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Analysis of cointegration and causality test for tourism and trade in India

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Abstract
This paper tries to investigate the long term and short term casual relationship between tourism and trade in India. This study uses econometric model to identify long term relation and short term relations that are measured through Johansen Cointegration Test and Granger Causality Test. The result of the co-integration test proves that there is significant long term relationship between tourism and trade. The short-term relationship test confirms that there exist bi-directional relationship between tourism and trade. The findings of the study indicate that there are two-way causal effects (bi-directional causalities) of tourist receipts influence on exports and import as well as trade balance in India. Therefore tourism shows stronger ability to predict subsequent and trade practices in India. Overall, future economic policy should focus more on tourism trade in order to generate more foreign exchange earnings for the better economic condition in India.

Keywords: co-integration and granger causality for tourism receipts

1. Introduction I.

Tourism has become one of the fastest growing sectors across world as well in India in the recent past. Tourism is one of the productive business activities directed for the production of the goods and services. It provides goods and services to the customers (visitors, generally foreigners) as well as employment and income to the locals. Tourism business, enterprises and the people (related directly or indirectly) generate earnings from the operation of the tourism business activities. Tourism as an economic activity produces various direct, indirect and induced impacts in the economy. It ultimately increases the foreign exchange earnings, generates employment opportunity and increases income. Again, the resultant income flows being circulated in the economy, encourages for other economic activities to take place inducing many rounds of income. It also stimulates the income and employment in other sectors of the economy (UNESCAP, 2001)

The share of tourism expenditures in GDP appears to be very minimal, which is only 0.77% in 2005. These tourism expenditure ratios are 0.06% and 0.14% for 1970 and 1980, respectively. Tourism is also a composite product (service) that enters into international trade flows as an invisible export item. However, tourism differs from other commodity exports in the sense that the consumer or the tourist has to consume the product from the exporting country. Therefore most of the economical researches and articles on different countries, point out that international tourism and trade is closely related to each other.

The primary purpose of this research paper is to examine the relationship between tourism and trade balance in India. The research paper has to investigate the relationship between tourism and trade by using monthly data of 2001 to 2015. Using of co-integration technique, it tries to assess whether long-run relationship exists between tourism receipt and economic growth or not. In addition, it also inquires about the causal relationship between them and direction of causality of tourism and trade in India.

2. Review of Literature

Esra Polat, Semra Turkan & Suleyman Gunay (2010) [5] investigated relationship between tourism and trade in Turkey by using cointegration and causality tests. Their findings indicated that one-way causal effects (unidirectional causalities) from the number of tourist arrivals of tourist expenditures to exports. In addition, there are two-way Granger causalities (bi-directional causalities) between imports and tourism series as well as total trade and tourism. Norsiah Kadir and Kamaruzaman Jusoff (2010) [6], examines the relationship between tourism and trade in Malaysian economy by using cointegration and causality tests. The quarterly data for the period of 1995 to 2006 of international tourism receipts, exports, imports and total trade of Malaysia. Their results show that co-integration test long-run equilibrium did not exist between all the series. The Granger-Causality tests found that, there was one-way causal effect (unidirectional causality) of exports to international tourism receipts. A. Nowjee, V. Poloodoo, M. Lamport, K. Padachi and D. Ramdhony (2012) [1] investigate the relationship between tourism, real effective exchange rate and economic growth in Mauritian economy using causality analysis. The Granger causality test revealed unidirectional causality running from tourism arrival to real effective exchange rate and from economic growth to real effective exchange rate. Jonel Kristo (2014) [7] evaluates the impact of tourism on economic growth for Albania using an error correction mechanism approach. To compare fluctuations in the total economic contribution of the travel and tourism sector in the economy and the real effective exchange rate, with changes in real GDP growth rate. Using a cointegration method to assess the event of a break in the long run equilibrium between tourism and economic growth. Their results found that hypothesized conviction that tourism development supports higher GDP growth. Loganathan Nanthakumar, AngShy Han Mori and Kogid (2013) [8] investigated the seasonal and structural break analysis of tourist arrivals to Malaysia using seasonal unit, structural break analysis and multivariate co-integration analysis. Their study used monthly time series data

from 1995 (January) until 2010 (December) with monthly seasonal dummies. They found that, there was no seasonal effect of tourism demand from Singapore, Thailand and Indonesia to Malaysia. Multivariate analysis found that real effective exchange rate (REER) and Malaysia's consumer price index (CPI) had causal relation with Singapore, Thailand and Indonesia tourist arrival. Kareem, Olayinka Idowu (2008) examined the direction of causality between tourism-exports and economic growth in Africa. Africa's tourism-exports has been shown in comparison with other regions of the world. Tourism could be used by African countries to drive economic growth. They found that causality between tourism expenditure and economic growth, while there was unidirectional causality between tourism receipt and economic growth.

3. Data Source and Methodology

3.1 Data Source

Data regarding tourism and trade data were collected from India Statistics and Reserve Bank of India (RBI) which is time series monthly data for the period of 2001 to 2015. The paper empirically investigates the relationship between tourism and trade in India by using cointegration and causality tests. The monthly series data of tourism receipt and trade such as export and import has analysis, to investigate the long-run and short-run relationships among international tourism receipt and trade in India. Further, this study contributes to addition of literature because the tourism receipt and trade relation in India.

3.2 Analytical Framework for Econometric Models

In general, most of the time series datas are non-stationarity. Therefore, an attempt is made to verify the stationarity properties by using the popular unit root test models namely, Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test for double confirmation of the variable's stationarity. Later long run and short run relationship were tested by using the Johansen Co-integration Test and Granger causality test respectively in the study.

3.3 Unit root test

Augmented Dickey-Fuller test is required to check the order of integration through unit root (white noise error or random walk). Unit root tests based on Augmented Dickey-Fuller (ADF) test and non-parametric Phillips-Perron (PP) approaches are used in this study to examine the stationarity of export, import and tourism receipts in India. The times series, the test of stationarity of trade and tourism receipts are carried out by estimating the following equation *(Jabir Ali 2011).*

$$\Delta X_t = b_0 X_{t-1} + \sum_{i=1}^{T} bi\, \Delta X_{t-i} + \varepsilon_t \quad \ldots\ldots (1)$$

3.1.1.
3.1.2.
3.1.3.

Where X_t represents the base level or the first difference of the variables. The null hypothesis of non-stationarity is $b_0 = 0$. If the null hypothesis is accepted at the base level of the series but rejected at the first difference of the series, then the series is taken as stationary at the first difference level, and it is denoted by I(1). The above tests have been performed using a constant intercept and lag length has been determined though Schwarz information criterion.

3.3.1 Johansen Cointegration Test

Cointegration has emerged as a powerful technique for investigating common trends in multivariate time series and provides a sound methodology for modeling both long run and short run relationship in a system. The purpose of the cointegration test is to determine whether a group of non-stationary series are cointegrated or not, and explores the long-run equilibrium relationship among the variables. Under this study, Johansen's cointegration tests have been used to assess the long-run predictability among Tourism receipts and trade in India, using the Johansen cointegration test, assuming a non-dimensional vector Xt with integration of on order I(1), estimates a vector autoregressive models. Johansen and Juselius (1990) further improved the model by incorporating an error correction depicted as follows *(Jabir Ali 2011)*

$$X_t = C + \sum_{i=1}^{k} \prod\nolimits_i X_{t-1} + \varepsilon_t \quad \ldots\ldots (2)$$

$$\Delta X_t = \mu + \sum_{i=1}^{k-1} r_i\, \Delta X_{t-i} + \prod\nolimits_i X_{t-k} + \varepsilon_t \quad \ldots\ldots (3)$$

where Xt is an n x1 vector of the I(1) variables representing trade variables and tourism earnings respectively, μ is a deterministic component which may include a linear trend term, an intercept term, or both, Δ denotes the first difference operator, Πi is an n x r matrix of parameters indicating c is a vector of constants, k is lag length based on the Hannan-Quinn criterion, and it is a εt random error term, which indicates how many linear combinations of Xt-1 are stationary.

The residual vectors of the above model construct two likelihood ratio test statistics, i.e. the trace test and the maximal eigenvalue test. The trace statistics tests the null hypothesis of r cointegrating relations against the alternative of the k cointegrating relations. The maximum eigenvalue statistics tests the null hypothesis of r contegrating relations against the alternative of r + 1 cointegrating relations. There are varied views on the usefulness of two tests for cointegration. While, Johansen and Juselius (1990) argued that the trace test may lack power relative to the maximal Eigen value test, Cheung and Lai (1993) viewed that the λtrace test shows more robustness than the maximal eigenvalue test. The Johansen likelihood ratio test statistic, λtrace, and the maximal Eigen value, λmax for the null hypothesis that there are at most r cointegrating vectors are given by:

$$\lambda_{trace} = -T \sum_{i=r+1}^{k} \text{In}\,(1 - \hat{\lambda}_i) \quad \ldots\ldots (4)$$

$$\lambda_{max} = -T\, \text{In}\,(1 - \hat{\lambda}_{r+1}) \quad \ldots\ldots (5)$$

3.3.2 Granger Causality Test

Granger causality test has been used to analyze the direction and causal relations between trade variables and tourism earnings in India. The Granger (1969) approach predicts how much of the current value of one variable can be explained by past values of other variable and then tries to see whether adding lagged values of prior variable can improve the explanation. For instance, Y is said to be Granger-caused by X if X helps in the prediction of Y, or equivalently if the coefficients on the lagged X is statistically significant. Specifically, Y_t is causing X_t if some coefficient, a_i, is non-zero in the following equation (Jabir Ali 2011)

$$X_t = C_0 + \sum_{i=1}^{p} a_i Y_{t-1} + \sum_{j=1}^{p} b_j X_{t-j} + \mu_t \quad \ldots\ldots(6)$$

A time series, Y_t, causes another time series, X_t, if the current value of X_t can be predicted better by using past values of Y_t than by not doing so:

$$Y_t = Y_0 + \sum_{i=1}^{p} a_i X_{t-1} + \sum_{j=1}^{p} \beta_j X_{t-j} + \mu_t \quad \ldots\ldots(7)$$

Where p is the number of lags used for the variable. The regression equations (6) and (7) test the existence of short-term relationship between the variables X and Y. Moreover, if both trade variables and tourism are co-integrated, then causality must exist in uni-directional or bi-directional. The test for causality is based on an F-statistics, which tests whether lagged information on a variable Y provides any statistically significant information about a variable X in the presence of lagged X. The F-statistic is given by:

$$F_1 = \frac{(SSE_0 - SSE_1)/p}{SSE_1/(T-2p-1)} \quad \ldots\ldots(8)$$

Where SSE0 and SSE1 are the sum of squares of residuals, p is the number of lags and T is the number of observations. It is important to note that the statement "X Granger causes Y" does not imply that Y is the effect or the result of X. This implies that the Granger causality measures precedence and information content but does not by itself indicate causality in the true sense. The analysis of unit root, co-integration and causality tests for different commodities were performed using econometric software Eviews Version 6.

4. Result and Discussion

Table 1: Descriptive Statistics (Rupees in Billion)

	Tourism Receipts	Export	Import	Trade
Mean	42.32160	573.2069	869.5577	-296.3550
Maximum	116.8000	1672.518	2480.657	11.06000
Minimum	8.779000	144.4400	160.8100	-1094.091
Std. Dev.	27.27214	390.1825	654.9429	280.1851
Skewness	0.795381	0.866203	0.830956	-0.972252
Kurtosis	2.863455	2.635418	2.558261	3.002885
Probability	0.000252	0.000038	0.000067	0.000005
Sum	6602.169	89420.28	135651.0	-46231.39

Sources: computed by Authors' (2015)

The Table # 1 shows that descriptive statistics of tourism receipts has reached lowest limit of Rs.8.77 billions in September, 2001 and touched the highest tourism receipt of Rs.116.80 billions in December 2013. The study period mean tourism receipts was Rs. 42.32 billions with the standard deviation of tourism receipts was Rs. 27.27 billion. From the above table # 1 exhibits descriptive statistics shows that the minimum were Rs.144.4400 billion, Rs.160.8100 billion and maximum Rs.1672.518 billion, Rs. 2480.657 billion in export and import respectively. Average export is of Rs.573.20 billion and import Rs.869.55 billion, where as standard deviation of export and import were as of 390.1825 and 0.830956 respectively. The trade of minimum and maximum were as of Rs.-1094.091 billion and Rs.11.06000 billion.

Results of Unit Root Test

Table 2: Unit Root Test Results

	ADF Test		PP Test	
	At Level	1ST Δ	At Level	1ST Δ
Export	2.124791 (0.9999)	-3.165298 (0.0242)**	1.878690 (0.9998)	-22.18890 (0.0000)**
Import	0.648461 (0.648461)	-18.00034 (0.0000)**	-0.048523 (0.9518)	-17.76054 (0.0000)**
Tourism	1.379674 (0.9989)	-3.264640 (0.0184)**	-0.005318 (0.9559)	-13.68420 (0.0000)**
Trade	-1.181635 (0.6817)	-11.71554 (0.0000)**	-2.388827 (0.1466)	-19.20084 (0.0000)**

**1% & *5 % level significant

The Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) Unit Root test has been applied to confirm whether the study variables of trade on (export and import) and tourism receipt are stationary or Non Stationary. Its shows that most of tourism and trade as well as export and import is not stationary at the Level, but in the 1st difference i.e. I (1) order it was stationary the result of the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) Unit Root Test was reported in the Table #

1) Results of Johansen Cointegration Test

Table 3: Johansen Cointegration Test Result

Co-integration between Trade and Tourism	Hypothesis	Trace Statistics	Max-Eigen Statistics	Co-integration/ Non co-integration
Export & Tourism	H_0: r = 0 (None *)	44.58719** (0.0000)	41.86007** (0.0000)	Co-integrated
	H_0: r ≤ 1 (At most 1)	2.727127* (0.0438)	4.064138 (0.0987)	
Import & Tourism	H_0: r = 0 (None *)	44.53713** (0.0000)	43.49328** (0.0001)	Co-integrated
	H_0: r ≤ 1 (At most 1)	1.043847 (0.3069)	1.043847 (0.3069)	
Trade & Tourism	H_0: r = 0 (None *)	36.67379** (0.0000)	36.67375** (0.0000)	Co-integrated
	H_0: r ≤ 1 (At most 1)	3.75E-05 (0.9970)	3.75E-05 (0.9970)	

**1% & *5% level significant, Sources: computed by Authors' (2015)

In order to determine the long run relationship between trade and tourism, cointegration test is performed. This study, Johansen approach is used to test whether there are log-run relationship between the trade and tourism by using Johansen test. In the table # 3 shows the results of Johansen test. After testing the precondition of non-stationary time series (i.e. the series were stationary at their first difference), Johansen (1988) and Johansen and Juselius (1990) cointegration test has been carried out to determine the existence of a long-run relationship between export and tourism receipt of cointegration results which show that the tourism receipt and export series are Co-integrated, as well as import and tourism accordingly tourism and trade. The two series are Co-integrated means; there is a significant long term relationship between that two series. Therefore the tourism have a long term relationship with export and import.

2) Results of Granger Causality Tests

Table 4: Granger Causality Test Result

Null hypothesis	F-statistics	Prob ability	Direction	Relationship
Import does not Granger Cause Export	4.77276	0.0098	Bi-directional	Import ⟷ Export
Export does not Granger Cause Import	23.4183	1.E-09		
Tourism Receipts does not Granger Cause Export	9.07212	0.0002	Bi-directional	Tourism Earnings ⟷ Export
Export does not Granger Cause Tourism Receipts	12.9953	6.E-06		
Tourism Receipts does not Granger Cause Import	3.06227	0.0497	Bi-directional	Tourism Earnings ⟷ Export
Import does not Granger Cause Tourism Receipts	22.7756	2.E-09		
Trade does not Granger Cause Export	4.77318	0.0098	Bi-directional	Trade ⟷ Export
Export does not Granger Cause Trade	27.6324	6.E-11		
Trade does not Granger Cause Import	23.4169	1.E-09	Bi-directional	Trade ⟷ Import
Import does not Granger Cause Trade	27.6306	6.E-11		
Trade does not Granger Cause Tourism Receipts	27.7014	6.E-11	Bi-directional	Trade ⟷ Tourism Earnings
Tourism Receipts does not Granger Cause Trade	3.52477	0.0319		

**1% & *5% level significant, Sources: computed by Authors' (2015) (lags 2)

The next step is to determine the pattern of causality between exports and imports with trade and tourism receipts in India. The cointegration tests indicate only the existence of long-run relationship among two series, the Granger (1969) causality tests are used to analyze the direction of relationship among series. The test result shows in the Table # 4 indicated that tourism receipts influence on export and import with trade bi-directional causality.

5. Conclusion

Tourism receipts have become an important resource of foreign receipts earnings from outside across nationals for economic growth. This paper studies the relationship between tourism and trade that has been examined for the period of 2001 to 2015 in India. To investigate the long run and short run relationships between international tourist receipts, which is source of foreign exchange receipts for Indian economy. Similarly Johansen Co-Integration test indicates by using null hypothesis that there is cointegration between tourism receipts and export, tourism receipts and import as well as tourism receipts and trade at 5% level of significance. This means that there exists a long-run relationship between the tourism receipts and (export and import) as well as trade in India. The Granger Causality Test indicates that Tourism receipts influence Trade

as well as export and import of India is having Bi-directional causality relation in India. Therefore Tourism receipts have stronger ability to predict trade impact subsequent export and import vice versa.

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