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RESEARCH ARTICLE

The Effects of Real Exchange Rates on International Tourism: Empirical Evidence from Morocco

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ABSTRACT

Considering the vital role of the tourism sector in the economy, and the intense competition between nations to attract large numbers of tourists, nations are seeking to ameliorate their competitiveness in order to boost their position internationally. In this context, it is essential to determine the main factors of international tourism demand, and with this in mind, this article examines the impact of the real effective exchange rate on international tourism flows to Morocco over the period 1995-2023. We apply the Vector Autoregressive (VAR) model and the Granger causality test to analyze this impact. In addition, we have introduced other control variables (inflation rate, gross domestic product per capita, carbon dioxide emissions) for two reasons: firstly, to ensure the robustness of the results, and secondly, to account for other factors that may affect international tourism demand in the case of Morocco. Our results show that there is a negative relationship between the evolution of the real effective exchange rate, the inflation rate, carbon dioxide emissions and international tourism flows in Morocco, whereas gross domestic product per capita has a positive impact on the evolution of international tourism demand. In our judgment, this study can also guide professionals and policymakers in the formulation of policies and strategies associated with the development of the tourism sector, to improve Morocco's position in this area. The practical implications of these findings suggest that policies aimed at stabilizing the exchange rate and managing economic and environmental variables could enhance Morocco's attractiveness as a tourist destination.

INTRODUCTION

The tourism sector today occupies a key position in any economy, given its important role in the economic and social development of many developing countries, thanks to its significant contribution to wealth creation and employment, as well as its positive impact on the balance of payments through the movement of capital and individuals. Recent data shows that tourism significantly contributes to GDP Growth and employment in these regions, highlighting its evolving importance(Brida et al., 2016; Rasool et al., 2021). Because of its importance as a source of income and added value for countries, the development of the tourism industry continues to be one of the major concerns of countries to attract the largest possible number of tourists and to increase their share of tourism demand(Azimovna et al., 2022; Fundeanu, 2015).

Consequently, the study of tourism demand and the identification of the factors and variables that stimulate tourism activity constitutes one of the most important areas of research in economics. From this perspective, tourism demand can be stimulated by a number of factors, including social and environmental factors, factors related to the external working environment and economic factors, with economic factors being considered the most important factors affecting tourism demand. These variables include the real effective exchange rate, relative prices between destination and origin, prices and costs of tourist trips, marketing, income represented by the GDP of the country of origin and finally the cost of transport (Cheng et al., 2013; DRITSAKIS & GIALETAKI, 2004; Li et al., 2006; Seo et al., 2009).

Therefore, fluctuations in the real effective exchange rate have a determining impact on the purchasing power of the tourism sector and consequently influence the volume of tourism demand, in particular international tourism demand, because the local tourist pays for his tourism expenditure with the national currency of his country, while the foreign tourist exchanges his local currency either with the currency of the country visited or with an international currency accepted by the country visited, i.e., he carries out the currency exchange process. This means that the exchange process will affect the tourist's purchasing power, and therefore tourist demand(Krasniqi et al., 2023; Muryani et al., 2020).

However, despite the growing importance, significant gaps remain in understanding how fluctuations in exchange rates affect tourism demand, particularly in smaller economies such as Morocco. While existing research evaluates the effects of exchange rate volatility on tourism in various economies, there is a notable lack of specific analysis focusing on developing countries like Morocco.

Besides, existing research has not been done on how those local economic factors interacting with international tourism demand are affected by inflation rates and carbon dioxide emissions(Bouzahzah & Menyari, 2013).

This paper tries to fill in these gaps with a fully developed study on the effects of real effective exchange rate fluctuations in international tourism demand in a nonpareil country in potentiality for tourism and economic dynamics: Morocco. The main scope of this paper is to discuss the effect of the exchange rate on international tourism demand in the case of Morocco, a country with great natural, cultural, and historical potential, let alone the favorable climate and safety; with these two elements, Morocco can be characterized as quite attractive to tourists.

This study aims to address these gaps by providing a thorough analysis of the impact of the real effective exchange rate on international tourism demand in Morocco, a country with unique characteristics in terms of tourism potential and economic dynamics. The main objective of this paper is to explore the impact of the exchange rate on international tourism demand in the case of Morocco, a country with significant natural, cultural, and historical potential, not to mention the climate and security that make Morocco a relatively popular tourist destination. Given the above, it seems necessary to ask the following question: What is the impact of the exchange rate on the evolution of international tourist demand in the case of Morocco?

To answer this question and discuss its various aspects, the study is based on the (VAR) modeling proposed by (Sims, 1989), which makes it possible to study the stationarity of the variables in the model, to study whether there are Granger causal relationships between the exchange rate and the demand of international tourists, as well as VAR modeling.

Finally, the article is organized as follows. Section 1: The introduction is the first section in which the issue has been highlighted and related to the national context, while section 2 briefly reviews previous relevant studies on the role of the exchange rate in determining international tourist demand where previous literature has been reviewed to highlight the scientific gap which reinforces the importance of the study. Section 3 presents the methodology, the choice of the specific model and the empirical data. The empirical results are presented in section 4, before concluding in section 5, which summaries the conclusions and policy implications.

LITERATURE REVIEW

Tourism demand has always been a major preoccupation of researchers seeking the main determinants of international tourism demand to help professionals, investors, and policymakers develop strategies for developing the tourism sector and improving the country's competitiveness. From the pioneering work of (Garin-Munoz & Amaral, 2000; Webber, 2001) to the present day, the literature on tourism demand and the study of the impact of the exchange rate on its evolution have grown exponentially over the last three decades. This development can be attributed to two main factors: first, the exceptional interest in the tourism sector, which is an important engine of economic growth, and second, the development of econometric techniques and tools and the availability of data that help researchers deepen their research in this area. A number of empirical studies have been carried out aiming to explain international tourism demand and detecting its main determinants. A summary of the relevant literature highlights the exchange rate as a primary determinant of international tourism demand.

Pioneering work by (Garin-Munoz & Amaral, 2000)and (Webber, 2001) was one of the early studies to empirically establish that fluctuations in exchange rates play a crucial role in influencing international tourism demand. (Garin-Munoz & Amaral, 2000) quantified the impact of macroeconomic variables on international demand for tourist services in Spain. Their analysis based on panel data from 17 countries covering the period 1985-1995, used panel regression. The empirical results indicated an income elasticity of 1.41, a price elasticity of -0.3, an exchange rate elasticity of 0.5, and a negative impact from the Gulf War of -0.15. (Webber, 2001) empirically concluded that exchange rate volatility is a determinant of long-term tourism demand, noting that tourists may cancel, delay, or even change their destination in 40% of cases due to exchange rate fluctuations.

Several authors have subsequently mentioned the exchange rate as a factor in determining the exchange rate (Kareem, 2008; Bashagi & Muchapondwa, 2009; Quadri & Zheng, 2010). For example (Kareem, 2008) uses a generalized model of moments (GMM) on a panel of African countries, the author reports that exchange rate appreciation, inflation, political instability and crime rates negatively affect tourist arrivals in Africa, whereas infrastructure and real global income positively influence tourism. To identify the factors influencing international tourism demand in Tanzania (Bashagi & Muchapondwa, 2009) using the ARDL approach detected that the exchange rate among the factors influencing international tourism demand for Tanzania between 1996 and 2006. In their 2010 study (Quadri & Zheng, 2010) examined the relationship between exchange rates and international tourist arrivals in Italy. By focusing on the potential effects of exchange rate fluctuations on tourism demand from nineteen different countries, they used daily data spanning from February 1, 2004, to July 31, 2009. Their findings revealed that exchange rate changes did not exert a uniform influence on the number of international tourist arrivals in Italy, highlighting the variability of this impact across different countries.

Additionally (Agiomirgianakis et al., 2014) analyzed the impact of exchange rate volatility on tourism flows in Turkey from 1994 to 2012 using an ARDL model. The study's findings reveal a negative relationship between exchange rate volatility and tourist arrivals in Turkey. In the same vein and in 2015 (Agiomirgianakis et al., 2015) arrived at conclusions suggesting that there is a negative effect of the exchange rate on tourist arrivals in Iceland between 1990 and 2014 using an empirical methodology based on cointegration theory, representation with error correction.

On the other hand (Ongan et al., 2017) analyzed the effects of real exchange rates on tourism receipts (tourist arrivals) from the Netherlands, France, Germany, the United Kingdom, Spain, Italy, and Sweden to the United States between 1996 and 2015. The empirical results demonstrate that tourists visiting the United States are more responsive to exchange rate fluctuations than to changes in (GDP). French tourists, however, are highly influenced by (GDP), whereas tourists from the United Kingdom are significantly affected by real exchange rate variations.

Similarly (Irandoust, 2019) explored the relationship between exchange rates and tourism demand across ten European countries from 1995 to 2016. The study found that exchange rates had both significant positive and negative effects on the number of arrivals, supporting the notion that tourism demand responds asymmetrically to fluctuations in exchange rates. This underscores the crucial role

of each country's monetary policy in shaping the direction of the relationship between exchange rates and tourism demand.

On the other hand (Munir & Iftikhar, 2021), examined annual panel data from Bangladesh, India, Nepal, Pakistan, and Sri Lanka from 1995 to 2019 to explore the impact of exchange rate fluctuations on tourism. By employing both linear and nonlinear autoregressive distributed lag (ARDL and NARDL) models, their study revealed that the exchange rate affects tourism asymmetrically. This asymmetry influences tourism dynamics differently in the short and long term across the South Asian countries analyzed.

Moreover (Tung & Thang, 2022) by analyzing data from 47 countries classified as low-income and lower-middle-income, the researchers investigated how exchange rate variations affect foreign tourist demand between 2005 and 2020. The results confirm that an increase in the exchange rate leads to a rise in the number of international visitors arriving in these countries. In addition, the results showed that pollution, represented by carbon dioxide emissions, has a negative influence on demand from international travelers. Nevertheless, the quality of institutions and infrastructure in host countries can positively influence demand from international tourists.

Besides (Maiyo, 2024) this research uses vector autoregressive modeling (VAR) of monthly data from 2012 to 2021 to examine the influences of exchange rates on foreign tourist demand in Kenya. Granger causality analysis found significant causal effects between exchange rate fluctuations and tourism flows. In particular, regional tourism flows are highly sensitive to global currencies such as the US dollar and the euro.

Firstly, the literature confirms that exchange rates play a major role in shaping international tourism demand, even though the empirical results obtained are contradictory. Secondly, researchers remain focused on developed contexts so few works that address the case of developing countries such as Morocco, to our knowledge, which is considered a gap in this topic. Finally, Most studies on international tourism demand use the number of tourist arrivals as the dependent variable. This variable effectively represents international tourist demand. As for explanatory variables, there were multiple combinations. However, the exchange rate consistently stands out as a primary determinant in explaining variations in international tourism demand.

METHODOLOGY AND DATA DESCRIPTION

To achieve our predefined objectives, we will base our data processing on a vector autoregression (VAR) model proposed by (Sims, 1989). This model is particularly suited for evaluating the dynamic interactions between several time series, such as tourism demand and various key macroeconomic variables. The VAR model is justified by its ability to simultaneously analyze the reciprocal effects of these variables while capturing their short-term and long-term dynamics.

The data used in this study consist of annual time series covering the period from 1995 to 2023, totaling 28 observations. The data were collected from reliable sources, including the World Bank. The analysis of these theoretical and empirical studies allowed us to extract a set of variables which can be the main determinants of international tourist demand for the case of Morocco. These variables are the number of tourist arrivals(NA), Gross Domestic Product per capita (GDP), inflation rate (INF) , Real Effective Exchange Rate (REER) and Carbon dioxide emissions (CO_2) . The econometric model used can be expressed as follows:

$$NA_t = \alpha + \beta_1 GDP_t + \beta_2 ECO_{2_t} + \beta_3 INF_t + \beta_4 REER_t + \varepsilon_t$$

In this equation, α represents the constant term, $\beta_1, \beta_2, \beta_3, \beta_4$ are the coefficients to be estimated, and ε_t denotes the error term. These coefficients will help measure the impact of each variable on tourism demand in Morocco and identify the dynamic relationships between them. This model offers a comprehensive framework for analyzing how economic and environmental factors influence the tourism sector, contributing to a deeper understanding of the policies needed to support this industry.

EMPIRICAL RESULTS

To explore how our variables are related, we use a vector autoregression (VAR) model. To achieve this, we will adopt the steps below:

Test for stationarity

When applying a VAR model to time series data, it is essential to examine their stationarity to prevent the issue of spurious regressions. A variety of unit root tests are available, with foundational contributions from Fuller (Fuller, 1976) and (Dickey & Fuller, 1979). The Dickey-Fuller tests are parametric methods used to assess whether a time series is stationary or non-stationary by identifying either deterministic or stochastic trends. Stationarity analysis enables us to determine the order of integration, i.e., whether the variable is stationary in level, i.e., whether its order of integration is zero; and whether the variable admits stationarity in difference, i.e., whether the order of integration can vary from 1 to n. The results of the variable stationarity test are shown in the table below:

Table 1: Augmented-dickey fuller tests result

Variables	At Level		First Difference		Result
	Test Statistics	P-value	Test Statistics	P-value	
REER	-0.871964	0.7815	-4.851857	0.0006***	I(1)
GDP	-10.49710	0.0000***	-5.145890	0.0004***	I(0)
ECO_2	-0.942460	0.7586	-5.122132	0.0003***	I(1)
NA	-1.538482	0.4981	-6.158507	0.0000***	I(1)
INF	-4.598732	0.0011***	-6.452523	0.0000***	I(0)

Notes: ***, **, * denote significance levels of 1%, 5%, and 10%, respectively.

Using the Augmented Dickey-Fuller unit root test, the stationarity analysis shows that, on one hand, gross domestic product and the inflation rate are stationary at level, while, on the other hand, the other variables, namely the real effective exchange rate, the number of tourist arrivals, and carbon dioxide emissions, are not. These variables were made stationary by taking their first difference.

Determination of the optimal lag order

Prior to implementing the vector autoregression, it is crucial to establish the appropriate number of lags for the VAR model. This will be done by determining the AR lag length using various selection criteria. These include the Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Hannan-Quinn Criterion (HQC), Final Prediction Error (FPE), and Bayesian Information Criterion (BIC).

Table 2: VAR lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-165.7919	NA	1287.447	21.34899	21.59042	21.36135
1	-127.2766	48.14406*	287.8622*	19.65958*	21.10818*	19.73376*

Notes: ***, **, * denote significance levels of 1%, 5%, and 10%, respectively.

The optimal lag length for the model is identified by minimizing both the Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SIC). These criteria help in selecting the lag length that best balances model fit and complexity. As detailed in Table 2, most of the selection criteria indicate that a lag length of 1 is preferred. This suggests that, among the tested options, a single lag is the most suitable for capturing the dynamics of the model while avoiding overfitting.

Model estimation

The objective of vector autoregressive modeling is to describe the interdependencies between all the variables. The result of this modeling has identified many relationships between the four variables

studied, but we are now looking at the equation for the number of tourist arrivals in Morocco as a function of the other variables. The results are as follows:

$$\mathrm{DNA} = 1.457873 + 0.606794 * \mathrm{DNA}(-1) - 0.516170 * \mathrm{DREER}(-1) - 1.126993 * \mathrm{DECO}_2(1)\ 0.154008 * \mathrm{DDGP}(-1) - 0.041083 * \mathrm{DINF}(-1)$$

R-squared: 0.663734 **F-statistic: 7.105805**

Following the application of VAR(1) modeling, our primary objective is to express the number of tourist arrivals in Morocco as a function of the other variables within the model. The results from the VAR (1) analysis indicate that all the coefficients in our econometric model are statistically significant. Specifically, the Student's t-values for these coefficients are less than the critical values from the student's t-table at a significance level of $= 5\%$, demonstrating that these coefficients are reliably different from zero.

Additionally, the overall performance of the model is robust, as evidenced by the calculated Fisher statistic exceeding its theoretical value. The global significance test of our VAR (1) model further confirms its validity, with an R^2 value of 0.6637, or 66.37%. This indicates that the model accounts for a substantial portion of the variation in the number of tourist arrivals in Morocco. Therefore, we can conclude that our model is globally significant and effectively captures the dynamics of tourist arrivals.

Model validation

To effectively interpret the results from the VAR(1) model, it is essential to assess its econometric robustness. This involves conducting several tests to validate the model's reliability. We will perform three key tests: the normality test, the autocorrelation LM test, and the heteroscedasticity test. These tests will help ensure that the model's assumptions are met and that its findings are robust and reliable.

Table 3: VAR diagnostic tests

Diagnostic test	Result	P-Value
Autocorrelation LM Test	LM-statistics = 33.16833	0.2005
Heteroscedasticity Test	White-statistics = 155.8325	0.3554
Normality test - Jarque-Bera test	$\chi 2$ = 3.571669	0.9085

A series of tests can be employed to validate the VAR(1) estimates. The robustness tests, summarized in Table 3, reveal that the residuals are not autocorrelated, Homoscedastic, and follow a normal distribution. Based on these results, we can conclude that our VAR(1) model is econometrically sound and valid.

Variance decomposition

The purpose of variance decomposition analysis is to assess the relative importance of innovations in explaining the variations of each variable within the model. When an innovation significantly contributes to the error variance, it indicates that the model is highly responsive to changes in that particular variable. In essence, this analysis helps us determine which innovations have the most substantial impact on the variables in the model.

Table 4: Variance decomposition of the number of tourist arrivals in morocco:

Period	S.E.	DNA	DREER	DECO_2	DDGP	DINF
1	1.454641	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.970834	54.56764	4.871569	38.31819	2.158281	0.084318
3	3.918637	84.45435	1.568115	10.12803	1.575670	2.273834
4	5.433190	57.92965	4.269300	30.42063	6.132544	1.247877
5	10.45479	82.37897	2.643235	9.657346	2.737035	2.583409
6	16.10865	66.87486	3.150967	25.15918	3.273642	1.541350

7	26.36464	73.86486	3.996972	15.36465	4.222276	2.551243
8	46.82802	76.42140	1.998681	17.42080	2.315607	1.843506
9	67.05578	63.27633	5.390261	23.41329	5.654796	2.265330
10	133.3257	82.70528	1.465492	12.09242	1.595954	2.140852

(CO_2) emissions account for approximately 19% of the variation in tourist arrivals in Morocco from the third to the tenth periods, indicating that (CO_2) emissions play a significant role in influencing changes in tourist arrivals in Morocco. In addition, the inflation rate explains 0.08% of the variability in tourist arrivals in Morocco during the second period; over time, this impact gradually increases, reaching 2% by the end of the study period. On the other hand, the real effective exchange rate represents 4.87% of the variance in tourist arrivals in Morocco during the second period and fluctuates between 1% and 5% throughout the study period. It is important to note that the volatility of the real effective exchange rate has a more substantial effect compared to the inflation rate, which also influences the variation in tourist arrivals. Furthermore, (GDP) is explained by its previous variations, averaging 3% during the study period and peaking at 6.13% in the fourth period before stabilizing at 2% by the end of the period.

Granger causality analysis

To consolidate the estimation results, we employ Granger causality analysis to identify the causal relationships between the number of tourist arrivals (NA) and the explanatory variables. The Schwartz criterion is used to determine the lag length. This analysis aims to determine which explanatory variables significantly cause variations in the number of tourist arrivals. The results of the Granger causality tests are detailed in Table 5 below, highlighting the impact of these economic factors on tourism flows.

Table 5: Results of panel granger causality test

Null Hypothesis:	**F-Statistic**	**P-Value**
NA ↛ ECO_2	10.01973	0.0008***
ECO_2 ↛ NA	12.15721	0.0003***
NA ↛ INF	5.79033	0.0099***
INF ↛ NA	0.82093	0.4537
GDP ↛ NA	1.47225	0.2521
NA ↛ GDP	2.66613	0.0929*
REER ↛ NA	3.99713	0.0338**
NA ↛ REER	1.27167	0.3011

Notes: ***, **, * denote significance levels of 1%, 5%, and 10%, respectively

The analysis of the Granger causality test results(Granger, 1980), as presented in Table 5, reveals several key aspects. Firstly, a significant bidirectional relationship is observed between the number of tourist arrivals and carbon dioxide emissions. This finding aligns with the work of (Garin-Munoz & Amaral, 2000; Meo et al., 2018), who also reported reciprocal interactions between these variables, suggesting mutual influence.

Regarding unidirectional relationships, our results indicate that the number of tourist arrivals has a significant impact on both the inflation rate and Gross Domestic Product per capita. This is consistent with the findings of (Kareem, 2008) for Africa and (Bashagi & Muchapondwa, 2009) for Tanzania. However, the impact on Gross Domestic Product per capita is not universally supported, as noted by (Irandoust, 2019), who did not find a significant effect in his study.

Additionally, a unidirectional relationship is observed between the Real Effective Exchange Rate and the number of tourist arrivals. This is supported by (Agiomirgianakis et al., 2015; Ongan et al., 2017), who demonstrated that exchange rate fluctuations influence tourism demand. However, the findings of (Quadri & Zheng, 2010) highlight that the impact of exchange rate fluctuations can vary significantly across different countries, which may explain the variations observed in our study.

This analysis highlights the complexity of the relationships between tourism demand and explanatory variables, reflecting the nuanced findings in the existing literature. Future research could further explore these dynamics and address the contextual factors influencing these relationships.

CONCLUSION AND RECOMMENDATIONS

This article aims to measure the impact of the exchange rate on international tourist demand in Morocco. We use VAR methodology to econometrically model the relationship between the number of tourist arrivals (NA) and Gross Domestic Product per capita (GDP), Inflation rate (INF), Real Effective Exchange Rate (REER), and Carbon dioxide emissions (CO_2) over the period 1995-2023. The results enable us to draw several important conclusions and remarks:

First, the Granger causality test reveals several key insights: Initially, a significant bidirectional relationship exists between the number of tourist arrivals and carbon dioxide emissions, indicating mutual influence between these variables. Additionally, a unidirectional causality is found where the number of tourist arrivals significantly impacts both the inflation rate and Gross Domestic Product per capita. Conversely, the Real Effective Exchange Rate shows a unidirectional causality towards the number of tourist arrivals. This highlights the complex interplay between tourism demand and its explanatory variables, suggesting a need for further exploration into these dynamics and contextual factors.

Second, we found a significant negative influence of the lagged inflation rate and Real Effective Exchange Rate on the number of tourist arrivals. Exchange rates are thus important for the development of tourism in any economy, large or small, particularly in attracting international tourists in the case of a depreciation of the national currency; inversely, an appreciation of the national currency can reduce the number of tourist arrivals. Similarly, the rate of inflation harms the development of Morocco's tourism sector, notably as inflation affects purchasing power, causing tourists to retreat to less-frequented and less expensive areas. Consequently, decision-makers should consider monetary policy decisions, which are important tools for stimulating demand from foreign tourists.

Additionally, the world is moving towards sustainable green environmental conservation, and tourism is no exception to this rule. According to the results, we found that carbon dioxide emissions negatively impact the evolution of the number of tourist arrivals in Morocco. As a consequence, decision-makers must take advantage of this result to move towards green tourism, promote green technologies in production, and reduce sources of pollution in the production process, notably renewable energies.

Finally, it is indisputable that the evolution of the tourism sector contributes positively to a country's economic growth through business development and job creation, and boosts its foreign exchange reserves. However, according to our results, we found that even the Gross Domestic Product per capita delayed by one period has a positive influence on the number of tourist arrivals, as tourists prefer countries that offer a high quality of life, especially in terms of public services such as infrastructure and security.

LIMITATIONS OF THE STUDY

Our study presents several key limitations. Firstly, it focuses solely on the Moroccan context, which may limit the applicability and generalizability of the findings to other countries or regions. Additionally, the use of only annual data may constrain the accuracy of forecasts and analyses, as it overlooks more frequent fluctuations in the studied variables. The application of the VAR (Vector Autoregression) model provides a limited understanding of variable dynamics, as it does not offer an in-depth or varied interpretation of the results. Furthermore, the exclusion of qualitative variables restricts the analysis, potentially missing important factors influencing tourism demand.

FUTURE RESEARCH DIRECTIONS

For future research, several improvements can be made. Expanding the study to include other countries or regions could facilitate comparative analyses and enhance understanding of global trends. Utilizing high-frequency data, such as monthly or quarterly, would better capture finer variations and improve forecast accuracy. Additionally, integrating qualitative variables into the models could provide richer insights into the factors affecting tourism demand. Exploring alternative econometric models could also offer a more nuanced interpretation of the relationships between variables.

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