15]. Information and communication technology (ICT) is identified as an important determinant factor to digital tourism [8-15]. In the case of tourism, ICT helps to tourist finding the information about their targeting tourism places, climate, weather, accommodation, sceneries, geo-political, and socio-economic situations [3]. Therefore, it cannot be divided the ICT from tourism activities of a country [2-6].

Despite enough studies investigating the relationship between tourism and its determinants, only few studies investigate the relationship between information and communication technology and tourism demand [5]. However, it is realized that the role of ICT on tourism demand is now important [9-13]. Thus, this situation underscores a depth study on the relationship between ICT and tourism demand [4-9].

Sri Lanka is one of the developing countries which is famous among tourists all over the world since the historical periods due to having lots of pioneer attractive tourism places. In that respect, tourists' arrivals towards Sri Lanka have been growing increasingly for a long-period. In 1970, 46247 tourists arrived to Sri Lanka which increased as 2333796 in 2018. Therefore, from these statistics, it is known that Sri Lanka has become the popular tourism

places among the tourists. In order to that, it is believed that the ICT has a major role in promoting the tourists' arrivals towards Sri Lanka. However, this contribution is not so far confirmed by using statistical tools. Therefore, it is continuously being a research gap when studying the relationship between ICT and tourism demand in Sri Lanka. Hence, the main motivation of this study is to seek the answer to the research question of whether there is a long-run relationship between ICT and tourism demand in Sri Lanka or not. For that, this study establishes the following objective. The objective of this study is to test the long-run relationship between ICT and tourism demand in Sri Lanka.

The rest of the study is organized as follows: Section 2 presents the review of literature, Section 3 explains the research method used in this study, Section 4 discusses the empirical findings of this study, and Section 5 concludes this study with some policy implications.

2 Review of Literature

ICT is a new phenomenon in the tourism industry, which nowadays rapidly grows, and in the case of tourism, most of tourists believe that the ICT is one of the leading factors to find about the tourism -related information. That is why, many governments attempt to promote the tourism demand through ICT. In this juncture, many researchers address the relationship between ICT and tourism demand. In that respect, [2] investigates the relationship between ICT and tourism industry. In this study, it was found that tourism would be promoted by ICT. [8] tests the impact of ICT on tourism demand in European Union which concluded that the ICT was not the determinant factor of tourism demand in European Union. [1] conclude the ICT helps to promote the sustainable tourism demand. [3] concludes the ICT is one of the leading strategies to promote tourism demand. [7] examines the relationship between ICT and tourism demand, this study concludes that tourism demand has been promoted by ICT. [6] finds the ICT boosts the tourism demand. [9] summarizes that the ICT promotes the tourism demand. Most of the literature conclude that ICT increase tourism demand and few literature states that the ICT does not increase the tourism demand. However, no one so far interested to study the relationship between ICT and tourism demand by using Sri Lankan time series data. Therefore, it is needed to study the situation of Sri Lanka about the relationship between ICT and tourism demand due to having a potential relationship between ICT and tourism demand in Sri Lanka and it is the pioneer study in investigating the relationship between ICT and tourism demand in Sri Lanka.

3 Research method

3.1 Empirical model specification and Data

Having critically reviewed the literature given above, this study, to attain the objective, establishes the following empirical model specification, which can be written as follows:

(1)

$$\ln TD_t = \beta_0 + \beta_1 \ln ICT_t + \varepsilon_t$$

where TD_t tourism demand, ICT_t is information communication technology, β_0 is intercept, β_1 is coefficient of ICT, and ε_t is error term.

Data for the variables used in this study were time series, covered the period of 1980-2018. Total tourism arrivals were used as the proxy variable for the tourism demand (TA), as well the total mobile cellular subscriptions were employed as the proxy variable for the information communication technology (ICT). The data for tourism demand were collected from Sri Lanka Tourism Development Authority (SLTDA). The data for ICT were gathered from the World Bank database. All the data for the variables used in this study were transformed into natural logarithmic form in order to make the normality and linearity of the data series.

3.2 Analytical method

In this study we employed both exploratory and inferential data analysis techniques to attain the objective. The exploratory data analysis included scatter plots, confidence ellipse with Kernel fit. Inferential data analysis consisted of unit root test, Engel- Granger cointegration test, and Pairwise Granger causality test.

As to time series, unit root test is very important to least the spurious relationship between the time series variables. By using the unit root test, it can be confirmed the order of integration of the variables. Accordingly, this study employed the Augmented Dickey-Fuller (ADF) unit root test to confirm the order of the variables used in this study. In the case of time series analysis, it is necessary to check the order of integration of the series. despite number of unit root tests applied in empirical studies, this study employed the ADF unit root test.

As two variables have been employed in this study, Engel- Granger bivariate cointegration test was recommended to test the long-run relationship between ICT and tourism demand. In order to apply this technique, both independent and dependent variables should be stationary at their 1st difference. As to Engel- Granger bivariate cointegration, if the variables are stationary at their 1st difference, the ordinary least square regression (OLS) method directly will be applied to the equation (1). Once estimated the OLS regression by using the equation (1), the error term given in equation (1) were estimated using the following equation as:

(2)

$$\varepsilon_t = \ln TD_t - [\beta_0 + \beta_1 \ln ICT_t]$$

If the estimated error term (ε_t) is stationary at its level, it can be concluded that the variables used in thus study are cointegrated between them, meaning that there is a long-run relationship between ICT and tourism demand. Otherwise, no cointegration.

Once confirmed the long-run relationship between the variables used in this study, the next step was that estimating the short-run dynamics of the variables used in this study. In order to that, this study employed the error correction model (ECM) proposed by [4]. The ECM of this study can be written as follows:

(3)

$$\Delta \ln TD_t = \beta_0 + \beta_1 \Delta \ln ICT_t + \beta_2 \hat{\varepsilon}_{t-1} + u_t$$

where Δ is the notation of 1st difference, $\hat{\varepsilon}_{t-1}$ is the one period lag value of the residuals derived from the equation (1), u_t is the error term, and β_2 is coefficient of error term.

The estimated model of this study was validated based on test statistic of the Durbin-Watson d test and R^2 of the estimated model given in equation (1). The null-hypothesis that there is no-first order serial correlation in the disturbance (ε_t) which was rejected if the Durbin-Watson d statistic would be less than the R^2 of the estimated model given in equation (1). Therefore, the decision was the estimated model of this study does not suffer from the serial correlation issue. This technique was introduced by [5].

Testing the Granger causal relationship between the variables used in this study was another analytical technique employed in this study. In that respect, the Pairwise Granger causality test for short-run causal relationship between the variables and coefficient of error term for long-run causal relationship between the variables were employed in this study [4]. The test equation of Pairwise Granger causality can be defined as follows:

(4)

$$E(Y_{t+h}|J_t, X_t) = E(Y_{t+h}|J_t)$$

where J_t is the information sets considering the past observation of X_t and Y_t up to and including time (t).

4 Results and Discussion

Figure 1 shows the relationship between ICT and tourism demand in Sri Lanka which explains that ICT in Sri Lanka promotes the tourism demand, which means when increasing ICT, tourism places and tourism-related activities are easily reached to international tourists. Thus, there is possibility that tourists' arrival towards Sri Lanka would increase by the means of ICT.

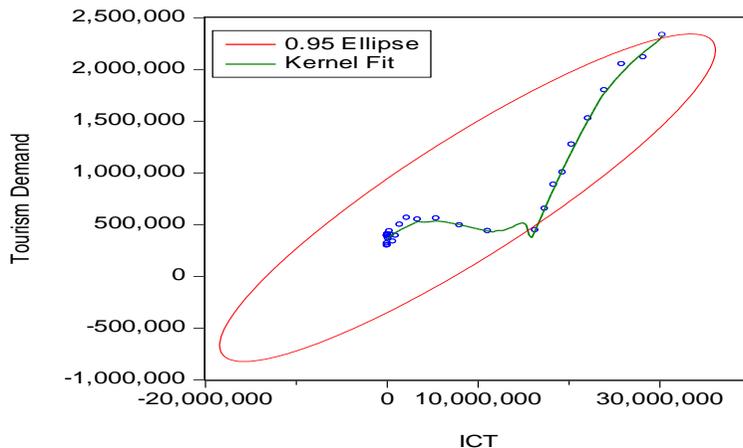


Figure 1. Relationship between ICT and Tourism Demand in Sri Lanka.
Source: E-views software

Given in Table 1 are the test results of Augmented Dickey-Fuller unit root test, which confirms that the variables used in this study are non-stationary at their level, and become stationary at their 1st difference.

Table 1. ADF unit root test results

Variable	Augmented Dickey-Fuller (ADF) test		Decision
	At level	1 st Difference	
$\ln ICT_t$	-1.389 (0.840)	-5.341 (0.001)	$I(1)$
$\ln TD_t$	-0.906 (0.941)	-3.942 (0.023)	$I(1)$

Source: E-views software

Provided in Table 2 is the test results of cointegration between the variables of ICT and tourism demand in Sri Lanka, which indicates that the ADF unit root test result for residual given in equation 2 is stationary at 5% significance level. Therefore, it can, based on the Engel and Granger cointegration test, be concluded that ICT in Sri Lanka has a long-run relationship with tourism demand.

Table 2. Bivariate Cointegration test result

Variable	Augmented Dickey-Fuller (ADF) test	Decision
	At level	
ε_t	-4.085 (0.017)	$I(0)$

Source: E-views software

The estimated equation given in below illustrates the long-run coefficient of independent variable used in this study. In that respect, the estimated coefficient of ICT demonstrates that 1% increases in the usage of ICT in Sri Lanka promote the tourism demand by 0.146%.

$$\begin{aligned} \ln \widehat{TD}_t &= 11.28 + 0.146 \ln ICT_t \\ t &= (30.532) \quad (5.627) \\ R^2 &= 0.5398 \quad d=0.1516 \end{aligned}$$

It is essential in Econometric analysis that the validation of estimated model. In order to validate the estimated model, there are number of techniques that have been followed by the empirical studies. However, as to this study, the Durbin Watson d test is more appropriate when using bivariate [5]. In this context, the null hypothesis that there is no first order serial correlation in the disturbance (ε_t) should not be rejected when the Durbin-Watson d statistic is less than the R^2 . In the event of this study, the R^2 is 0.53 and Durbin-Watson d statistic is 0.15. As Durbin-Watson d statistic is less than the R^2 , the null hypothesis is accepted. Therefore, it

can be concluded that the estimated model of this study does not suffer from serial correlation effect which further concludes that the estimated model is robust.

The estimated short-run dynamics of the variables used in this study are given in the below equation. The test result indicates that short-run changes in ICT has a significant positive effect on tourism demand. Further, the estimated coefficient of error correction term indicates that it is negative, less than one and statistically significant. Therefore, it can be concluded that the response variable of this study moves towards the long-run equilibrium path. Further, the estimated coefficient of error correction term is 0.009, which means that 0.9% of error will be corrected every year.

$$\Delta \ln \widehat{T D}_t = 0.130 + 0.155 \ln I C T_t - 0.009 \varepsilon_{t-1}$$

$$t = (3.10) \quad (1.80) \quad (1.99)$$

$$R^2 = 0.8702 \quad d = 0.1543$$

Presented in Table 3 is the test results of pairwise Granger causality test from a single equation. The null hypothesis that ICT does not Granger cause tourism demand in Sri Lanka is rejected at 5% significance level as the corresponding p-value is less than 0.05. On the other hand, the test result further indicates that the null hypothesis that tourism demand does not Granger cause ICT is not rejected as the corresponding p-values is greater than 5% significance level. Therefore, it is concluded that there is one-way Granger cause from ICT to tourism demand over the study period.

Table 3. Pairwise Granger Causality Test

Null Hypothesis	Obs.	F-statistic	p-value
$\Delta \ln T A_t$ does not Granger Cause $\Delta \ln I C T_t$	25	0.409	0.748
$\Delta \ln I C T_t$ does not Granger Cause $\Delta \ln T A_t$		3.222	0.047

Source: E-views software

In addition to the short-run Granger causality, the estimated coefficient of error correction term given in estimated short-run equation indicates the long-run causality between the variables used in this study. Therefore, as the estimated coefficient of error correction terms satisfies all statistical needs, it can be concluded that there is a long-run causal relationship between the variables.

5 Conclusion and Policy implication

This study has investigated the long-run relationship between ICT and tourism demand in Sri Lanka over the period of 1990 -2018 by using different analytical tools. The exploratory data analysis indicates that the ICT in Sri Lanka has a positive relationship with tourism demand. The ADF unit root test indicates that the variables used in this study are stationary at their 1st difference. The test result of bivariate cointegration technique states that ICT in Sri Lanka has a long-run relationship with tourism demand. Further, the estimated coefficient of ICT in both the long-run and short-run indicate that they have beneficial relationship with tourism demand in Sri Lanka. The diagnostic test result indicates that the estimated model is robust. The test result of Pairwise Granger causality test confirms that there is one-way Granger causal relationship from ICT to tourism demand in Sri Lanka. The overall conclusion of this study is that ICT in Sri Lanka promote the tourism demand. Therefore, as ICT is one of the potential factors in promoting the tourism demand in Sri Lanka, this study suggests that ICT should be used in a correct way to increase tourists' arrivals into Sri Lanka more and more.

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