



## **Tourism and Economic Growth in Jordan: Evidence from Linear and Nonlinear Frameworks**

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### **ABSTRACT**

This study investigates cointegration and causal effects between tourism and economic growth (EG) in Jordan. We use quarterly data from 1998Q1 to 2015Q4 on real gross domestic product and real international tourism receipts. Two empirical approaches are employed; Engle and Granger (1987) linear cointegration framework, and the nonlinear framework of Enders and Siklos (2001) cointegration test, in addition to Diks and Panchenko (2006) causality test. Empirical findings reveal the presence of a positive long-run relationship between tourism and EG. According to the linear approach there is a unidirectional causality from tourism to growth, thus, supporting the tourism-led growth hypothesis. Whereas, the nonlinear method, which seems to give more appropriate results, suggests a bidirectional causality, hence, confirming the feedback hypothesis that EG and tourism reinforce each other.

**Keywords:** Tourism Receipts, Economic Growth, Linear and Nonlinear Frameworks, Jordan

**JEL Classifications:** L83, C33, F43, O50

### **1. INTRODUCTION**

Over the past few decades, international tourism has witnessed important developments, and become one of the significant industries in many countries of the world. Its potentials in generating benefits to these countries are substantial, including provision of foreign exchange earnings that can support the balance of payments position, creation of employment opportunities, and increasing government tax revenues.

The development of the tourism sector has usually been viewed as a positive contribution to economic growth (EG). Scholars have shown considerable interest in analyzing the relationship between tourism and growth. The belief that tourism expansion increases the long - run EG is known in the literature as the tourism-led growth (TLG) hypothesis.

A large number of studies have emerged to empirically examine this hypothesis. The findings of these studies have been mixed and inconsistent. Hence, the TLG hypotheses has not always been valid, and the direction of causality in some cases has been from

EG to tourism or bilateral. Researches infer from these results that the TLG hypothesis may be country specific (Lee and Chang, 2008; Holzner, 2011).

In recognition that the results of investigating the tourism - growth nexus so far have been inconclusive, more research examining new case studies seems to be required. Therefore, we try in the current study to identify this issue for an important international tourism destination; Jordan, which is the site of Petra, one of the seven wonders of the world.

Another motive to conduct this research is that there is a few studies which address this subject for the Arab World, and particularly, for Jordan. In fact, tourism is one of Jordan's most important industries, in terms of gross domestic product (GDP) contribution (10-14% during last decade), and job creation (the largest private sector employer), and it is the second highest earner of foreign currency (USAID, 2016). However, this sector has recently witnessed some fluctuations in tourism receipts and the number of international tourist arrivals, owing mainly to the instability among its neighbors, although it has remained a safe and stable land.

We hope that this study can bridge the gap in the current literature on this issue, and enrich the limited exiting research work, particularly as the available literature does not cover the recent few years which has witnessed the challenges of the Arab Spring revolutions and their direct and indirect consequences on many countries in the region.

Accordingly, the current paper aims to find answers to these questions: Is there a long -run equilibrium relationship between international tourism receipts and EG in Jordan? If so, what is the causality direction between them?

The main contribution of the study is that it examines tourism-growth link not on the basis of an arbitrary assumption of a linear model, but rather it uses the linear model, in addition to nonlinear models, in the context of nonparametric cointegration and causality framework, which is believed to give powerful and more accurate results, and hence, enable policy makers, to undertake more reliable polices according to the obtained findings.

This paper is structured as follows: Section two briefly reviews the relevant previous literature. Section three illustrates the methodological framework. Description for the data used and empirical analyses are provided in section Four. While section Five summarizes the main findings and provides some concluding remarks and policy implications.

## 2. LITERATURE REVIEW

### 2.1. Theoretical Background

According to the international trade theory (Krugman et al., 2015), services exports, such as spending of foreign tourists, are considered part of total exports (goods and services). Although their size was, and still is, not as large as world goods exports, they have become increasingly important.

As many countries in the world have witnessed accelerated expansion in their exports, particularly during the last few decades, theorists have analyzed the role of exports in the economy and examined their relation to EG. Exports have been deemed according to “new theories of EG” a key factor, as capital and labor, in generating growth, or even an engine of growth. The so-called the hypothesis of export-led growth has been formulated to indicate that exports expansion causes and leads to EG. Concerning services exports, specifically, tourism- the subject of this paper- it has been stated that theoretical models which consider a causal relationship between tourism services and EG is a recent phenomenon (Kim et al. 2006).

Nevertheless, many scholars have considered the impact of tourism revenues on growth as that of international goods exports, and that they are a driver of EG, and hence, TLG hypothesis is derived from that of exports.

Channels through which tourism activity can influence EG include: Firstly, increase in a county’s resources, resulting from the provision of foreign exchange earnings which may be used, especially in developing countries, to import capital goods needed

for production processes. Secondly, creation of employment opportunities which generate income for labor and increase national income. Thirdly, tourism expansion may improve the efficiency with which a country’s resources are used. On the other hand, factors that stimulate demand, if there is space capacity in the economy, may result also in increases in GDP. These include: The rise in the government tax revenues, and hence government expenditure on roads and development of infrastructure, in addition to the rise in investments in hotels and tourism sites. Another way is the increase in consumers’ spending as income may be generated from investments in traditional industries, which are usually labor intensive industries. Detailed explanations of the different channels are addressed by scholars to show how these ways can positively influence growth, such as: Spillover effects, externalities, and linkages with other sectors of the economy (Cazes, 1992); exploitation of scale economies at local level (Helpman and Krugman, 1985); and enhancing of efficiency through international competition (Krueger, 1980).

### 2.2. Empirical Literature

A large number of studies has been published to empirically investigate the link between tourism and EG. The interest in this research area may be due to the huge expansion of international tourism worldwide, as well as the weight of the tourism activity for the economy of many countries.

Most work on this subject reviews the literature according to this classification: Single country, panel data and cross sectional studies. Another group of articles will be added in the current study; i.e., those based on recent nonlinear framework.

The category of single country studies consists of a large number of papers that cover a vast range of economies. Examples of articles on developed countries include those of Balaguer and Cantavella-Jorda (2002) for Spain, Tang and Jang (2009) for the USA. While the studies of Dubarry (2004) for Mauritius, Belloumi (2010) for Tunisia, and Shih and Do (2013) for Vietnam belong to those on developing countries. Examples on the case of Emerging Market Economies are the studies conducted by Ongan and Demiroz (2005) for Turkey, Ozturk and Acaravci (2009) for Turkey, Brida et al. (2011) for Brazil, Balcilar et al. (2014) for South Africa and Ozturk (2016) for. The studies of Surugiu and Surugiu (2013) for Romania, Hajdinjak (2016) for Croatia, Kristo (2014) for Albania belong to the transitional economies.

Studies on specific countries include large as well as (medium and small) economies. Examples of the first category are Mishra et al. (2010) for India, Wang et al. (2012) for China, and Panahi et al. (2015) for Turkey. While those of Kreishan (2011) for Jordan and Belloumi (2010) for Tunisia are for small countries.

It is worth mentioning that most of the studies available on the tourism growth link are referred to a single economy, and this area is still attracting more and more researches. Recent published studies include: Ravinthirakumaran (2015) for Sri Lanka, Tang and Tan (2015) for Malaysia, Kasimati (2011) for Greece, Bento (2016) for Portugal, and Shih and Do (2016) for Vietnam.

The findings of a large number of the reviewed studies are in support of the TLG hypotheses. i.e., tourism expansion leads to EG. Some studies, however, disagree with this hypothesis and find instead an economic - driven tourism hypothesis. Among this work is that of Oh (2005) for South Korea, Tang and Jang (2009) for the USA, Lean and Tang (2010) for Malaysia and Ridderstaat et al. (2014) for Aruba. Other papers provide evidence of the existence of a bidirectional relationship. The following articles belong to this group: Dritsakis (2004) for Greece, Kim et al. (2006) for Taiwan, Khalil et al. (2007) for Pakistan and Wang et al. (2012) for China. Very few number of studies did not identify any relationship at all, such as Brida et al. (2011) for Brazil, Kasimati (2011) for Greece. The disparity in the results obtained regarding the examination of TLG hypothesis may be, as stated by Tang and Jang (2009), a reflection of a country effect. Countries differ in the weight of tourism in the overall economy, the size and openness of the economy and production capacity constrains (Kim et al. (2006).

In fact, evidence of contradictory results can be observed in many cases and even for the same country. Turkey may serve as an example as appears in the following three studies. Investigation of the causal effect of the TLG hypothesis has shown a unidirectional causality from tourism to growth in the study of Gunduz and Hatemi (2005). The main tested variables in this study are international tourist arrivals, real exchange rate and real GDP (RGDP), and the method employed is unit root testing and causality testing based on leveraged bootstrap simulation techniques, for annual data during 1963-2002. Using different time span (1980Q1-2004Q2) and disparate method (cointegration and Granger causality testing) in addition to different variables (international tourism receipts and GDP), Ongan and Demiroz (2005) have reached to a bidirectional causal relationship between tourism and growth in the short and long run. It seems that the contradictory empirical results are due to the differences in the factors determining the relationship such as: The variables used, methodologies applied, time framework chosen and frequency of data in addition to changes in economic conditions.

The second group of available empirical studies that evaluate the TLG relationship is based on panel data analysis. It includes: Aslan (2013) for ten Mediterranean countries, and Chou (2013) for ten transition economics, both of them have not use the data together for the whole sample but separately for each country. On the other hand, the work of some researches has been based on analysis of the panel of countries as one group using panel data estimation techniques. The following studies belong to this group: Lanza et al. (2003) for OECD countries, Caglayan et al. (2012) for a panel of 135 countries, Seetanah (2011) for 19 island economies.

The findings of this kind of studies are questioned on the grounds that their results are generalization over the whole populations with different conditions. Contradictory findings may be obtained in this case. For example, the study of Dritsakis (2012) for seven Mediterranean economies including Tunisia has revealed that the causal relationship between tourism and growth for the whole group goes from EG to tourism, while the study of Belloumi (2010) for Tunisia indicates an opposite direction, from tourism

expansion to EG. Some studies, as that of Demirhan (2016) for nine Mediterranean countries have provided analysis both as a group and for individual countries. The same applies for the study of Alhawaish (2016) for GCC countries.

Cross sectional analysis has been introduced primarily to eliminate the effects of the economic cycle and of possible structural changes. But the use of this technique is criticized for several reasons, such as the measurement of all variables at the same point in time (Herzer and Vollmer, 2012). Nevertheless, examples of these studies include Brau et al. (2007) for 143 countries, Singh (2008) for 37 islands and Figini and Vici (2010) for 150 countries.

Several models and econometric methods have been applied in the previous literature. The evolution in the use of these methods reveals that the majority of them has been linear. However, the selection of the model specification and econometric techniques employed, as stated by Pablo-Romero and Molina (2013) strongly affect the result of examining the connection between tourism and growth, and the widespread diversification of the empirical findings in this field of literature might be due to the nonlinearity factor (Brau et al., 2007). Wang (2012) adds that it is quite possible that a linear framework oversimplifies the tourism-growth relation, and that the true relationship between variables is complex and nonlinear in nature. Also, Adamou and Clerides (2010) believed that the model representing the relationship between them may well be nonlinear. Therefore, several problems may arise as a result of applying linear relations. Moreover, Brida et al. (2016) pointed that inference from such incorrect relationships may be inaccurate.

Based on the criticisms mentioned, several improvements in the techniques applied to examine the tourism-growth nexus have occurred, as appears in the new wave of recent studies considering the nonlinear framework. For instance, Po and Huang (2008), as well as Chang et al. (2012), and Chiu and Yeh (2016) utilize a nonlinear cross sectional analysis to investigate a nonlinear relation between tourism and growth by using a threshold variable (the degree of tourism specialization). The results show strong evidence of a nonlinear relation between tourism and growth. While Adamou and Clerides (2009) examine the tourism-growth relation, allowing for nonlinear relation between them by including a squared term of tourism variable in the regression. Brida et al. (2016) have proved that the results of their study allow explaining the nonlinearity for Brazilian economy and showed that the best adjustment mechanism is an threshold autoregressive (M-TAR) one. Phiri (2015) examines cointegration and causal effects between tourism and EG for South Africa applying linear and nonlinear cointegration analysis. Regarding the nonlinear form only, the author has used four threshold methods (TAR, c-TAR, MTAR and cMTAR), and found a bidirectional causality between tourism receipts and EG.

### 2.3. Research Studies on Jordan

Literature is scarce for Jordan, a small developing Arab country, which is located in the Middle East Region. But, there exists some previous work on other countries in the region that are somewhat

similar to Jordan in income, size, and the stage of development, in addition to tourism heritage. Also some studies on developing countries may be of interest because they include the Middle East as one of the groups investigated.

Table 1 gives information on main studies on this issue for Jordan and the region. It is obvious from this table that the results concerning the direction of causality between real international tourism receipts (RITR) and EG is mixed. For Jordan, in particular, the only available study indicates that tourism leads to growth. We hope in the current study to reach to a more accurate result, through applying better and more developed models within the nonlinear framework.

### 3. METHODOLOGY

#### 3.1. Linear Framework

Our empirical model consists of a long run regression equation:

$$RGDP_t = \alpha_0 + \alpha_1 RITR_t + \epsilon_t \quad (1)$$

Where  $RGDP_t$  is the real gross domestic product;  $RITR_t$  is the measure of RITR, and the term  $\epsilon_t$  is the long run regression error term.

The first step in analyzing time series data is to test the stationarity of the data under consideration, or the unit root test. An augmented Dickey-Fuller (ADF) test is used. It is applied to test the hypothesis

**Table 1: Previous studies investigating tourism-growth nexus for some Arab and developing countries**

Authors	Period	Variables	Economic methodology	Country/countries	Results
Belloumi (2010)	1970-2007	Tourists receipts, exchange rate, GDP	Engle and Granger (1987) ECN and Johansen and Juselius (1990) cointegration procedure and granger causality tests	Tunisia	TR→EG
Kreishan (2011)	1970-2009	Tourists arrivals, tourists revenues, GDP	Johansen and Juselius (1990) cointegration procedure and granger causality tests	Jordan	TR→EG
Ekanayake and long (2012)	1995-2009	Tourists receipts, physical capital, labor, GDP	Panel unit root, cointegration, causality test and FMOLS	140 developing countries/six regions including the Middle East and North Africa	TR≠EG
Caglayan et al. (2012)	1995-2008	Tourists revenues, GDP	Pedroni (1999) Panel cointegration method and panel causality tests	135 untries/11 groups including “Middle East and North Africa”	*TR↔EG for Europe *EG→TR for: America, Latin America and Caribbean countries *EG→TR for: Eat Asia, South Asia and Oceania *TR EG for: Asia, Middle Eat and North Africa, central Asia and Sub-Sahara Africa
Dritsakis (2012)	1980-2007	Tourists receipts, tourists arrivals, exchange rate, GDP	Panel cointegration and FMOLS	Seven Mediterranean countries: Spain, France, Italy, Greece, Turkey, Cyprus and Tunisia	TR→EG
Bouzahzah and El Menyari (2013)	1980-2010	Tourists receipts, real effective exchange rate, GDP	Johansen cointegration and error correction model	Tunisia and Morocco	*TR→EG (short run) *EG→TR (long run)
Aslan (2013)	1995-2010	Tourists receipts, GDP	Panel cointegration and Granger causality	10 Mediterranean countries	*TR↔EG for Portugal *EG→TR for Spain, Italy, Tunisia, Cyprus, Croatia, Bulgaria, Greece
Tange and Abosedra (2016)	1995-2010	Tourists arrivals, real exchange rate, GDP	Bootstrap simulation and rolling causality approaches	Lebanon	*TR EG for: Malta and Egypt TR→EG

GDP: Gross domestic product, EG: Economic growth

for the presence of a unit root in the time series ( $Y_t$ ) by the following equation (Gujarati and Porter, 2009):

$$Y_t = \rho Y_{t-1} + U_t,$$

Where  $-1 \leq \rho \leq 1$ .

Or

$$\Delta Y_t = \delta Y_{t-1} + U_t$$

Where  $\delta = 1 - \rho$  and  $U_t$  are white noise disturbances.

If the time series of the variables is not stationary at the level, it is possible to have an integration relationship between them in the long run. In general, if it is found that there is a linear Johansen combination between the variables in the long run, this combination will be stationary over time.

Linear Granger causality test is an important technique based on testing for the presence or absence of a causal relationship between the variables and the direction of this relationship:  $RGDP_t \rightarrow RITR_t$  or  $RITR_t \rightarrow RGDP_t$  (Engle and Granger 1987).

It should be noted that it is not true to pre-assume a linear relationship between economic variables. In fact, it is widely recognized that most economic data is characterized by nonlinear features that may arise from structural breaks, hence, traditional linear Granger causality tests may have low power in the presence of nonlinear relations (Hiemstra and Jones, 1994), and the forecasting performance of non-linear methods would be better than linear models (Baek and Brock, 1992).

Therefore, nonparametric approaches are appealing, since they place direct emphasis on prediction without imposing the assumption that the underlying data maintain a specific functional form.

### 3.2. Nonlinear Framework

#### 3.2.1. Nonlinear unit root test

The non-linearity stationary test proposed by Kapetenios et al. (2003) can be used to test whether the series of the two variables under consideration have stationary properties. The approximated equation of this test can be expressed as:

$$\Delta X_t = \mu + \delta X_t^3 + \sum_{i=1}^k b_i \Delta X_{t-i} + U_t \tag{2}$$

Where  $x$  is the series of variables in study,  $u$  is an i.i.d. error with zero mean and constant variance. The null hypothesis that  $\delta=0$  is tested against the alternative hypothesis that  $\delta < 0$ . The acceptance of the null hypothesis indicates the presence of unit root in a series and vice versa.

#### 3.2.2. Nonlinear cointegration test

Enders and Granger (1998) and Enders and Siklos (2001), have worked on the development of nonlinear cointegration models, Enders and Siklos (2001) model allows for tests of asymmetries,

the TAR and the MTAR. TAR model can be described by the following equation:

$$\Delta \mu_t = I_t \rho_1 \Delta \mu_{t-1} + (1 - I_t) \rho_2 \Delta \mu_{t-1} + \sum_{j=1}^{p-1} \gamma_j \Delta \mu_{t-j} + \varepsilon_t \tag{3}$$

Where  $\mu_t$  are the residuals of the dynamic ordinary least square cointegration approach, the lagged values of  $\Delta \mu$  are meant to yield uncorrelated residuals and it is the Heaviside indicator such that  $I_t = 1$  if  $\mu_{t-1} < \tau$  and zero otherwise, while MTAR is given by the equation:

$$\Delta \mu_t = I_t \rho_1 \Delta \mu_{t-1} + (1 - I_t) \rho_2 \Delta \mu_{t-1} + \sum_{j=1}^{p-1} \gamma_j \Delta \mu_{t-j} + \varepsilon_t \tag{4}$$

Where  $I_t = 1$  if  $\Delta \mu < \tau$  and zero otherwise, the coefficients  $\rho_2$  and  $\rho_1$  represent the different speeds of adjustment for the deviations from the long-run equilibrium.

In addition, if a cointegration relationship exists, the null hypothesis of symmetric adjustment ( $\rho_1 = \rho_2$ ) can be tested by applying a standard F-test. So if a cointegration relationship with MTAR adjustment exists, the following asymmetric error correction model can be estimated as:

$$\Delta y_t = \alpha + \beta_1 I_t \rho_1 \Delta \mu_{t-1} + \beta_2 (1 - I_t) \rho_2 \Delta \mu_{t-1} + \sum_{j=1}^{p-1} \gamma_j \Delta \mu_{t-j} + \sum_{j=1}^p \delta_j \Delta X_{t-j} + e_t \tag{5}$$

#### 3.2.3. Diks and Panchenko (DP) Nonlinear causality test (2006)

One of the most prominent tests of nonlinear Granger causality analysis has been developed by Hiemstra and Jones (HJ) (1994). However, Diks and Panchenko (2006) show that the relationship tested by HJ is not generally compatible with Granger causality, as it would lead to over rejection of the null hypothesis of non-causality.

We will use the procedures of Diks and Panchenko (DP) (2006) in the nonlinear Granger causality analysis as follows:

$$T_n(\varepsilon_n) = \frac{n-1}{n(n-2)} \sum_i \begin{pmatrix} f_{X,Y,Z}(X_i, Y_i, Z_i) f_Y(Y_i) \\ -f_{X,Y}(X_i, Y_i) f_{X,Z}(X_i, Z_i) \end{pmatrix} \tag{6}$$

Where,  $f_{X,Y,Z}(X,Y,Z)$  is the joint probability density function. For one  $\text{lag} X = Y = 1$  and if  $\varepsilon_n = Cn^{-\beta}$  ( $C > 0, \frac{1}{4} < \beta < \frac{1}{3}$ ), Diks and Panchenko (2006) prove that the test statistic in equation (6) satisfies the following  $\sqrt{n} \frac{T_n(\varepsilon_n) - q}{s_n} \xrightarrow{D} N(0,1)$  Where  $\xrightarrow{D}$  denotes convergence in distribution and  $S_n$  is an estimator of the asymptotic variance of  $T_n(\cdot)$  [Diks and Panchenko (2006), Bekiros and Diks (2008)].

In the DP test, the value of the bandwidth plays an important role in making a decision on nonlinear causality. If the bandwidth value is smaller (larger) than one, this will result in a larger (smaller) P-value (Bekiros and Diks, 2008). But when the

bandwidth value is equal to one, the nonlinear Granger causality analysis is carried out as follows: The DP test is applied to the stationary series to detect nonlinear interrelationships (Bekiros and Diks, 2008).

## 4. DATA AND EMPIRICAL ANALYSIS

### 4.1. Data

Data applied for Jordan in this study are quarterly time series, from 1998Q1 to 2015Q4, of RGDP given in US\$ at a constant base of 2005 to represent EG; and RITR in constant US\$ also, expressing the tourism variable. GDP data have been collected from the Central Bank of Jordan, while RITR have been collected from World Travel and Tourism Council.

### 4.2. Empirical Analysis

#### 4.2.1. Linear framework

##### 4.2.1.1. Linear unit root test

In order to investigate the stability of the model variables, we used the standard unit root ADF test.

The results are shown in Table 2. They indicate that the time-series for RGDP and international tourism receipts are not stationary at levels I(0), and the null hypothesis states that nonstationary variables are not rejected in levels. But when we take the first difference of these variables, all variables became stationary. Accordingly, the time series for the two variables of the study are integrated of order one I(1).

To determine the lag length selection, we reached for the results shown in Table 3. The results show that all the criteria (LR, FPE, Akaike information criterion [AIC], SC, and HQ) have chosen two lag length selections, which will be taken into consideration in subsequent tests.

##### 4.2.1.2. Linear cointegration analysis

Table 4 presents the results of applying Johansen cointegration test. It indicates the presence of at least 2 cointegrating equations at the 0.05 level between the two variables, hence, confirming the existence of a long-term relationship between the variables of the study.

The existence of cointegration between the two variables, which are integrated of order one I(1), means that the appropriate model for this type of data is the error correction model.

##### 4.2.1.3. Variance decomposition

This test is designed to identify the amount of variation error for each variable which is attributed to an error in the prediction of the variable itself and the amount attributable to an error in the prediction of other variables in the model.

By applying this test for RGDP and tourism receipts variables. Table 5, shows that RGDP is influenced by the income of tourism. It is clear that during the first period the changes in tourism receipts (RITR) explain about (18.8%) of the prediction error in RGDP, such ratio refers to the percentage of variances in RGDP error prediction, which is due to random errors in tourism receipts. It is noted that these percentages are increasing significantly in subsequent periods, even up to about (52.2%) in the tenth period, which refers to the strength of the effect of the change in tourism receipts (RITR) on RGDP.

#### 4.2.1.4. Granger causality test

To determine the direction of the causality relationship between tourism and RGDP; if it is one-way or bidirectional, we used Granger causality test. The results presented in Table 6, show a causal relationship in one direction from tourism receipts to RGDP, which means that tourism receipts expansion is causing real gross domestic product growth.

#### 4.2.2. Nonlinear framework

##### 4.2.2.1. Nonlinear unit root test

The results of applying Kapetenios et al. (2003) nonlinear unit root tests are reported in Table 7. They suggest that the two variables are I(1) series. The findings are significant at 5% level. Therefore, the TAR and MTAR models are suitable for nonlinear cointegration tests.

##### 4.2.2.2. Nonlinear cointegration analysis

Following Enders and Siklos (2001), we test in this study for cointegration and asymmetry in both the TAR and MTAR specifications. In particular, we test the null hypothesis of no cointegration,  $H_0: \rho_1 = \rho_2 = 0$ . The results, reported in Table 8, show that in both models, the null hypothesis of no cointegration can be rejected since the F-values for the TAR and MTAR models are found to be 14.48 and 17.08, respectively.

The results from the TAR model suggest that the null hypothesis of symmetry cannot be rejected (F-statistic = 1.98). However, considering that the speed of adjustment depends on the previous period's change (MTAR model), the results imply that the null hypothesis of a symmetric adjustment towards the long-run equilibrium could now be rejected at the 5% significance level (F-statistic = 7.16). Besides, the results from the MTAR model further reveal that the adjustment process is statistically significant for deviations from the equilibrium, with the point estimate of the threshold equal to 0.0037.

Since there is no presumption on the use of the TAR or the MTAR model, the recommendation is to choose the best adjustment mechanism using a model-selection criterion such as the AIC or Schwarz information criterion (SC). Both criteria favored the MTAR specification.

**Table 2: ADF unit-root test**

Variable	Level I (0)				First difference I (1)			
	Critical value 10%	Critical value 5%	ADF	P	Critical value 10%	Critical value 5%	ADF	P
RGDP	-2.585861	-2.897223	2.486037	1	-2.585861	-2.89223	-3.706445	0.0273
RITR	-2.585861	-2.897223	1.672142	0.9841	-2.585861	-2.89223	-3.885425	0.0089

RGDP: Real gross domestic product, RITR: Real international tourism receipts, ADF: Augmented Dickey-Fuller

**Table 3: Lag length selection**

LR	FPE	AIC	SC	HQ	Lag length
NA	2.88E+15	49.787	49.933	49.845	0
1615.902	3098210	29.134	30.015	29.488	1
246.2467***	178912.6***	26.276***	27.890***	26.924***	2

AIC: Akaike information criterion. \*\*\*indicates statistical significance at 1% significance level

**Table 4: Unrestricted cointegration rank test (trace)**

Hypothesized number of CE (s)	Eigenvalue	Trace statistic	5% critical value	P**
Number of CE (s)	0.206073	57.27783	47.85613	0.0051
At most 1*	0.273574	34.82913	29.79707	0.0121
At most 2*	0.164659	16.13728	15.49471	0.04
At most 3	0.019125	1.564148	3.841466	0.2111

Trace test indicates 2 cointegration at the 0.05 level. \*Denotes rejection of the hypothesis at the 0.05 level. \*\*MacKinnon-Haug-Michelis (1999) P values

**Table 5: Variance decomposition**

Period	RITR	RGDP
1	18.80827	81.19174
2	22.35616	77.64383
3	27.32049	72.67951
4	32.55905	67.44096
5	37.75387	62.24614
6	42.36585	57.63415
7	46.12915	53.87085
8	48.98568	51.01432
9	51.02313	48.97687
10	52.39467	47.60533

RGDP: Real gross domestic product, RITR: Real international tourism receipts

**Table 6: Granger causality test**

Null hypothesis	Observation	F-statistic	P
RITR does not Granger Cause RGDP	72	3.73981	0.04271
RGDP does not Granger Cause RITR	72	1.77287	0.19750

RGDP: Real gross domestic product, RITR: Real international tourism receipts

**Table 7: Results of nonlinear unit root tests, 1998Q1-2015Q4**

Variable	t-statistic	Lag
RGDP	0.002	3
ΔRGDP	74.321***	3
RITR	0.001	3
ΔRITR	2.133**	3

The optimal lag length is determined by schwarz information criterion. \*\* and \*\*\*indicates statistical significance at 5% and 1% significance level, respectively. RGDP: Real gross domestic product, RITR: Real international tourism receipts

**Table 8: Tests of cointegration and symmetry (TAR and MTAR Models)**

$\tau$	$\rho_1$	$\rho_2$	$\rho_1=\rho_2=0$	$\rho_1=\rho_2$	Lags	AIC	SIC
TAR model	-0.0080***	-0.0136***	14.4851***	1.9828	2	-7.18702	-7.18236
-0.0399							
MTAR model	-0.0010	-0.0133***	17.0813***	7.1601**	2	-7.18792	-7.18326
0.0037							

$\tau$  represents the threshold value.  $\rho_1=\rho_2=0$  is the null hypothesis of no cointegration.  $\rho_1=\rho_2$  is the null hypothesis of symmetry in  $\rho_1$  and  $\rho_2$ . The critical values are 7.39 and 5.10 for 1% and 5% significance level, respectively. \*\* and \*\*\*indicates statistical significance at 5% and 1% significance level, respectively, MTAR: Mechanism threshold autoregressive. AIC: Akaike information criterion

Estimates of the of the asymmetric error correction model are reported in Table 9. Although the Wald test suggests that the null hypothesis of symmetry cannot be rejected ( $P=0.19$ ), the fact that GDP responds significantly only to deviations below the threshold value, implies the presence of asymmetry.

**4.2.2.3. DP nonlinear causality test**

Table 10 presents the results from the nonlinear causality test between tourism and EG. The DP test indicates that there is a bidirectional nonlinear causality; from tourism receipts to GDP, which is consistent with our linear causality analysis, and also from GDP to tourism.

This finding is compatible with the recent view that tourism and EG exhibit nonlinearities and, consequently, linear conventional causality test may have low power in detecting causal linkages. To see whether tourism and EG in Jordan are strictly characterized by a nonlinear process, we carry out the BDS test proposed by Brock et al. (1996). The BDS test provides a nonparametric statistic for testing the null hypothesis of the identically and independently distributed error term in series.

Results from the BDS test on residuals are listed in Table 11. The P-values show that the null hypothesis of identically and independently distributed error term is rejected in favor of nonlinearity. Therefore, we should in this study consider the results of the nonlinear causality tests, because using linear Granger causality tests for policy implications regarding the nature of causation between tourism and EG in Jordan’s economy may be misleading.

**5. DISCUSSION AND CONCLUDING REMARKS**

Most previous empirical research made on the relationship between tourism and EG have assumed a linear relation based on the conventional time series analysis. The current study re-investigates this nexus for Jordan, a small developing Middle Eastern country, within a nonlinear cointegration framework, using quarterly data on RGDP and RITR for the 1998Q1-2015Q4 period.

Empirical results of applying Engle and Granger (1987) linear cointegration analysis show evidence of a long-run relationship between tourism and growth. The causality effect has been unidirectional in favor of the hypothesis of tourism driving EG. This result is also consistent with theoretical expectations in the context of the tourism-ledgrowth hypothesis. It is compatible with the result of Kreishan’s (2011) study for Jordan, and many studies applying the linear method, especially those on developing

**Table 9: Estimation of the asymmetric error correction**

	Coefficients	Statistics
Constant	0.00013**	t=1.9610
$\beta_1$	-0.00231	t = -0.7141
$\beta_2$	-0.00678***	t = -3.7547
Sum $\delta_j$	-0.00324***	F = -2.5412
Wald tests		
Cointegration (H0: $\beta_1 = \beta_2=0$ )	Wc=6.6045	P=0.001
Asymmetry (H0: $\beta_1 = \beta_2$ )	Wa=1.6214	P=0.214
Short-run causality (H0: $\delta_1=0$ )	Ws=2.9248	P=0.0497

Threshold value  $\tau = 0.0037$ . \*\* and \*\*\* indicates statistical significance at 5% and 1% significance level, respectively

**Table 10: The DP test**

Null hypothesis	Data	
	Statistic	P
RITR does not Granger Cause RGDP	1.71*	0.0015
RGDP does not Granger Cause RITR	1.43*	0.0023

\*Indicates statistical significance at 1%. RGDP: Real gross domestic product, RITR: Real international tourism receipts, DP: Diks and Panchenko

**Table 11: Results for the BDS nonlinearity test**

Tourism receipts		Economic growth	
Statistic	P	Statistic	P
0.001921	0.0000	0.004614	0.0001

countries and those where tourism has an important role in the economy. We can interpret this conclusion as follow: The increase in tourism receipts leads to expansion of foreign exchange earnings required for importing capital goods, and creation of employment opportunities and hence, labor’s income, in addition to rise of government expenditure on roads and infrastructure.

These results may be spurious if the relationship is exposed to nonlinearity due to important sudden shocks, such as main changes in supply and demand conditions. Jordan has experienced to apparent decline in its receipts in 2009 owing to the drop in international demand, which resulted from the International Financial Crises. Also several fluctuations in these receipts have occurred later starting from 2011 due to the political instability and disturbances of the Arab Spring revelations. Therefore, we employed the nonlinear approach as it would provide more robust and accurate results in such cases. We based our analysis on Enders and Siklos (2001) cointegration test, in addition to Diks and Panchenko (2006) causality test. The findings of these nonlinear tests suggest that there is a long run cointegration relation between tourism receipts and EG, with a bidirectional causality effect, implying that not only tourism expansion leads to EG, but also improvement in economic performance causes and an increase in tourism receipts. We also applied the BOS test, which has confirmed that tourism and EG in Jordan are strictly characterized by a nonlinear relation. This same result has been obtained in the study of Phiri (2016) for South Africa, among others, which belong to the nonlinear framework research. The bidirectional causality can be explained as follows: Growth of tourism receipts expands EG. Increases in output and income are used then to develop tourism infrastructure, which in turn attracts more and more tourists to the country.

We can conclude from the above discussion that tourism and EG in the case of Jordan reinforce each other. Therefore, Jordanian authorities and policy makers should devote serious efforts to stimulate EG through promoting tourism activity and taking advantage from the improvement of GDP in enhancing tourism. Expansion of total output and national income, as a result of the growth in tourism services and other economic sectors, enable the country to allocate more investments to the tourism sector. Examples are the huge investments in Queen Alia’s airport, which could prove instrumental in boosting air traffic and visitor numbers to the country. The Dead Sea Cornish project, which will start operating in 2018, may serve as another example. It is expected that this project will host at least 60 investment projects, with around \$500 million and expected to generate around 10000 Job opportunities (Goussous, 2016).

Key measures to boost tourism through developing national tourism strategies and projects have been introduced. These include the National Tourism Strategy of (2004-2010), and that of (2011-2015), in addition to other international projects such as the USAID and UNDP projects aiming to complement national efforts in developing the sector and increasing its competitiveness. But what is more important is the proper and complete implementation of these strategies and projects, and the incorporation of different tourism plans in the overall national economic plans in order to attain sustainable economic development.

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