Tourism and economic growth in South Africa: Evidence from linear and nonlinear cointegration frameworks

Phiri, Andrew

School of Economics, FAculty of Economic and Management Sciences, North West University (Potchefstroom Campus), South Africa

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TOURISM AND ECONOMIC GROWTH IN SOUTH AFRICA: EVIDENCE FROM LINEAR AND NONLINEAR COINTEGRATION FRAMEWORKS

A. Phiri
School of Economics, Faculty of Economic and Management Sciences,
North West University (Potchefstroom Campus), South Africa

ABSTRACT: This study examines cointegration and causal effects between tourism and economic growth in South Africa for annual data collected between the period of 1995 and 2014. The paper applies two empirical approaches to this end; one being the conventional Engle and Granger (1987) linear cointegration framework, and the second being a nonlinear cointegration framework of Enders and Granger (1998). Furthermore, two empirical measures of tourism development are used in the study, namely; tourist receipts and number of international tourist arrivals. In line with conventional wisdom, the empirical results of the linear framework supports the tourism-led growth hypothesis when tourist receipts are used as a measure of tourism development. However, the nonlinear framework depicts bi-directional causality between tourist receipts and economic growth. Furthermore, the linear framework supports the economic-growth-driven-tourism-hypothesis for tourist arrivals whereas the nonlinear framework depicts no causality between tourist arrivals and economic growth. Therefore, our study emphasizes on the direct relevance which tourist expenditures rather than number of tourist arrivals hold towards economic growth and overall economic development.

Keywords: Tourism receipts; Tourist arrivals, Economic growth; cointegration, causality tests, MTAR-TEC, South Africa.

JEL Classification Code: C22, C51, O40, O55.

1 *INTRODUCTION*

Tourism development is increasingly being recognized as an important source of revenues as well as a crucial tool in promoting economic growth, alleviating poverty, advancing food security, environmental protection and multicultural peace and understanding across the glove, more especially in developing or emerging economies. According to the United Nations World Tourism Organization (UNWTO), the number of international tourists worldwide in 2014 grew 4.4 percent with an additional 48 million more visitors more than in 2013, to reach a new record of 1 135 million tourist worldwide which saw receipts from international tourism reach an estimated US$ 1 245 billion which is 3.4 percent from its previous year. In fact, it is forecasted that the number of tourists worldwide will reach 1 602 million which will generate receipts of approximately US$2 trillion in revenue. Academically, the acclaimed benefits of tourism towards economic development are not difficult to pinpoint in the literature. For instance, Wang et. al. (2012) highlight that 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. Oh (2005) also cites that tourism creates job opportunities; promotes improvements in a country's infrastructure, transfers both new technological and managerial skills into an economy as well as produces foreign earnings that are not only essential to import consumer goods but also to capital and intermediate goods. Moreover, Khalil et. al. (2007) note that positive developments in the tourism sector can cause direct and indirect growth of households incomes and government revenues by means of multiplier effects, improving balance of payments and promoting tourism-based government policies. All-in-all, there is an increasing and unanimously widely-held view that tourism is a fundamental factor of economic growth, even though this has not been concretely imbedded in the theoretical literature concerning growth theory.

South Africa has enjoyed close to 70 years of professional experience in the tourism industry, with prominent developments in the industry being traced back to 1947, when the South African Tourist Co-operation (SATOUR) was formed as a separate entity from the publicity arm of the South African Railways and Habours, which formerly dealt with tourist matters (Grundlingh, 2006). However, the SATOUR was established in wake of the apartheid era, when the National Party (NP) become the ruling political party in South Africa in 1948 and implemented a legal system of political and social segregation of races. The tourism industry was greatly affected by the legacy of apartheid which rendered the tourism market a predominantly regional business, with the whites of neighbouring countries like Rhodesia and Mozambique forming a majority of tourists and long-distance visitors from overseas forming the remaining minority of tourists (Mkhize, 1994). Despite experiencing further slumps in the tourism industry during these reigns of apartheid when the United Nations organized a series of international events termed the World Conference Against Racism (WCAR) which discouraged tourist attractions in the country, the post-apartheid years have experienced a boost in the tourism industry and up-to-date, tourism continues to be an essential component in promoting economic development and sustainability within the country. Now, boasting a number of cultural, historical, archaeological and geological sites, post-apartheid South Africa is considered a premier tourist destination, not only within the African continent, but also on a competitive global platform. Adding on to this repertoire, the country has hosted a number major international sporting events; inclusive of the Rugby World cup in 1995, the African Cup of Nations in 1996 and 2012, the A1 Grand Prix since 2006, the World Cup of Athletics in 1998, the Cricket World Cup in 1998 and probably the biggest event of them all, the FIFA World Cup 2010. The FIFA World Cup by itself solely attracted more than 309 000 tourists which was a significant contributor to the 8.34 million international visitors to the country in that year. And even more encouraging, foreign arrivals in South Africa reached their highest levels in 2013 with 10 million tourists visiting the country in that year alone and overall, the growth rate of tourists has surpassed that of the world average for over the last decade or so (Saayman and Saayman, 2010).

In light of the increasing importance which tourism contributes towards the overall economic development and welfare in South Africa, it is quite surprising and thought-provoking that there appears to be a lack of academic research which explicitly explores the impact which tourism exerts on economic growth within the country. Therefore, motivated by this observed hiatus in empirical research, this current paper contributes to the academic literature by examining cointegration and causality effects between tourism and economic growth in South Africa between the period of 1994 and 2014. In order to ensure robustness in our empirical study, we adopt two methodological approaches in examining the tourism-growth cointegration relationship in South Africa namely; linear and nonlinear cointergration and causality approaches. Having outlined the background to this study, the rest of the paper is arranged as follows. The following section of the paper presents the literature review of the study. The third section outlines the empirical framework used in the study whereas the fourth section of the paper introduces the empirical data and conducts the empirical research. The paper is then concluded in the fifth section of the paper in the form of policy implications of the empirical research and also suggests possible avenues for future research.

2 TOURISM AND ECONOMIC GROWTH: A REVIEW OF THE EMPIRICAL LITERATURE

The empirical investigation into the relationship between tourism and economic growth has undergone a number of empirical stages which have been facilitated by the advancement in applied statistical investigation techniques. In a majority of the literature, much emphasis and reliance has been placed upon cointegration analysis, as introduced by Engle and Granger (1998), which is then commonly supplemented by causality analysis, as pioneered by Granger (1969). According to Engle and Granger (1998), any long-run regression which is estimated for a pair of times series variables will produce spurious results if the time series variables are not cointegrated over time. Their theorem is relatively simple. If a pair of nonstationary time series can be proved to increase monotonically over time, then a linear stationary combination of the time series (i.e. cointegration vector) can exists in the form of an error correction mechanism which ensures that the time series variables always converge to a steady-state equilibrium over time (even in the event of shocks to the system of variables). Other notable extensions of the Engle and Granger's cointegration theorem are Johansen and Juselius (1990) cointegration procedure, which caters of establishing multiple cointegration relations between two or more times series variables, as well as the bounds testing autoregressive distributive lag (ARDL) cointegration approach of Pesaran et. al. (2001) which allows for the cointegration of multivariable which are integrated of different orders of I(0) stationary variables and I(1) difference stationary variables; as well as Pedroni (1999) co-integration method for panel data investigations.

As has been mentioned before, causality analysis is often, if not always, used to compliment cointegration analysis, more notably under the context of linear cointegration analysis. The central theorem behind granger causality can be iterated as follows. Suppose two time series X_t and Y_t , are such that X_t can be modeled as lagged coefficients of the reciprocal variable Y_t, then the series X_t is said to 'granger cause' Y_t, if one if one or all of the lagged coefficients of X_t are statistically significant such that they provide information about the future values of Y_t. In specific application to the tourism-growth literature, four distinct hypotheses have emerged from Granger's (1969) causal analysis, with each hypothesis bearing specific relevance towards the implementation of tourism-related macroeconomic policies. The first out of the four hypotheses depicts causality running from tourism to economic growth, a result which places emphasis on the role which tourist-attraction policies play in the promotion of economic growth and overall economic development. As mentioned by Makochekanwa (2013) this tourism-led-growth-hypothesis (TLGH) is more applicable to developing or emerging economies seeing that such economies rely on tourism as a key foreign exchange earner. In fact, the same author highlights that for the world's forty poorest countries, tourism is the second most important source of foreign exchange after oil exports. The second hypothesis, dubbed the as the economic-growth-driven-tourism-hypothesis (EGDTH), occurs when economic growth is found to solely granger cause tourism. Under this hypothesis, policies directed towards improvement in economic growth will attract more tourist to an economy or a specific region and yet the direct improvement in tourist numbers will not affect economic growth. Lanza et. al. (2003) mention that the GLTH commonly occurs for highly-industrialized countries who are not successful because their travel and tourism industries are strong but rather, the travel and tourism industries in these countries are successful because their economies are strong. Under the third hypothesis, namely, the reciprocal hypothesis (RH), a two-way 'feedback' causality between tourism and economic growth is found to be true, and in this case, tourist attracting policies and economic growth policies complement each other and should thus be implemented conjunctively. The final hypothesis shows no causal relations between the variables thus rendering tourism-based policies, on one hand, and economic growth policies, on the other hand, as two separate stratagems which bear no influence on each other.

And even more recent, the prospect of a nonlinear relationship between tourism and economic growth has emerged in the academic paradigm and the tourism-growth literature has become increasingly open to the possibility of nonlinear relations existing between the variables. As clarified by Wang (2012), it is quite possible that a linear framework oversimplifies the tourism-growth relationship and that the underlying relationship between the variables is indeed complex and nonlinear in nature. Ridderstaat et. al. (2014) more specifically argues that the tourism-growth relationship cannot be strictly linear since the effects of tourism on economic growth adhere to the law of diminishing returns. And yet despite such reasonings or insights, the literature on the nonlinear relationship between tourism and economic growth remains relatively limited in quantity. And if the literature be further narrowed down to empirical studies which exclusively attempt to model both nonlinear cointegration as well as causal relations between the variables, then the study of Brida et. al. (2013) solely satisfies this criterion. Therefore, we optimistically note the potential for growth in this particular field of empirical investigation when one considers the rapid expansion in the availability of statistical tools which can enable researchers to carry out such analysis. Having efficiently highlighted important empirical developments in the tourism-growth literature, we present a summary of a comprehensive portion of the literature in Table 1 below. For convenience or reference sake, we segregate the summarized empirical studies into single-country studies, panel-data studies and nonlinear studies.

Table 1: Summary of literature review on tourism and economic growth

Single country studies				
Author	Country	Year/Period	Methodology	Causal relation
Balaguer and Cantavella-Jorda (2002)	Spain	1975-1997	Johansen and Juselius (1990) cointegration procedure and Granger causality tests	TR→EG
Dubarry (2004)	Mauritius	1952-1999	Johansen and Juselius (1990) cointegration procedure and Granger causality tests	TR→EG
Oh (2005)	South Korea	1975-2001	Engle and Granger (1987) ECM and Granger causality tests	EG→TR
Khalil et. al. (2007)	Pakistan	1960-2005	Engle and Granger (1987) ECM and Granger causality tests	TR↔EG
Brida et. al. (2008)	Mexico	1980-2007	Johansen and Juselius (1990) cointegration procedure and Granger causality tests	TR→EG
Tang and Jang (2009)	USA	1981-2005	Engle and Granger (1987) ECM, Johansen and Juselius (1990) cointegration procedure	EG→TR

			and Granger causality tests	
Belloumi (2010)	Tunisia	1970-2007	Engle and Granger (1987) ECM, Johansen and Juselius (1990) cointegration procedure and Granger causality tests	TR→EG
Kreishan (2011)	Jordan	1970-2009	Johansen and Juselius (1990) cointegration procedure and Granger causality tests	TR→EG
Wang et. al. (2012)	China	1984-2009	Engle and Granger (1987) ECM, and Granger causality tests	TR↔EG
Ridderstaat et. al. (2014)	Aruba	1972-2011	Engle and Granger (1987) ECM, Johansen and Juselius (1990) cointegration procedure and Granger causality tests	EG→TR
		Panel data studies		
Author	Countries	Year/Period	Co-integration method	Results
Lanza et. al. (2003)	13 OECD countries	1977-1992	Johansen and Juselius (1990) cointegration procedure and Granger causality tests	TR↔EG
Lee and Chang (2008)	OECD & non-OECD countries	1990-2002	Panel cointegration tests, Panel vector error correction model and panel causality tests	TR→EG for OECD countries; TR↔EG for non OECD countries
Seetanah (2011)	19 island economies	1990-2007	Generalized method of moments (GMM) method and panel causality tests	TR↔EG
Caglayan et. al. (2011)	30 American countries, 34 Asian countries, 37 European countries, 13 East Asian countries, 6 South Asian countries, 5 Central Asian countries, 7 Oceania countries, 24 Sub-Saharan countries 28 Latin American & Caribbean countries	1995-2008	Pedroni (1999) panel co-integration method and panel causality tests.	EG→TR for American, Latin American and Carribean countries; TR→EG for East Asian, South Asian and Oceania countries; TR≠EG for Middle East, Asia, North Africa, Central Asia and Sub-Saharan countries
Samimi et. al. (2011)	20 developing countries	1995-2008	Johansen and Juselius (1990) cointegration procedure and granger causality tests	TR↔EG
Dritsakis (2012)	7 Mediterranean countries	1980-2007	Panel cointegration panel granger causality tests.	EG→TR
Chiou (2013)	10 transition countries	1988-2011	Panel causality tests	TR≠EG for Bulgaria, Romania and Slovenia; TR→EG for Cyprus, Latvia and Slovakia; EG→TR for Czech Republic and Poland; TR↔EG for Estonia and Hungary
Aslan (2013)	10 Mediterranean countries	1995-2010	Panel granger causality tests	EG→TR for Spain, Italy, Tunisia, Cyprus,

				Croatia, Bulgaria & Greece; TR≠EG for Malta & Egypt.
		Nonlinear studies		
Author	Country/Countries	Year/Period	Methodology	Results
Po and Huang (2008)	88 developed and developing countries	1995-2005	3-regime panel threshold autoregressive model of Hansen (1999)	When TR/EG≤4.05% or TR/EG>4.73% then TR and EG are positively related; When TR/EG<4.05%≤TR/EG, then TR and EG are insignificantly related;
Adamou and Clerides (2009)	Cyprus	1960-2007		When TR/EG≤20%, then TR and EG are positively related; When TR/EG>20%, then TR and EG are insignificantly related.
Chang et. al. (2012)	131 East Asian, Pacific, European, Central Asian, Latin America, Caribbean, Middle East, North African, North American, South Asian and Sub-Saharan African countries	1991-2008	3-regime panel threshold autoregressive model of Hansen (1999)	When TR/EG≤14.97% or 14.97<TR/EG≤17.5%, then then TR and EG are positively related; When TR/EG>17.5%, then TR and EG are insignificantly related.
Wang (2012)	10 countries in the 2008 Country Brand Index	1996-2006	2-regime threshold autoregressive model of Hansen (1999)	When exchange rate depreciation > -6.59%, then there is positive relationship between TR and EG; When exchange rate depreciation ≤ -6.59%, then there is a negative relationship between TR and EG.
Brida et. al. (2013)	MERCOSUR countries	1990-2011	Non-parametric cointegration and causality tests	TR→EG for Brazil, Paraguay and Uruguay TR↔EG for Uruguay and Argentina.
Adbulnasser et. al. (2014)	G7 countries	1995-2012	Hatemi-J (2011) asymmetric panel causality tests	Asymmetric causality: TR→EG for Canada & Italy; EG→TR for France, Italy & Japan Symmetric causality: TR→EG for Germany; France & US; EG→TR for Canada & Germany.
Pan et. al. (2014)	15 OECD countries	1995-2010	Panel smooth transition regression model	When lagged exchange rate > -2.629%, then positive effects of TR on EG are magnified; When two-period lagged inflation rate > 5.03%, then the positive effects of TR on EG are magnified.

Note: →, ↔ and ≠ represent uni-directional causality, bi-directional causality and no causality between the variables, respectively. The abbreviations TR, EG and TR/EG represent tourism, economic growth and the ratio of tourism to economic growth, respectively.

3 EMPIRICAL FRAMEWORK

3.1 Engle and Granger (1987) linear cointegration framework

We begin our empirical framework by specifying our baseline empirical model via the following two long run regression equations:

$$GDP_t = \alpha_{00} + \alpha_{10}TR_t + \epsilon_{t1} \quad (1)$$

$$TR_t = \alpha_{01} + \alpha_{11}GDP_t + \epsilon_{t2} \quad (2)$$

Where GDP_t is the gross domestic product; TR_t is the measure of tourism which in our study is given by two measures (i) the first being international tourism receipts; and (ii) the second being the number of international tourist arrivals, and the term ϵ_{ti} is the long run regression error term. According to the Engle and Granger's (1987) cointegration theorem, long-run convergence along a steady state path can exist when two preliminary conditions are met. Firstly, there actual time series variables must be integrated of order I(1). The second condition is that the error term from the long-run regression must be integrated of a lower order I(0). Once these two conditions are satisfied, one can then proceed to model the long run regression error terms as the following error correction models (ECM):

$$\Delta GDP_{t-1} = \sum_{i=1}^{p} \alpha_{i1}\Delta GDP_{t-i} + \sum_{i=1}^{p} \beta_{i1}\Delta TR_{t-i} + \lambda_1 \epsilon_{t-1,1} \quad (3)$$

$$\Delta TOUR_{t-1} = \sum_{i=1}^{p} \alpha_{i1}\Delta GDP_{t-i} + \sum_{i=1}^{p} \beta_{i1}\Delta TR_{t-i} + \lambda_1 \epsilon_{t-1,1} \quad (4)$$

Where Δ is a first difference operator and is that lagged error correction term which acts as an error correction mechanism in the ECMs. From the ECMS regressions (3) and (4), granger causality testing can be facilitated by examining whether the regression coefficients from the lagged variables from the TEC models (i.e. α_k for GDP and β_k for TOUR) are significantly different from zero.

3.2 Enders and Granger (1998) nonlinear cointegration framework

As a nonlinear extension to Engle and Granger's (1987) linear cointegration framework, Enders and Granger (1998) begin on the premise of assuming that error terms from the long-run regressions (1) and (2) should be modelled as the following nonlinear cointegration functions:

$$\epsilon_{ti} = \rho_1 \epsilon_{t-1}(\epsilon_{t-1} < \tau) + \rho_2 \epsilon_{t-1}(\epsilon_{t-1} < \tau) \quad (5)$$

$$\epsilon_{ti} = \rho_1 \epsilon_{t-1}(\Delta\epsilon_{t-1} < \tau) + \rho_2 \epsilon_{t-1}(\Delta\epsilon_{t-1} < \tau) \quad (6)$$

Where τ is the threshold variable whose value is unknown a prior and ultimately governs the asymmetric behaviour among the error terms. Regressions (5) and (6) are known as threshold autoregressive (TAR) and momentum threshold autoregressive (MTAR) model specifications, respectively. Since the MTAR model relies on the first differences of the lagged residuals, $\Delta\boldsymbol{\varepsilon}_{t-1}$, this specification effectively captures large and smooth changes in a series whereas the TAR model specification is designed to capture the depth of swings the equilibrium relationship. In each of the TAR and MTAR specifications, the threshold variable is modelled in two forms. Under the first form, the value of the threshold is zero whereas under the second form, the threshold value is determined through grid search method as illustrated in Hansen (2000). In the latter case, the threshold models are respectively known as consistently-estimated threshold autoregressive (c-TAR) and consistently-estimated momentum threshold autoregressive (c-MTAR) model specifications. In testing for cointegration effects in regressions (5) and (6), Enders and Granger (1998) as well as Enders and Silkos (1998) suggest testing for (i) normal cointegration effects; and (ii) asymmetric cointegration effects. These cointegration tests are respectively implemented under the following null hypotheses:

$$H_0^{(i)} : \rho_1 = \rho_2 = 0 \quad (7)$$

$$H_0^{(ii)} : \rho_1 = \rho_2 \quad (8)$$

As is the case of the linear cointegration framework, once the aforementioned null hypotheses are rejected, then one can introduce a threshold error correction (TEC) framework, which for the TAR model assumes the following specification:

$$\begin{pmatrix} \Delta GDP_t \\ \Delta TR_t \end{pmatrix} = \begin{cases} \lambda^+ \varepsilon_{t-1} + \sum_{i=1}^{p} \alpha_k^+ \, \Delta GDP_{t-k}^+ + \sum_{i=1}^{p} \beta_k^+ \, \Delta TR_{t-k}^+ \, , if \ \varepsilon_{t-1} < \tau \\ \lambda^- \varepsilon_{t-1} + \sum_{i=1}^{p} \alpha_k^- \, \Delta GDP_{t-k}^- + \sum_{i=1}^{p} \beta_k^- \, \Delta TR_{t-k}^- \, , if \ \varepsilon_{t-1} \geq \tau \end{cases} \tag{9}$$

Whereas for the case of the MTAR model, the TEC framework assumes the following function:

$$\begin{pmatrix} \Delta GDP_t \\ \Delta TR_t \end{pmatrix} = \begin{cases} \lambda^+ \varepsilon_{t-1} + \sum_{i=1}^{p} \alpha_k^+ \, \Delta GDP_{t-k}^+ + \sum_{i=1}^{p} \beta_k^+ \, \Delta TR_{t-k}^+ \, , if \ \varepsilon_{t-1} < \Delta \tau \\ \lambda^- \varepsilon_{t-1} + \sum_{i=1}^{p} \alpha_k^- \, \Delta GDP_{t-k}^- + \sum_{i=1}^{p} \beta_k^- \, \Delta TR_{t-k}^- \, , if \ \varepsilon_{t-1} \geq \Delta \tau \end{cases} \tag{10}$$

From the above TAR-TEC and MTAR-TEC model specifications, the presence of asymmetric error correction effects as opposed to linear error correction effects can be tested through the following null hypothesis:

$$H_0^{(iii)}: \lambda^+ \xi_{t-1}^+ = \lambda^- \xi_{t-1}^- \tag{11}$$

Similar to the case for the linear cointegration framework, granger causality is facilitated in the TEC model by determining whether the regression coefficients from the lagged time series variables significantly differ from zero.

4 DATA AND EMPIRICAL ANALYSIS

4.1 Empirical data

In examining linear and nonlinear cointegration trends between tourism and economic growth the for case of South Africa, this study employs three time series for empirical use, namely; the international tourist receipts in US$ (TR(R)), the number of international tourist arrivals (TR(A)) and the gross domestic product (GDP) given in US$ at a constant base of 2005. As inferred by Ridderstaat et. al. (2014), tourism receipts suffers more during times of crisis as tourists tend to trade down and travel of shorter periods of time whereas international tourist arrivals slightly get distorted during these periods. Therefore, given these slight differences in measures of tourism, our study opts to simultaneously use both of these measures of tourism to ensure a more robust empirical analysis. In further trying to ensure consistency, all data has been collected from the World Tourism Organization yearbook of tourism statistics and has been collected on a yearly basis for the periods of 1994 and 2014. However, given the relatively small sample size of this data collection, we further interpolate the data into quarterly data in order to increase the sample size from 20 to 80 observational units.

4.2 Unit root tests

As a preliminary step towards examining linear and nonlinear cointegration trends between tourist arrivals and economic growth, on one hand, and between tourist arrivals and economic growth, on the other hand, one must examine the integration properties of the aforementioned time series variables. To this end, we employ the augment Dickey-Fuller (ADF) and the Phillips-Perron (PP) unit root tests to the data and report our findings below in Table 1. Regardless of whether the ADF or PP unit root tests are used, all the time series variables are found to be first difference stationary variables (i.e. integrated of order 1(1)). As should be noted, this result satisfies a previously-discussed condition of the Engle-Granger (1987) cointegration theorem, thus permitting us to proceed with a more formal cointegration analysis of the time series data.

Table 1: Unit root test results

unit root tests → time series ↓	ADF	PP
TR(R)	0.91	-0.99
	(-2.29)**	(-3.16)**
TR(A)	1.55	-0.76
	(-2.74)***	(-5.28)***
GDP	0.14	0.43
	(-2.83)***	(-3.06)**

Note: Unit root tests results on first differences of the time series are reported in ().p-values reported in (). '*', '**' and '***'denote significance levels of 10, 5 and 1 percent, respectively. All unit root tests are performed with a constant and no trend.

4.3 Linear cointegration analysis

Having confirmed first difference stationarity of the time series variables, we proceed to examine linear cointegration effects between TR(A) and GDP, on one hand, and between TR(B) and GDP, on the other hand. We begin our linear cointegration analysis by subjecting the two sets of time series variables to the Johansen and Juselius (1990) Eigen and Trace tests for cointegration rank.

Table 3: Maximum Eigen and trace test results for cointegration

Cointegration between TR(R) and GDP					
h_0	h_1	Eigen statistic	90% C.V	Trace statistic	90% C.V
r≤1	r=1 (r≥2)	3.78	10.49	2.65	6.50
r≤0	r=0 (r≥1)	17.52*	16.85	18.37	15.66
Cointegration between TR(A) and GDP					
h_0	h_1	Eigen statistic	90% C.V	Trace statistic	90% C.V
r≤1	r=1 (r≥2)	6.01	6.50	5.62	6.50
r≤0	r=0 (r≥1)	13.09*	12.91	18.66	15.66

Note: '*' denotes a 10% significance level. The alternative hypotheses of the trace tests are stated in parentheses.

As is evident by the results of the Eigen and Trace tests statistics for cointegration as reported in Table 3, both the Eigen and Trace test statistics reject the null hypothesis of cointegration effects for both sets of time series variables up to a cointegration rank of 1 at a 10 percent level of significance. In light of these encouraging or optimistic results, we proceed to estimate long run ordinary least squares (OLS) regressions; the associated error correction models (ECM's) and further perform granger causal tests based on the ECMs. The results of the aforementioned analysis are collectively reported in Table 4 whereas the granger causality tests based on the ECMs are reported in Table 5.

Table 4: OLS long-run regression and error correction model estimates

dependent variable →	TR(R)	GDP	TR(A)	GDP
α_{0i}	-9.68	1.56	-1.44	0.62
	(0.00)***	(0.00)***	(0.03)*	(0.00)***
α_{1i}	6.52	0.14	3.37	0.27
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
error correction model				
dependent variable → independent variable ↓	ΔTR(R)	ΔGDP	ΔTR(A)	ΔGDP
$\boldsymbol{\varepsilon}_{t-1}$	-0.74	-0.04	-1.41	-0.12
	(0.39)	(0.01)*	(0.77)	(0.03)*
ΔTR_{t-1}	0.64	0.05	0.01	0.02
	(0.44)	(0.01)**	(0.75)	(0.03)
ΔTR_{t-2}	0.50	0.03	0.43	0.05
	(0.49)	(0.02)	(0.53)	(0.02)*
ΔTR_{t-3}	0.25	0.04	-0.40	-0.01
	(0.48)	(0.02)*	(0.61)	(0.03)
ΔTR_{t-4}	0.30	0.03	0.12	0.01
	(0.50)	(0.02)	(0.43)	(0.02)
Δ GDP $_{t-1}$	-7.90	-0.08	10.29	0.97
	(9.26)	(0.35)	(8.46)	(0.04)*
Δ GDP $_{t-2}$	-0.77	-0.19	-7.41	-0.54
	(8.62)	(0.32)	(8.80)	(0.39)
Δ GDP $_{t-3}$	-1.24	0.04	11.34	0.83
	(9.12)	(0.02)*	(10.13)	(0.45)
Δ GDP $_{t-4}$	3.94	0.18	-9.86	-0.23
	(6.95)	(0.26)	(7.77)	(0.35)

p-values reported in (). ‘*’, ‘**’ and ‘***’denote significance levels of 10, 5 and 1 percent, respectively.

In referring to the empirical results reported in Table 4, we firstly take note of a significantly positive relationship between tourism and economic growth for both measures of tourism. The respective elasticities of 0.14 for TR(A) and 0.27 for TR(R), indicates that a 1 percentage increase in the number of tourist arrivals results in a 0.14 percent increase in economic growth whereas a 1 percentage increase in the dollar value of tourist receipts results in 0.27 percent increase in the levels of economic growth. Secondly, from our ECM's we find a significant and negative error correction (EC) term for both sets of regressions whereas the difference lagged variables are, for a majority of cases, positive and insignificant. This result points to significant long run relations between tourism and economic growth, whereby such relations are slightly deficient in the short-run. Lastly, our causality test results for the two sets of regressions, as reported in Table 5, points to unidirectional causality running from tourism receipts to economic growth and also from economic growth to the number of international tourist arrivals.

Table 5: Linear ECM-based causality tests

x→ y↓	GDP	TR(R)	x→ y↓	GDP	TR(A)
GDP	-	3.08 (0.07)*	GDP	-	1.98 (0.16)
TR(R)	0.49 (0.62)	-	TR(A)	3.58 (0.05)*	-

Null hypothesis: x does not granger cause y. p-values reported in (). '*', '**' and '***'denote significance levels of 10, 5 and 1 percent, respectively.

4.4 Nonlinear cointegration analysis

Having investigated linear cointegration effects between the time series variables, we now divert our attention towards examining possible nonlinear cointegration and causal relations among the same sets of variables. As should be remembered, we carry out the nonlinear cointegration analysis under 4 forms of threshold models, namely; TAR, c-TAR, MTAR and c-MTAR. Hereafter, the methodology is carried out in four consecutive steps/processes. Firstly, we test for significant nonlinear cointegration and error correction effects. to recall, we employ three main testing hypotheses namely, i) testing for cointegration, ii) testing for nonlinear cointegration iii) testing for nonlinear error correction effects. Secondly, we estimate the threshold error terms derived from the long-run regression equations. Thirdly, we estimate the associated threshold error correction models (TECM). And lastly, we carry out causality tests under the TECM frameworks.

Table 6: Threshold cointegration and threshold error correction tests

		TAR-TEC			c-TAR-TEC		
y	x	$H_0^{(i)}$	$H_0^{(ii)}$	$H_0^{(iii)}$	$H_0^{(i)}$	$H_0^{(ii)}$	$H_0^{(iii)}$
TR(R)	GDP	4.13	0.20	1.88	4.15	0.23	0.24
		(0.04)*	(0.66)	(0.20)	(0.04)*	(0.64)	(0.64)
GDP	TR(R)	3.34	0.79	4.59	4.51	2.53	3.41
		(0.06)*	(0.39)	(0.05)*	(0.03)*	(0.13)	(0.09)*
TR(A)	GDP	3.14	0.45	2.66	4.13	1.91	1.49
		(0.07)*	(0.51)	(0.13)	(0.04)*	(0.19)	(0.10)
gdp	TR(R)	2.77	0.42	2.68	3.97	2.25	2.60
		(0.09)*	(0.52)	(0.12)*	(0.04)*	(0.15)	(0.12)*
		MTAR-TEC			c-MTAR-TEC		
		$H_0^{(i)}$	$H_0^{(ii)}$	$H_0^{(iii)}$	$H_0^{(i)}$	$H_0^{(ii)}$	$H_0^{(iii)}$
TR(R)	GDP	4.05	0.10	0.74	8.07	5.46	4.09
		(0.04)*	(0.76)	(0.41)	(0.00)***	(0.03)*	(0.07)*
GDP	TR(R)	2.81	0.01	3.76	3.32	0.76	3.76
		(0.09)*	(0.95)	(0.08)*	(0.06)*	(0.40)	(0.08)*
TR(A)	GDP	2.84	0.01	2.82	5.51	4.53	5.48
		(0.08)*	(0.98)	(0.10)*	(0.01)*	(0.04)*	(0.04)**
GDP	TR(A)	3.12	0.95	0.08	5.50	4.59	2.39
		(0.07)*	(0.34)	(0.79)	(0.02)*	(0.05)*	(0.11)*

p-values reported in (). '*', '**' and '***'denote significance levels of 10, 5 and 1 percent, respectively. y represents the dependent variable and x represents the independent variable.

In referring to the tests for cointegration as reported in Table 6, we firstly note that all of the threshold cointegration regressions reject the null hypothesis of cointegration. This result clearly indicates that there must be some sort of meaningful relationship which exists between the two time series variables. However, in subjecting the threshold regressions under our second hypothesis concerning threshold cointegration effects, our results become less optimistic as we find that only three threshold cointegration regressions manage to reject the null hypothesis of no threshold cointegration effects. These three threshold regressions are al c-MTAR-Tec specifications in which i) GDP is regressed on TR(A), ii) TR(A) is regressed on GDP and iii) GDP is regressed on TR(R). In further testing these three c-MTAR-TEC regressions for threshold error correction effects, we discover that all three model specifications reject the null hypothesis of no threshold error effects in favour of threshold error correction effects. In light of these results, we proceed to estimate the three c-MTAR-TEC regressions as plausible asymmetric specifications which can depict the nonlinear cointegration in the tourism-growth correlation.

Table 7 below presents the estimation and causality analysis of the three c-MTAR-TEC models. We note that the all estimated threshold models satisfy the asymmetric convergence condition of the threshold error terms $\rho_1,\rho_2<0$ and $(1-\rho_1)(1-\rho_2)<1$. As mentioned by Enders and Silkos (2001) this condition ensures the stationarity of the threshold error terms hence validating the notion of asymmetric cointegration between the sets of time series data. We also note that tourist receipts is the driving variable in the equilibrium system, then $\rho_1> \rho_2$, hence indicating that positive deviations from equilibrium are eradicated quicker than negative ones. However, in the equilibrium system between tourist arrivals and economic growth, the condition $\rho_1> \rho_2$, holds true regardless of which time series variable is the driving variable in the equilibrium system. This later results implies that negative deviations from equilibrium are eradicated faster than positive ones. Furthermore, and more encouraging we find that all estimated threshold error correction models produce at least one significantly negative error correction term, a result which further offers support in a favour of a long-run asymmetric equilibrium convergence among the variables. In lastly turning to our causality analysis, we observe bi-directional causality between tourist receipts and economic growth. However, for the remaining threshold regressions (i.e. between TR(A) and GDP) we find no evidence of causality, thus insinuating no causality between tourist arrivals and economic growth.

Table 7: c-MTAR-TEC regression estimates and causality test results

	y	X	y	x	y	x
	TR(R)	GDP	TR(A)	GDP	GDP	TR(A)
$\rho_1 \epsilon_{t-1}$	-0.85		-0.12		-0.44	
	(0.00)***		(0.08)		(0.26)	
$\rho_2 \epsilon_{t-1}$	-0.06		-0.93		-0.89	
	(0.84)		(0.00)***		(0.03)*	
τ	-0.197		0.203		-0.043	
$\alpha_k^+ \ \Delta GDP_{t-k}^+$	0.51	6.57	0.67	6.75	0.01	0.01
	(0.11)*	(0.32)	(0.06)*	(0.17)	(0.99)	(0.71)
$\alpha_k^- \ \Delta GDP_{t-k}^-$	-1.97	-6.45	0.13	4.27	-4.22	-0.24
	(0.07)*	(0.04)*	(0.70)	(0.62)	(0.67)	(0.69)
$\beta_k^+ \ \Delta TR_{t-k}^+$	0.01	0.60	0.02	0.17	4.27	0.59
	(0.55)	(0.07)*	(0.60)	(0.74)	(0.47)	(0.11)
$\beta_k^- \ \Delta TR_{t-k}^-$	0.08	0.66	-0.22	-3.73	4.29	1.94
	(0.03)**	(0.37)	(0.70)	(0.64)	(0.70)	(0.72)
$\lambda^+ \varepsilon_{t-1}$	-0.01	-1.05	0.02	0.16	0.78	1.45
	(0.04)*	(0.01)*	(0.72)	(0.80)	(0.32)	(0.26)
$\lambda^- \varepsilon_{t-1}$	-0.01	-0.08	-0.05	-1.47	-0.04	-0.08
	(0.69)	(0.85)	(0.08)*	(0.00)***	(0.03)*	(0.06)*
causality tests						
H_0: y→x	2.57		1.18		2.19	
	(0.11)*		(0.34)		(0.16)	
H_0: x→y	2.71		0.14		0.18	
	(0.11)*		(0.87)		(0.84)	
diagnostic tests						
DW						
p-value						
LB						
JB						

p-values reported in (). ‘*’, ‘**’ and ‘***’denote significance levels of 10, 5 and 1 percent, respectively. y represents the dependent variable and x represents the independent variable.

5 CONCLUSION

Primarily motivated by the absence of academic evidence depicting the empirical relationship between tourism and economic growth in South Africa, our study endeavoured into investigating both linear and threshold cointegration and causality effects between the variables for interpolated quarterly data constructed from yearly data collected between 1994 and 2014. As a further methodological extension of our analysis, we use two empirical measures of tourism, namely; the dollar value of tourism expenditure receipts and the number of international tourist arrivals into the country. As a by-product, our overall empirical strategy offers a singular approach to exploring both linear and nonlinear cointegration relations between tourist receipts and economic growth, on one hand, and between tourist arrivals and economic growth, on the other hand. The three principal findings of our empirical analysis can be summarized as follows. Firstly, we observe a common finding of significant cointegration relations between tourism and economic growth regardless of whether a linear or nonlinear framework is used or regardless of whether tourist receipts or number of tourist arrivals is used a measure of tourism. Secondly, the linear framework indicates a unidirectional causality running from tourism receipts to economic growth whereas there is a unidirectional causal flow from economic growth to tourist arrivals. In effect, the aforementioned results offer support in favour of tourism-led growth hypothesis between tourist receipts and economic growth whilst the economic-growth driven tourism hypothesis is supported between tourist arrivals and economic growth. Thirdly, the nonlinear framework indicates bi-direction causality between tourist receipts and economic growth as well as no causal relations between tourist arrivals and economic growth. Accordingly, this supports the reciprocal hypothesis and no causality effects, respectively.

In deriving the key policy implications derived from our empirical analysis, we rationalize our results as follows. The finding of causality from tourist receipts to economic growth under the linear framework is expected since most African countries still use their income to improve the level of tourism infrastructure and sites that are available in these countries in order to win tourist to their destination so that there will be an increase in the level of economic activities in the sector, which will thereby accelerate long-run economic growth (Kareem, 2013). For instance, a key driver of economic growth has been the recent liberalisation of South African airspace, which has seen an increasing number of international airlines carrying out more weekly flights between South Africa and other countries. Moreover, the finding of bi-directional causality between tourist receipts and economic growth under the nonlinear framework is not irrational since this implies that whilst tourism receipts improves economic growth, such improvements in economic growth are the used to modify or develop infrastructure, which in turn, attracts tourists back into the country. This result has also been re-iterated by the department of Environmental Affairs and Tourism, which claims that 40 percent of business visitors returned to the country within a few years of their first visit, while 18 percent of business tourists went on leisure trips prior to their business activities and 22 percent of them did the same afterwards. Incidentally, this also rationalizes the finding of uni-directional causality running from economic growth to the number of international tourist seeing that tourist infrastructure attracts the number of international tourists into the country who then spend their expenditure when they arrive in the country, which, in turn contributes to improved economic growth.

Overall, our study implies that South Africa can improve her economic growth performance, not only in investing in the traditional sources of growth such as investment in physical and human capital as well as through technological advancements but can also strategically harness the contribution of the tourism industry towards such economic growth. Therefore, it is recommended that special emphasis be paid to the domestic tourism industry as means of fostering higher economic growth and hence policymakers are advised to consider integrating tourism development programs into major economic development plans such as the highly popularized Millennium Development Goals (MDG). In particular, sustainable developments within the local tourism sector can assist in addressing the MDG's global challenges such as poverty, hunger and unemployment through the direct contribution which the tourism adds to economic growth. Therefore, by generating wealth, the South African tourism sector can play a significant role in the achievement of MDG goals by creating opportunities for entrepreneurship, opportunities for employment and, via its multiplier effects, generate income from the primary sector of the economy inclusive of trade, manufacturing, construction and agriculture.

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