

ESTIMATING THE EFFECT OF EXCHANGE RATE VOLATILITY ON NIGERIAN TOURISM INCOMES

Yusuff, M. A.¹ and Soyemi, Jumoke²

¹ Department of General Studies, The Federal Polytechnic, Ilaro

² Department of Computer Science, The Federal Polytechnic, Ilaro

mulikat.yusuff@federalpolyilaro.edu.ng, jumoke.soyemi@federalpolyilaro.edu.ng

Abstract

Due to a decline in global oil prices, the Nigerian government's revenues have fallen sharply, and the economy is facing numerous problems. Tourism revenues are a significant part of expanding the government's revenue base. These revenues are affected by exchange rate volatility, warranting investigation. This study examines the effects of exchange rate volatility on tourism revenues in Nigeria from 1995 to 2015. Volatility in the real exchange rate was measured using an exponential generalised autoregressive conditional heteroscedasticity (EGARCH,1,1) model. The relationship between the series was analysed using Johansen's cointegration tests and error-correction models. Our findings indicate that exchange rate volatility negatively affects tourism revenues. Additionally, the study reveals a strong long-term relationship between the exchange rate and tourism revenues. It is recommended that maintaining a stable exchange rate could help in achieving higher tourism revenues.

Keywords: Co-integration, Exchange rate, Revenue, Tourism, Volatility, EGARCH

1.0 Introduction

Tourism is one of the most vital service sectors, enabling countries to achieve gains in economic, social, and cultural areas (Ali et al., 2014). To capitalise on these opportunities, many nations, both developed and developing, with tourism potential, depend on international tourism to expand their revenue base and accelerate economic growth. The tourism industry is now regarded as the world's largest and one of its fastest-growing economic sectors. In 2016, despite challenges such as terrorist attacks, political instability, pandemics, and natural disasters, global tourism revenues increased to US\$7.6 trillion, accounting for about 10.2% of the world's Gross Domestic Product (WTTC, 2017).

Nigeria, which derives approximately 90% of its revenue from oil, has recently experienced a decline in oil prices. The country is consequently facing numerous economic challenges due to low income. Tourism revenues play a vital role in supplementing this decreasing income. There are about 7000 tourist attractions- natural, cultural, and historical- spread across all parts of the country, and the tourism sector has been growing in line with global trends since 1990, thanks to industry revitalisation. This progress is evident in the rise in international tourist arrivals and the revenue generated. In 1995, the country hosted 656 tourists and earned \$47 million in tourism revenue; by 2015, these figures had increased to 1.2 million tourists and \$470 million in revenue. With increased investments in tourism, the sector has become a stable source of foreign exchange and employment, benefiting the country's economy.

However, the literature shows that the exchange rate is an essential factor in determining the revenue a country can generate from international tourism. The real effective exchange rate

determines the degree of competitiveness of a country's tourism in the global tourism market. Studies such as Garin-Munoz and Pérez-Amoral (2000) in Spain, Tse (2001) in Hong Kong, Eilat and Einav (2004), Ali et al. (2014), and Kilic and Bayar (2014) in Turkey have investigated the relationship between tourism revenues and exchange rate volatility. In this study, the observed fluctuations in the exchange rate arguments used in previous studies were examined for Nigeria.

2.0 Review of Empirical Studies

The impact of exchange rate volatility on the tourism sector has been widely researched. These studies have used different tourism indices and analytical methods, yielding diverse results. Nowjee et al. (2012) examined the relationship between the exchange rate, tourism, and economic growth in Mauritius, measured tourist arrivals and employed a multivariate vector error correction model on data from 1981 to 2010; they found that tourist arrivals statistically significantly Granger-cause the real exchange rate. Saayman and Saayman (2013), using an autoregressive distributed lag model and a bounds test approach, estimated the impact of exchange rate volatility on tourist arrivals and spending in South Africa and found that it significantly affected both. The study by Cheng, Kim, and Thompson (2013), which employed a structural vector autoregressive model to explore the effects of exchange rates on American tourism, found that depreciation improved the tourism trade balance. The study further determined that only export income was marginally sensitive to the exchange rate.

Hui and Yining (2012) employed regression analysis to assess the effects of real exchange rate volatility on tourism receipts from China's nine major source countries. They found that REER has a negative effect on tourism receipts. Ali et al. (2014)'s study on the effect of exchange rate volatility on Turkish tourism income, using a multivariate cointegration model, found that exchange rate volatility negatively affects tourism revenues and that there is a weak long-term relationship between exchange rates and tourism revenues. Cheng, Kim, and Thompson (2013) investigated the effects of exchange rate volatility on United States tourism export revenues and import spending over 37 years, using a vector autoregressive model, and found that depreciation increased tourism receipts but did not affect tourism expenditure. Kilic and Bayar (2014) applied a vector error correction model to examine the effects of exchange rate volatility on tourism receipts and expenditure in Turkey, revealing a positive long-term relationship between the REER and both tourism receipts and expenditure. The study by Tang (2013) employed bounds testing and an error-correction model to analyse the effects of exchange rates on tourism receipts in Malaysia from 1974 to 2009 and found that the real exchange rate had a positive and significant impact on real tourism receipts.

Issues surrounding international tourism activities in Nigeria have received limited attention. However, Ogbeba, Oji-Okoro, and Abba-Abubakar (2016) studied the effects of exchange rate fluctuations on tourism sector output in Nigeria, using a vector error correction model and measuring tourism output as the tourism sector's contribution to GDP. Their results revealed that exchange rate fluctuations have a significant negative effect on the tourism sector output. In contrast, we employed data on Nigeria's international tourism receipts and a multivariate cointegration model to conduct this study.

3.0 Methodology

The study uses annual data on tourism receipts and the real effective exchange rate, obtained online from the World Bank's World Development Indicators. The data covers the period from 1995 to 2015. The model adopted in this paper to estimate the impact of exchange rate volatility on tourism revenues is also used by Ali et al. (2014) to examine the effects of exchange rate volatility on Turkish tourism incomes. The model is specified thus:

$$TOR = \beta_0 + \beta_1 RER + \beta_2 RERV + u$$

In the model, TOR represents tourism revenues; β_0 denotes the fixed term; RER denotes the exchange rate; RERV denotes the exchange rate fluctuation; and U denotes the error term. The multivariate co-integration method developed by Johansen and Juselius (1990) and the error correction model were employed to examine the co-integrating relationship and short-run dynamics between the exchange rate and tourism revenues. The E-View 8 statistical package was utilised for the analysis.

4.0 Empirical Estimation and Results Analysis

A measure of volatility was initially computed, followed by an analysis of the data's nature, before proceeding with Johansen cointegration and error-correction tests. The results are hereby presented.

4.1 Measurement of Exchange Rate Volatility and Result

To measure exchange rate volatility, we utilised exponential generalised autoregressive conditional heteroscedasticity (EGARCH) developed by Nelson (1991). The EGARCH model is often preferred over the GARCH model because it captures the magnitude, sign, and asymmetry in the variance structure (Takaendesa et al., 2005; Ali et al., 2014). The conditional variance equation in the EGARCH model, as specified by Takaendesa et al. (2005) and Ali et al. (2014), is expressed as:

$$\log(\sigma_t^2) = c + \beta \log(\sigma_{t-1}^2) + \alpha \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \right| + \gamma \frac{\varepsilon_{t-1}}{\sigma_{t-1}}$$

Where σ_t^2 is the conditional variance of the real exchange rate, ε_{t-1} are the residuals derived from the model's equation, and C, α , β , γ are parameter estimates. ε_{t-1} represents the ARCH term, which measures information about volatility in the previous period, while σ_{t-1}^2 is the GARCH term representing the forecast variance of the last period.

However, before applying the EGARCH estimation procedure, we examine the presence of ARCH effects in the real exchange rate process. According to Brooks (2008), as cited in Milambo, Maredza, & Sibanda (2013), it is crucial to perform the ARCH test to determine whether a GARCH-type model is appropriate for the data analysed. Therefore, in this study, the ARCH test was used to assess the impact of ARCH on the residuals, and the results are presented in Table 1 below.

Table 1 Heteroskedasticity Test: ARCH

F-statistic	549028.7	Prob. F(1,8)	0.0000
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Obs*R-squared	9.999854	Prob. Chi-Square(1)	0.0016
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In Table 1, the Obs* R-squared statistic from the ARCH test for autocorrelation in squared residuals is reported. The p-value (0.0016) and F-statistic (549028.7; p-value = 0.00000) indicate rejection of the null hypothesis of no heteroscedasticity in the residuals. Hence, the significance of the probability value indicates heteroscedasticity in the error terms. Thus, it was necessary to proceed with estimating the EGARCH process. Table 2 presents the results from the EGARCH (1,1) model.

Table 2: EGARCH Model

Dependent variable: LTOR			
Method: EGARCH			
Mean Equation			
Variable	Coefficient	z-Statistic	Prob.
GARCH	-2.048105	-3.902851	0.0001
LRERVOL	0.356759	1.529668	0.1261
C	13.31101	7.143125	0.0000
Variance Equation			
C	-1.989766	-2.498560	0.0125
α_1	0.087652	0.952952	0.3406
γ_1	-0.167518	-2.906525	0.0037
β	0.540081	3.765908	0.0002
R-squared	0.800123	Durbin Watson	
Adjusted R-squared	0.779083		
		2.010258	

In Table 2 above, the parameter estimate γ , which shows the effect of asymmetry, is negative and significant. This suggests the existence of the leverage effect. The situation implies that there were more negative than positive shocks, increasing real exchange rate volatility. To give credence to the volatility estimate derived from the EGARCH process, we further tested whether any ARCH effect remained in the EGARCH (1,1) residuals. Results are shown in Table 3.

Table 3 Heteroscedasticity ARCH Test

F-statistic	0.269243
Obs*R-squared	0.293427
Prob. F(1,18)	0.6098
Prob. Chi-Square(1)	0.5880

Evidently, the P-values of the Obs*R-squared from the Chi-squared (0.5880) and F-statistic (0.06098) as shown in Table 3 indicate the absence of ARCH effects. Consequently, the predicted conditional variance of the exchange rate provides an estimate of the real exchange rate volatility.

4.2 Unit Root Test Result

The first step in the Johansen co-integration procedure is to determine the order of integration of the variables to be estimated. In this study, we used the Phillip Peron test (Table 4). The series was tested individually using an approach that involves a constant and a trend term.

Table 4: Unit Root Results

Variable	Phillip Perron (PP) @ 5% Levels	First Difference	Remark
LTOR	-3.557	-18.567 ***	Integrated to order 1
LRER	-7.167	-19.680 ***	Integrated to order 1
LRERV	0.192	-17.200***	Integrated to order 1
Critical value	-12.500	-12.500	

Notes: Number of lags was determined by AIC, *** denotes level of significance at 1 per cent

A close examination of the results in Table 4 shows that all the series contain a unit root, implying that the null hypothesis of no trend-stationarity can be rejected at the 5% level for all series. The study then proceeded to differencing all the series simultaneously to obtain a trend-stationary process. Consequently, a cointegration test was employed to determine whether the series are stationary in levels, thereby ascertaining the existence of a long-run relationship among the variables in the model.

4.3 Co-integration Results

The existence of a long-run relationship between the real exchange rate and tourism receipts was investigated using Johansen and Juselius' (1990) multivariate cointegration approach, with the variables' integration orders set at 1 (i.e., I(1)). The co-integration test in Table 5 was conducted on the assumption that a linear combination of the non-stationary series yields a trend-stationary series in the long run.

Table 5: Co-integration results

H ₀	H ₁	Trace Statistic	Critical values@ 5%	Eigen values	Max- Eigen Statistic	Critical values@ 5%
r=0	r=1	29.07161	35.01090	0.604702	18.56229	24.25202
r≤1	r=2	10.50931	18.39771	0.269942	6.292614	17.14769
r≤2	r=3	4.216700	3.841466	0.190092	4.216700	3.841466

The result of the Johansen co-integration, as suggested by the trace statistic in Table 5, implies the existence of at most two (2) co-integrating equations between the real exchange rate and revenue from tourism at a 5 per cent significance level. Hence, the null hypothesis of no co-integration (i.e., r = 0) is rejected in this study, leading to the conclusion that there is a long-run relationship between the real change rate and tourism receipts.

4.4 Error Correction Model Results

Having established the existence of a long-run relationship between the real exchange rate and tourism incomes. The study further investigated the direction and causality of the relationships among variables within the scope of the error correction model. As stated by Kilic and Bayar (2014), once cointegration is established between two variables, a long-term equilibrium model and a short-term error-correction model are typically proposed for causality tests. Engle and Granger (1987) have shown that a vector error correction model (VECM) accounts for the adjustment mechanism from the short run to the long run equilibrium in the system.

Table 6: Error correction model

Variable	Coefficient	T-statistic
LRER	-2.3879	-4.3932
LREV	0.7847	5.1549
V_{t-1}	-0.8143	-11.2252

Note: V_t is the error correction term

The result of the vector error correction model is presented in Table 6 above. The results show that the real exchange rate appreciation decreases tourism receipts. A 1% change in real exchange rates leads to a 2.39% change in tourism, holding other variables constant. Thus, the degree of the responsiveness of tourism revenue to the variations in the real exchange rate is elastic. This also conforms to economic expectations. Furthermore, positive exchange rate volatility appears to increase tourism revenue by 0.785 per cent. The error-correction term indicates that 81.43 per cent of the external shocks to the system are corrected over time. This shows a relatively high speed of adjustment in the system's mechanism.

5.0 Conclusion

The tourism sector is one of the non-oil sectors after agriculture that has continued to generate steady income for the country. In recent years, tourism revenues have constituted more than 3 per cent of the country's income. It is a source of income that needs to be expanded to generate more revenue further. However, fluctuations in the exchange rate affect the income generated from tourism. This study examined the possible effects of exchange rate volatility on Nigerian tourism revenues. Exchange rate volatility was first estimated using the EGARCH model, and the relationship between exchange rate volatility and tourism revenues was then investigated using a Johansen multivariate cointegration and error-correction model. Our empirical results indicate that positive exchange rate fluctuations increase tourism revenues, whereas increases in the real exchange rate reduce them.

A stable exchange rate regime is therefore recommended to enable the country to earn substantial income from its massive tourism potential.

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