Research Article

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Causal Dynamics Between Tourism Receipts, Economic Growth, and Real Exchange Rate in Algeria's Economy Between 1990 and 2019

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Abstract: This study aimed to clarify the relationship between economic growth and tourism revenue in the Algerian economy. It focused on the relationship between economic growth, real exchange rate, and tourism receipts. This investigation is intended to fill a gap in the empirical literature on the tourism sector in developing countries. It used the autoregressive distributed lag model adopted from 1990 through 2019. The relationship between economic growth, tourism receipts, and real exchange rate in Algeria is a unidirectional causality relationship; and the tourism receipts and the real exchange rate affect the economy in the short and long term. In terms of long-term equilibrium, there was a positive but nonsignificant impact of tourism receipts on economic growth. At the same time, there was no significant effect of the real exchange rate on economic growth. In the short term, there was a positive and significant impact of tourism receipts lag on economic growth. A positive and significant impact of the second difference lag of the real exchange rate was found. Algerian decision-makers can benefit from these findings when developing the tourism sector. This is the first examination of the effect of these variables in Algeria during the period between 1990 and 2019.

Keywords: Tourism receipts; real exchange rate; economic growth; Algerian economy; ARDL model

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1 Introduction

Tourism is one of the leading industries within the world economy; it was an essential economic branch in the late 20th and early 21st centuries based on the indicators of number of employees, participation in the social product, value, and total consumption. The mix of higher incomes and more free time has contributed to the emergence of a replacement market segment in the tourism industry (Kim et al., 2015).

The tourism sector is important and is comparable to other economic areas. This sector occupies the first position in many countries, including Arab countries such as Tunisia and Lebanon and European countries such as Spain and France. Despite the presence of the ingredients for the tourism sector's success in Algeria, however, it has not received sufficient attention in Algeria's national economy. This has occurred even though Algeria boasts archaeological and historical tourist sites and mineral baths in addition to the sea, mountains, and desert. Algeria also has breathtaking views and favourable weather, which make the tourism sector potentially important for the economy, if decision-makers in the Algerian government implement policies to develop it. Despite the potential for tourism in Algeria, this sector still suffers from several problems that decision-makers have been unable to solve. Additionally, the tourism sector in Algeria was affected by the COVID-19 pandemic, as it was throughout the rest of the world, due to quarantine measures and the closure of borders and airports, which could continue to negatively affect this sector. Therefore, this research focused on the following question: What was the relationship between tourism receipts, economic growth, and the real exchange rate in Algeria's economy during the period between 1990 and 2019?

The importance of the study lies in its potential to help develop the tourism sector in Algeria into an engine for the economy, in addition to its contribution to reduc-

ing unemployment, increasing economic growth rates, and reducing the burden on the balance of payments.

No significant effect of the real exchange rate on economic growth was found. In the short term, there was a positive and significant impact of tourism receipts lag on economic growth. A positive impact of the second difference lag of the real exchange rate was found.

Decision-makers in Algeria can also benefit from the tourism sector, promoting the economy by diversifying it and eliminating the country's dependency on the hydrocarbons sector.

I begin with a literature review and description of the hypotheses. I then describe the data and methodology. Following that, I put forward the results of the investigation and then present a discussion before concluding the article.

2 Literature Review and Hypotheses

2.1 Literature Review

Previous studies on tourism receipts and economic growth and exchange rate have had different areas of interest and different focal points. Some studies investigated the relationship between tourism and other variables in a single country or within a cross-section of countries.

Ohlan (2017) studied the relationship between tourism, financial development, and economic growth in India during the period from 1960 to 2014. The results indicated the relationships between the variables of the study in the short and long term. One-way causal relationships were found between the study variables; however, the study neglected some variables that affect economic growth, which provided better results for the study.

Kumar and Stauvermann (2016) examined linear and nonlinear relationships between tourism and growth. A 1% increase in tourism receipts was found to increase output by 0.10% in the long term. A long-term U-shape was detected, with minimum tourism receipts consisting 1.26% of the gross domestic product (GDP). The causality results indicated that a higher level of tourism receipts causes growth. This study neglected some crucial variables that could have produced more wide-ranging results.

Liu et al. (2016) studied the dynamic relationship between international tourism, economic growth, and energy consumption in Taiwan during the period between 1965 and 2010. They used Granger causality[1] analysis to examine the causal relationships among international tourism development, economic processes, and energy consumption in Taiwan during that period. The results indicated a two-way causal relationship between economic growth and energy consumption, and between the development of international tourism and energy consumption. No reciprocal causal relationship was found between economic growth and international tourism development. This study separated the study variables from each other, as it was better to estimate the model with three variables; however, the results might have been better without separating the variables.

Katircioğlu (2011) studied tourism and growth in Singapore between 1960 and 2007. The results confirmed a long-term balance of the relationship between international tourism and economic growth in the case of Singapore, and real income and growth converged. The level of long-term equilibrium significantly increased, by 51.4%, in the tourism-led growth (TLG) hypothesis model. The main conclusion of this study was that the TLG hypothesis is specific for the long-term economy of Singapore, as was determined by conditional causal tests. However, this study did not include control variables that are important for research.

The study of Belloumi (2010) on the relationship between tourism revenues, real exchange rate, and economic growth in Tunisia during the period from 1970 to 2007 concluded that there was a correlation between tourism and economic growth. Additionally, the results of the Granger causality test indicated that tourism had an indirect positive impact on GDP growth. The results of this study were focused on tourism revenues and economic growth and did not explain the outcome of the real exchange rate.

Kreishan (2010) studied tourism and economic growth in Jordan from 1970 to 2009. The results of the Granger causality test revealed a one-way causality from tourism revenues to economic growth. The results of this study indicated that the government should focus on economic policies to promote international tourism as a potential source of economic growth in Jordan.

Balaguer and Cantavella-Jordá (2002) studied tourism as a long-term economic growth factor in Spain and con-

1 The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. It was first proposed by Granger (1969). Using the term causality alone is a misnomer, as Granger causality is better described as precedence, or, as Granger himself later claimed (Granger & Newbold, 1977), "temporally related."

cluded that economic growth in Spain, for at least the past three decades, was reasonable for the continued expansion of international tourism. This increased activity has doubled tourism's effects over time. External competitiveness was also found to be a crucial variable for Spanish economic growth.

Arslanturk et al. (2011), studying the Turkish economy during the period between 1963 and 2006, concluded that there was no causal link between tourism revenues and economic growth. Over time, economic growth did not have a predictive capacity for tourism revenues.

Boğa and Erkişi (2019) studied the relationship between reception of international tourism and economic growth in Asia-Pacific countries during the period from 1995 to 2017. Their results indicated that there was a bilateral causal relationship between tourism receipts and economic growth in the short term. The authors hypothesised that there was a two-way relationship between international tourism receipts and economic growth. This study neglected the control variables that affect the model.

Wu and Wu (2018) studied the interrelationship between world tourism and the growth of the Chinese economy in 12 western regions in China from 1995 to 2015 and found a causal correlation between the two variables in seven of those regions, whereas the remaining five regions affected only one variable. The heterogeneity of the study areas affected those results.

Tugcu (2014) analysed the state of the Mediterranean region between 1998–2011 and found a causal relationship between tourism and economic growth. European countries were able to generate growth better than tourism in that region. The study's results differed between Europe, Asia, and Africa.

Lee and Brahmasrene (2013) found a long-term equilibrium relationship between study variables. Tourism, carbon dioxide emissions, and foreign direct investment (FDI) had a positive and robust impact on economic growth. The latter, in turn, showed a positive and robust impact on CO_2 emissions during tourism, and FDI had a robust negative effect on CO_2 emissions.

The survey of previous studies revealed that the topic of the relationship between tourism receipts, economic growth, and the real exchange rate in the period from 1990 to 2019 was not examined previously. Especially in light of the COVID-19 pandemic, examining this gap can provide valuable insights to decision-makers in the Algerian economy and academic researchers in this field.

2.2 Research Hypotheses

To answer the research problem and achieve the desired objectives, I proposed the following set of hypotheses:

H1. International tourism receipts and real exchange rate affect Algeria's economic growth.

H2. Economic growth and real exchange rate affect Algeria's international tourism receipts.

H3. Economic growth and tourism international receipts affect Algeria's real exchange rate.

H4. The real exchange rate hurts economic growth in Algeria.

H5. The real exchange rate hurts international tourism receipts in Algeria.

3 Data and Methodology

This study relied on the autoregressive distributed lag (ARDL) model to study the relationship between international tourism receipts, real exchange rate, and economic growth in Algeria during the period from 1990 to 2019, and I used the EViews 10 software for analysis. I first describe the variables used in the model.

3.1 Data

Before constructing the model, I collected data regarding the study variables from the World Bank (n.d.) database (WDI) and the Algerian National Bureau of Statistics (ONS). I identified the dependent variables, the explanatory variables, and the expected impact of each variable; the variables are summarised in Table 1.

Table 2 shows the most important statistical indicators for the variables used in the model for the period from 1990 to 2019; that is, the indicators found to be highly acceptable to the nature of this study within 30 observations.

In Table 3, which represents the correlation matrix between study variables, there is a correlation between those variables. The accuracy of the model is increased, using the best unbiased linear capabilities.

Table 1: Variables used in the study and their definition.

Variable	Characteristic	Definition
LNTOUR	The logarithm of international tourism receipts	International tourism receipts (currency US$)
LNGDPG	The logarithm of gross domestic product (GDP) growth	GDP growth (annual %)
LNREER	The logarithm of the real effective exchange rate	Real effective exchange rate index (2010 = 100)

Source: The variables are related to Algeria, and all data are from the World Development Indicators' Data Bank by the World Bank https://databank.worldbank.org/reports.aspx?source=world-development-indicators, except for LNTOUR (1990–1994, 2018, 2019) and LNGDPG (2019), which we obtained from the Algerian National Bureau of Statistics (www.ons.dz).

Table 2: Descriptive statistics of the variables in the study.

	LNGDPG	LNTOUR	LNREER
M	4.631941	4.731771	18.64382
Median	4.63574	4.637684	18.98015
Maximum	4.674714	5.396235	19.98303
Minimum	4.583947	4.535622	16.86003
SD	0.020151	0.188400	1.056439
Probability	0.693189	0.000001	0.225635
Sum	138.9582	141.9531	559.3146
Observations	30	30	30

Source: Output of EViews 10 software.

3.2 Methodology

The ARDL model methodology was used, as one of its characteristics is that it can be applied regardless of whether the chain is stable at the level or integrated from the first order. However, it cannot be integrated from the second order.

Based on economic theory and empirical models used in previous studies on the same topic, the equation was estimated to measure the impact of tourism revenue, economic growth, and the real exchange rate in Algeria during the period of 1990 to 2019.

Table 3: Correlation of the variables in the study.

	LNGDPG	LNREER	LNTOUR
LNGDPG	1		
LNREER	−0.40829842	1	
LNTOUR	0.43076231	−0.80311554	1

Source: Output of EViews 10 software.

3.3 Model Specification and Estimation Technique

After testing for the unit roots, the subsequent step consisted of investigating the long-term relationships between the variables. Using the ARDL bounds testing approach, the ARDL representation between the competing variables can be described as:

$$LNTOUR_t = \alpha_0 + \alpha_1 LNGDPG_t + \alpha_2 LNREER_t + \varepsilon_t \quad (1)$$

$$LNGDPG_t = \alpha_0 + \alpha_1 LNTOUR_t + \alpha_2 LNREER_t + \varepsilon_t \quad (2)$$

$$LNREER_t = \alpha_0 + \alpha_1 LNTOUR_t + \alpha_2 LNGDPG_t + \varepsilon_t \quad (3)$$

Where $LNTOUR_t$ is the logarithm of international tourism receipts in Algeria at time *t*, $LNGDPG_t$ is the logarithm of GDP growth in Algeria at time *t*, $LNREER_t$ is the logarithm of the real effective exchange rate in Algeria at time *t* α_i is the parameters, and $\varepsilon_t$is the error term.

The ARDL bounds testing approach to cointegration was used as an estimation technique in the current empirical research. The advantages of this technique, developed by Pesaran et al. (2001), can be divided into three significant aspects. First, it enables analysis of both short- and long-term associations between dependent and independent variables without regard to the order of integration of the regressors, provided it does not exceed the order of one I(1) (Pesaran, 1997; Pesaran et al., 2001). Second, this approach is well-suited to small sample sizes because it provides a reliable outcome (Pesaran & Shin, 1998). Third, under this technique, variables can have different optimal lagged periods (Pesaran et al., 2001). Fourth, the long-term coefficients are unbiased even in the case of the endogeneity of the regressors.

Hence, according to Pesaran et al. (2001), Equations 1, 2, and 3 were tested by estimating the unrestricted error correction model (UECM) as follows:

$$\Delta LNTOUR_t = \vartheta_0 + \vartheta_1 LNTOUR_{t-1} + \vartheta_2 LNGDPG_{t-1} + \vartheta_3 LNREER_{t-1} + \sum_{i=0}^{p} \rho_{1i} LNTOUR_{t-1} + \sum_{j=0}^{q} \rho_{2j} LNGDPG_{t-1} + \sum_{j=0}^{q} \rho_{3j} LNREER_{t-1} + \varepsilon_t \quad (1.a)$$

$$\Delta LNGDPG_t = \vartheta_0 + \vartheta_1 LNGDPG_{t-1} + \vartheta_2 LNTOUR_{t-1} + \vartheta_3 LNREER_{t-1} + \sum_{i=0}^{p} \rho_{1i} LNGDPG_{t-1} + \sum_{j=0}^{q} \rho_{2j} LNTOUR_{t-1} + \sum_{j=0}^{q} \rho_{3j} LNREER_{t-1} + \varepsilon_t \quad (2.a)$$

$$\Delta LNREER_t = \vartheta_0 + \vartheta_1 LNREER_{t-1} + \vartheta_2 LNGDPG_{t-1} + \vartheta_3 LNTOUR_{t-1} + \sum_{i=0}^{p} \rho_{1i} LNREER_{t-1} + \sum_{j=0}^{q} \rho_{2j} LNGDPG_{t-1} + \sum_{j=0}^{q} \rho_{3j} LNTOUR_{t-1} + \varepsilon_t \quad (3.a)$$

Where Δ is the first difference operator, ϑ_0 is the constant intercept, μ_t is Gaussian white noise, the parameters $\vartheta_1 - \vartheta_3$ are the long-term coefficients, the parameters $\rho_1 - \rho_3$ represent the short-term parameters, and (*p*, *q*) represent lag order on the regression variables.

Even though the ARDL bounds testing approach to cointegration requires no pretesting for unit roots, we conducted augmented Dickey–Fuller (ADF; Dickey & Fuller, 1981; Said & Dickey, 1984) and Phillips–Perron (PP; Phillips & Perron, 1988) unit root tests to determine the level of integration of variables, ensure that none of the variables is I(2) or beyond and, therefore, provides justification for the suitability of the model estimation technique used here.

The second step involved examining the existence of a long-term association among the variables stated in our models based on the F-bound test procedure. To this end, the null hypothesis of no cointegration to be tested in Equations 1.a, 2.a, and 3.a was H0: $\vartheta_2 = \vartheta_3 = 0$, and the alternate hypothesis of the presence of cointegration was H1: $\vartheta_2 \neq \vartheta_3 \neq 0$. The computed value of F statistics was compared with the upper and lower critical values proposed by Pesaran et al. (2001).

In the third stage, and after establishing the existence of long-term cointegration, long-term coefficients were estimated by applying the long-term ARDL models. The error correction model (ECM) was estimated to determine the short-term coefficients and parameters of the short-term speed of adjustments to the long-term equilibrium.

4 Empirical Results

The methodology used in this study followed these steps:

1. Test the stability of the time series (unit root of stationarity).
2. VEC Granger causality analysis.
3. Bound test.
4. Estimation of the long-term model using the ARDL model.
5. Determination of an error correction model for the ARDL model (ARDL-ECM).
6. Structural stability test for long-term coefficients (ARDL-ECM).

4.1 Stability Test of Time Series (Unit Root of Stationarity)

4.1.1 Unit Root Tests

Table 4 provides information on the order of integration of all variables included in our study based on the results of the ADF and PP tests for unit root. The results showed that the dependent variable (LNTOUR) integrated of order one I(1) and all other independent variables integrated of different orders (I(0) and I(1)). Thus, both tests (ADF and PP) demonstrated that none of the series integrated of order two I(2). As a result, the ARDL bounds testing procedure could be adopted to estimate our model.

Table 4: Unit root test results.

		LNGDPG	LNREER	LNTOUR
At level	ADF test	—	−3.16**	—
	PP test	—	−4.49***	—
At first difference	ADF test	−8.63***	—	−5.73***
	PP test	−9.34***	—	−5.73***
Order of integration		I(1)	I(0)	I(1)

Note: ADF = augmented Dickey–Fuller test; PP = Phillips–Perron test. Source: Output of EViews 10 software.

**Rejection of the null hypothesis at 5%. ***Rejection of the null hypothesis at 10%.

4.1.2 Bounds Tests for Cointegration

Statistical findings for the bound testing for each model are given in Table 5. The computed *F* statistics for the model (4.44) were higher than the corresponding upper bound critical value at the 1% level of significance for the model (5). Thus, the null hypothesis of no cointegration was rejected, implying robust evidence of long-term cointegration relationships among all variables for both models.

4.1.3 Long- and Short-Term Estimation Findings

4.1.3.1 Long-term findings.

The estimated coefficients of the long-term relationship are given in Table 6.

Model 1 studied the effect of the real exchange rate and economic growth on tourism receipts in the Algerian economy during the study period using the ARDL model. The estimation of the model parameters indicated an adverse effect of the real exchange rate on tourism receipts, but it was not significant in the long run. A positive impact of economic growth on tourism receipts was found, but it was not significant in the long run.

Model 2 studied the effect of the real exchange rate and tourism receipts on Algerian economic growth during the study period using the ARDL model. The estimation of the model parameters indicated an adverse effect of the real exchange rate on economic growth, but it was not significant in the long run. A positive impact of tourism receipts on economic growth was found, but it was not significant in the long run.

Table 5: Computed *F* statistic for cointegration tests—ARDL bounds tests.

		] I(0)–I(1)]	Conclusion
Lower–upper bound (10%)		2.63–3.35	Cointegration
Lower–upper bound (5%)		3.10–3.87	Cointegration
Lower–upper bound (1%)		4.13–5.00	Cointegration
DV: LNTOUR	*F* statistics	4.44*	
DV: LNGDPG	*F* statistics	2.25	
DV: LNREER	*F* statistics	4.63	
K		2	

Note: DV = dependent variable; *K* = the number of regressors included in the models. *Statistically significant at 1%.

Model 3 studied the effect of the tourism receipts and economic growth on the real exchange rate in the Algerian economy during the study period using the ARDL model. The estimation of the model parameters indicated an adverse effect of the tourism receipts on the real exchange rate, but it was not significant in the long run. A negative impact of economic growth on the real exchange rate was found, but it was not significant in the long run.

4.1.3.2 Short-term findings.

Table 7 presents the short-term results as well as the error correction mechanism of the selected ARDL models. The coefficients of the error correction terms (ECTs) were negative and statistically and significantly corroborating; therefore, a long-term equilibrium relationship was established between the competing variables. The findings revealed that the speed of adjustment was negative (−0.26 in Model 1, −0.41 in Model 2, and −0.25 in Model 3), was significant at 1%, and did not exceed the value of 1; hence verifying the validity of the long-term equilibrium mechanism (Pesaran et al., 1999). This implied that the annual rate of adjustment toward full equilibrium in the long run ranged from 26% in Model 1 to 41% in Model 2 and 25% in Model 3.

Model 1 studied the effect of the real exchange rate and economic growth on tourism receipts in the Algerian economy during the study period using the ARDL model.

Table 6: Long-term coefficients estimation with ARDL bounds test model.

Model	Variable		Coefficient	*p*-value
ARDL	Dependent variable	LNTOUR		
	Independent variable	LNREER	−3.42	0.1545
		LNGDPG	37.53	0.1193
		C	138.67	0.2423
ARDL	Dependent variable	LNGDPG		
	Independent variable	LNREER	0.085	0.5482
		LNTOUR	0.0169	0.3703
		C	3.9	0.0008
ARDL	Dependent variable	LNREER		
	Independent variable	LNTOUR	−0.05	0.4
		LNGDPG	−0.52	0.82
		C	8.03	0.45

Note: ARDL = autoregressive distributed lag.

The estimation of the model parameters indicated a positive impact of the difference in the real exchange rate (ΔLNREER) on tourism receipts. However, it was not significant in the short run. A positive impact of the difference lag of the real exchange rate ($\Delta LNREER_{t-1}$) on tourism receipts was found, and it was significant in the short run, at the 5% significance level, so a 1% increase in (LNREER) lag stimulated LNTOUR by about 107% in the short term in Algeria.

Model 2 studied the effect of the real exchange rate and tourism receipts on Algerian economic growth during the study period using the ARDL model. The estimation of the model parameters indicated a positive impact of tourism receipts lag on economic growth, which was significant at the 1% level in the short run. We found that a 1% increase in (LNTOUR) lag stimulated LNGDPG by about 2.4% in the short term in Algeria. A positive impact of tourism receipts lag 2 on economic growth was significant at the 1% level in the short run, demonstrating that a 1% increase in (LNTOUR) lag 2 stimulates LNGDPG by about 1.7% in the short term in Algeria.

Model 3 studied the effect of tourism receipts and economic growth on the real exchange rate in the Algerian economy during the study period using the ARDL model. The estimation of the model parameters indicated a positive impact of the difference lag of the real exchange rate ($\Delta LNREER_{t-1}$), but it was not significant in the short run. A positive impact of the second difference lag of the real exchange rate ($\Delta LNREER_{t-2}$) was found, and it was significant in the short run at the 1% significance level, indicating that a 1% increase in $\Delta LNREER_{t-2}$ lag stimulates LNREER by about 41% in the short term in Algeria.

Table 7: Error correction representation of ARDL bounds test model.

Model	Variable		Coefficient	*p*-value
ARDL	Dependent variable	LNTOUR		
	Independent variable	ΔLNREER	0.056	0.94
		$\Delta LNREER_{t-1}$	1.07**	0.0305
		ECT_{t-1}	−0.263***	0.002
ARDL	Dependent variable	LNGDPG		
	Independent variable	ΔLNTOUR	0.024***	0.0032
		$\Delta LNTOUR_{t-1}$	−0.017**	0.0386
		ΔLNREER	−0.12***	0.0044
		$\Delta LNREER_{t-1}$	−0.062***	0.0043
		ECT_{t-1}	−0.41***	0.0043
ARDL	Dependent variable	LNREER		
	Independent variable	$\Delta LNREER_{t-1}$	0.053	0.63
		$\Delta LNREER_{t-2}$	−0.41***	0.000
		ECT_{t-1}	−0.25***	0.0002

Note: ARDL = autoregressive distributed lag.

**Statistically significant at 5%. ***Statistically significant at 1%.

4.2 VEC Granger Causality Analysis

Granger causality was used to determine the direction of the relationship between the study variables, as there were variables that were affected by each other and there were one-directional relationships. This varied from one economy to another (Engle & Granger, 1987; Granger, 1988).

The existence of cointegration between series confirmed that there should be at least one causal relationship, but it failed to give the relationship's direction. Hence, we followed the well-known procedure developed by Engle and Granger (1987) to examine the short- and long-term causal dynamics between the competing variables. Following Engle and Granger, a vector error correction model (VECM) was used for testing the Granger causality among tourism receipts, economic growth, and real exchange rate. The method can be written as follows:

$$\Delta LNTOUR_t = b_{10} + \sum_{i=0}^{p1} \rho_{1i} LNTOUR_{t-1} + \sum_{i=0}^{q1} \vartheta_{1i} LNGDPG_{t-1} + \sum_{i=0}^{r1} \phi_{1i} LNREER_{t-1} + \omega_1 + \varepsilon_{1t} \quad (1.b)$$

$$\Delta LNGDPG_t = b_{20} + \sum_{i=0}^{p2} \rho_{2i} LNTOUR_{t-1} + \sum_{i=0}^{q2} \vartheta_{2i} LNGDPG_{t-1} + \sum_{i=0}^{r2} \phi_{2i} LNREER_{t-1} + \omega_2 + \varepsilon_{2t} \quad (2.b)$$

$$LNREER_t = b_{30} + \sum_{i=0}^{p3} \rho_{3i} LNTOUR_{t-1} + \sum_{i=0}^{q3} \vartheta_{3i} LNGDPG_{t-1} + \sum_{i=0}^{r3} \phi_{3i} LNREER_{t-1} + \omega_3 + \varepsilon_{3t} \quad (3.b)$$

Where $b_{j0}, \rho_j, \vartheta_j$, and ϕ_j (j = 1, 2, 3) are the parameters to be estimated; ε_{jt} (j = 1, 2, 3) is the white noise error term; ECT is derived from the corresponding long-term equilibrium relationship; and the coefficients ω_j (j = 1, 2, 3) of the

ECTs represent the deviation of the dependent variables from the long-term equilibrium.

The ECM allows testing for the existence of Granger causality in three possible ways (Sebri & Abid, 2012). First, the short-term Granger causality was investigated by testing the significance of the sum of lagged differences of explanatory variables by using the partial *F* statistic. Second, the long-term causality was checked by examining the coefficients of the ECT_{t-1} based on *t* statistics. A long-term Granger causality exists if this coefficient is negative and statistically significant. Finally, strong Granger causality, which means that the two sources of causality are jointly significant, can be exposed by testing the joint hypothesis through the joint *F* test on both ECT_{t-1} and the sum of lagged differences of the explanatory variables.

Based on Table 8, there was a causal relationship between the variables of the study: Both the tourism receipts and real exchange rate affected the economic growth one-directionally. Economic growth and the real exchange rate did not affect the tourism receipts in Algeria. That is, there was no causal link in this direction. Tourism receipts and economic growth did not affect the real exchange rate.

4.3 Structural Stability Test for Long-Term Coefficients (ARDL-ECM)

In ARDL models, it is advisable to use structural stability testing and diagnostic tests.

4.3.1 Parameter Diagnostic Test

To ensure the quality of the model used in the analysis and that it is free from standard problems, we used the Lagrange multiplier (LM) test as a stability test. For heteroscedasticity tests, we used the ARCH, RESET, and normality tests. The results of the parameter diagnostic tests are reported in Table 9.

The results indicated that there was no problem of instability of variance

4.3.2 Structural Stability Test for the Estimated ARDL Model

The stability of the estimated coefficients in the model was also proven using CUSMUS and CUSMUSQ stability tests,

Table 9: Diagnostic tests.

Diagnostic test	LM test	ARCH test	RESET test	Normality test
F_{TOUR}(REER, GDPG)	0.9	0.25	0.67	0.057
F_{GDPG}(REER, TOUR)	0.75	0.066	0.79	0.45
F_{REER}(TOUR, GDPG)	0.38	0.55	0.9	0.44

Note: LM test = Breusch–Godfrey Lagrange multiplier test for residual serial correlation; ARCH test = autoregressive conditional heteroscedasticity test; RESET test = Ramsey's test for functional misspecification; normality test = Jarque–Bera normality test.

Table 8: VECM Granger causality analysis.

IV/DV	Long-term			Short-term
	ΔLGDPG	LNREER	ΔLNTOUR	ECT_{t-1}
ΔLGDPG	—	−0.25 (0.66)	5.9* (0.07)	−1.68*** (0.00)
LNREER	−0.12*** (00092)	—	0.35 (0.43)	−0.17*** (0.0002)
ΔLNTOUR	0.01 (0.14)	0.01 (0.71)	—	−0.98*** (0.00)
C	−0.166 (0.12)	0.79 (0.02)	−1.58 (0.45)	—
Observations	27	27	27	—
R^2	0.71	0.92	0.16	—
DW	1.78	1.83	1.96	—
Fisher	6.81*** (00003)	48.70*** (0.00)	1.57(0.22)	—

Note: IV = independent variable; DV = dependent variable.

**Statistically significant at 5%. ***Statistically significant at 1%.

as detailed by Brown et al. (1975). Figure 1 shows that the cumulative residual starvation test (CUSUM) expressed a linear medium within the boundaries of the critical region, indicating a pattern of stability in the model at 5% in both the long and short terms.

The same is true for the cumulative sum test for the residual follow-up boxes (CUSUMSQ), as shown in Figure 2.

5 Empirical Results and Discussion

This study empirically examined the causal dynamics between tourism receipts, GDP, and real exchange rate in Algeria's economy during the period from 1990 to 2019. It was performed using the ARDL bounds testing approach to cointegration. I found that there was a unidirectional causal relationship between economic growth and tourism receipts and the real exchange rate in the Algerian economy. These results are inconsistent with the studies of Kreishan (2010) and Choyakh (2008), which explained economic growth affecting tourism receipts and the real exchange rate in Algeria. The results reported here are generally supported by the study of Belloumi (2010). However, in the long and short term, there were differences between the studies. In terms of long-term equilibrium, there was a positive but insignificant impact of tourism receipts on economic growth. At the same time, no significant effect of the real exchange rate on economic growth was found, which is inconsistent with the study of Arslanturk et al. (2011). In the short run, there was a positive impact of tourism receipts lag on economic growth, which was significant at 1%. This implies that a 1% increase in (LNTOUR) lag stimulated LNGDPG by about 2.4% in the short run in Algeria. Moreover, a positive impact of second tourism receipts lag on economic growth was found at a 1% significance level. This implies that a 1% increase in (LNTOUR) lag 2 stimulated LNGDPG by about 1.7% in the short run in Algeria.

6 Conclusions

Through the results of this study, I conclude that there was a one-way causal relationship between economic growth, tourism receipts, and real exchange rate in Algeria in the studied period. Both the tourism receipts and the real exchange rate affected economic growth in the short run, as supported by the study of Belloumi (2010), where the higher the global tourism receipts, the lower the rate of economic growth in the long run, and the higher the real exchange rate, the lower the rate of economic growth.

The results of this study indicated that there was a causal relationship between tourism receipts, economic growth, and the real exchange rate in Algeria during the period from 1990 to 2019, but it was one-directional. According to Granger's causality, both tourism receipts and the real exchange rate affected economic growth in the short term, whereas in the long run, this relationship was not significant. That is, every increase in tourism revenues led to an increase in economic growth in the short run, and every increase in the real exchange rate led to an increase in economic growth in the short run.

The results of this study have many implications, and the Algerian economy needs to undergo deep reforms to improve its growth rate through diversification and reduced dependence on the oil sector. The most critical areas to develop are agriculture, tourism, and industry,

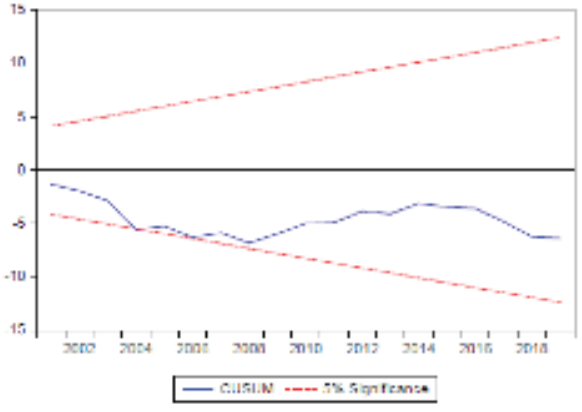

Figure 1: Model stability: Cumulative sum of recursive residuals (CUSUM). Source: Output of EViews 10 software.

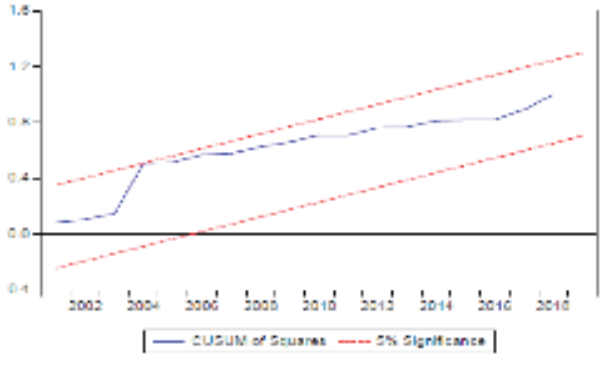

Figure 2: Model stability: Cumulative sum of squares of recursive residuals (CUSUM of squares). Source: Output of EViews 10 software.

which can increase investments. That, in turn, will raise the GDP and thus increase economic growth.

This article is not without limitations that should be addressed in future research. First, it could be interesting to specify variables that could achieve better results. Second, it would be useful to investigate the causal relationship of each of the two variables that could have enhanced this study with better results. Third, the number of years examined in the research should be increased, because 30 years is a relatively short time span for studying a time series.

Finally, we focused on the Algerian economy, which derives most of its growth from the oil sector. If the study were on a group of countries, such as the Arab countries, the countries of the Middle East and North Africa, or the Mediterranean countries, it would provide more wide-ranging results. This should be considered a horizon for new research.

Bionote

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