

# Tourism as a Driver of Development: A Predictive Study of Tourism Revenues in Algeria

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## Abstract

*This study aims to examine the role of tourism in Algeria's economy and development, as well as its revenues. The theoretical part of the study addressed the conceptual framework of tourism, focusing on the main determinants of tourism growth, including GDP, security stability, the country's environmental, cultural, and historical diversity, and tourists' behaviors. The applied part of the study focused on forecasting tourism revenues in Algeria using the Autoregressive Integrated Moving Average (ARIMA) model, implemented through the artificial intelligence software ORANGE. The results of forecasting tourism revenues showed that these revenues remain stable throughout the forecast period for Algeria, estimated for the next 7 years. This stability is primarily attributed to the country's heavy dependence on the hydrocarbons sector and the neglect of other sectors, including tourism, as well as the absence of a serious and clear governmental strategy to develop and diversify the tourism sector.*

**Keywords:** *Tourism, Autoregressive Integrated Moving Average Model, Forecasting, ORANGE Artificial Intelligence Software.*

*JEL Classification : Z3, C22, C53, C45.*

## Introduction

Tourism is considered one of the most important developmental sectors on which countries rely, especially those that do not possess energy resources that contribute to revitalizing their economies. It goes beyond being merely a recreational activity to become closely linked to the economy and development, as it contributes to achieving economic growth, diversifying income sources, providing job opportunities, and attracting foreign currency.

Moreover, the contribution of tourism to the economy exceeds direct profits generated from tourists' direct spending such as airfare, hotel accommodation, and various tourism activities during their trip to include indirect revenues through its multiplier effect on other sectors, most notably employment. Tourism creates direct jobs in hotels, restaurants, and airlines, in addition to indirect jobs in other sectors such as agriculture, handicrafts, and other industries that contribute indirectly to stimulating the country's tourism sector. Tourism also increases GDP, which in turn supports the development of infrastructure projects, the improvement of public services, and the encouragement of investment.

In addition, tourism has social, cultural, and environmental impacts, such as promoting cultural exchange, building relationships between peoples, and improving individual well-being. Environmentally, ecotourism contributes to preserving natural resources by raising tourists' environmental awareness, identifying the threats facing natural resources, and helping reduce these threats thus maintaining these resources and revitalizing tourism in the country.

Focusing on the tourism sector in Algeria, the country possesses tremendous tourism potential, with diverse natural landscapes due to its geographical location from coastlines to high plateaus and deserts as well as captivating historical and archaeological sites. These assets qualify Algeria to become a leading destination in this vital sector. Despite these strengths, the tourism sector in Algeria faces challenges that hinder its growth.

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Although the tourism sector in Algeria faces substantial challenges that impede its development, recent statistics indicate a noticeable improvement in its revenues, particularly in 2023. This progress reflects ongoing efforts to overcome obstacles and opens promising prospects for the sector's future. To understand future trends in tourism in Algeria, this study aims to build an econometric predictive model linking these developments to tourism revenues. Through this model, we seek to forecast the sector's potential revenues in the coming years and provide quantitative insights that support strategic planning for decision-makers.

Accordingly, the central question posed is: What is the future of tourism in Algeria, and what is its quantitative forecast for the next seven years?

To answer this question, we formulated the following hypothesis: "Tourism revenues in Algeria will remain low-growth during the upcoming forecast period due to the lack of serious and clear governmental strategies to develop the tourism sector in the country."

#### *Importance and Objectives of the Study:*

The importance of this study lies in examining the future dynamics of tourism revenues in Algeria and understanding their expected behavior. The objectives of forecasting tourism revenues in Algeria are as follows:

- To understand and analyze the factors influencing tourism in Algeria, such as economic growth, the volume of investments, and government policies.
- To provide a quantitative estimate of tourism revenues for future periods, offering a numerical basis for decision-making.

#### *Tourism: Concept and Developmental Importance:*

##### *Definition of Tourism:*

The concept of tourism has evolved throughout history from mere travel in search of trade or exploration to encompassing other interests such as accommodation, entertainment, and social interaction. Therefore, tourism has been defined in various ways depending on its purpose, the development of its activities, and its impact on different aspects of life.

The World Tourism Organization defines tourism as "the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business, or other purposes." (Abdessalam, Asmaa, & Hussein, 2018, p. 335).

Tourism is also defined as "the set of phenomena, events, and relationships arising from the travel and temporary stay of non-residents, provided that they are not linked to any profit-making activity or intention of permanent residence, but are instead considered a form of movement." (Imane, 2024, p. 231).

##### *Forms of Tourism*

The main forms of tourism are diverse, including recreational, cultural, ecological, and medical tourism. These primary types provide a framework for understanding the wide diversity in the world of tourism and its various objectives. (Tarfah Zakaria, 2013, p. 21).

Tourism can be classified into the following forms:

- **Holiday or Recreational Tourism:** This refers to travel to internationally known tourist destinations for the purpose of rest and relaxation. This type is characterized by long stays, which may range from 10 to 20 days.

- **Medical Tourism:** Travel for the purpose of treatment and relaxation in health resorts around the world. (Thamer, 2020, p. 14).
- **Cultural Tourism:** Cultural tourism is defined as the movement of individuals to cultural sites away from their usual place of residence to gather new information and experiences that meet their cultural needs. (Khaled, Niveen, & Rana Mohsen, 2024, p. 235).
- **Ecotourism:** According to the World Wildlife Fund, ecotourism is defined as: “Travel to natural areas that have not been polluted and whose ecological balance has not been disturbed, in order to enjoy their scenery, vegetation, and wildlife.” This type of tourism is particularly important for developing countries as it serves as a source of income in addition to its role in environmental preservation and promoting a culture and practices of sustainable development. (Hameeda, 2011, p. 67).
- **Educational Tourism:** This is a type of travel that broadens a person’s horizons and knowledge. It may be an individually organized trip or arranged by a university or school. However, it includes any leisure travel that provides learning opportunities. (Shawqi Taleb, 2024, p. 789).
- **Sports Tourism:** This refers to a person’s temporary travel outside their usual country of residence to participate in sports events and the activities associated with them. (Souad, 2017, p. 38).
- **Religious Pilgrimage Tourism:** This type involves tourists visiting religious sites, driven by a desire for spiritual and religious knowledge. (Souad, 2017, p. 36).

#### *Tourism Economics:*

Tourism economics is defined as “the science that provides the economic principles and theories necessary to achieve the optimal use of available tourism resources in a way that ensures the greatest possible benefit from them.”

(Mustafa Yousef, 2016, p. 22)

#### *Sustainable Tourism:*

Sustainable tourism is the point where the needs of visitors and host communities intersect, leading to the protection and support of future development opportunities. It involves managing all resources in a manner that provides economic, social, and spiritual needs while preserving cultural heritage, the required environmental patterns, biodiversity, and all elements essential for life and its systems. Sustainability necessarily includes continuity.

Sustainable tourism includes the optimal use of natural resources, including biodiversity, mitigating the environmental and cultural impacts of tourism, and maximizing the benefits of environmental protection and support for local communities. (Belkacem, 2017, p. 92).

#### *Determinants of Tourism Growth:*

There are several determinants of tourism growth that can be classified into economic, political, and social factors, all of which work together to attract tourists and increase the revenues of this sector.

#### *Economic Determinants:*

Economic factors are among the most important drivers of tourism growth.

- **Gross Domestic Product (GDP):** The higher the GDP per capita, the greater an individual’s ability to spend on travel and tourism. There is a reciprocal relationship between the tourism sector and

GDP: rising GDP increases per capita income and thus purchasing power, enabling individuals to spend more on leisure and travel, whether domestically or internationally. Moreover, higher GDP encourages governments to invest in essential tourism infrastructure such as hotels, roads, and other facilities, making the country more attractive to tourists.

- **Exchange Rates:** When the local currency depreciates, the number of tourists tends to increase. A weaker currency translates into lower costs for accommodation, restaurants, and transportation, which in turn increases the length of stay and tourist spending.

- **Foreign and Domestic Investment:** Direct investments whether local or foreign contribute significantly to developing the tourism sector by building hotels and resorts, and improving roads, airports, and seaports, thereby facilitating tourist access to destinations. Investment also enhances the development of restaurants, cafés, and entertainment centers.

- **Tourism Expenditure and Government Policies:** Tourism expenditure grows when government policy is aware of the sector's importance in achieving economic growth and contributing to economic, social, and environmental development. Visa regulations, tourism-related taxes, and investment incentives also play a critical role in shaping tourism growth.

#### *Political and Security Determinants:*

Tourists primarily seek destinations that guarantee personal safety. They avoid places experiencing political instability, such as protests, unrest, or other disturbances that may lead tourists to change their travel destination.

#### *Social and Cultural Determinants*

These include the country's environmental, cultural, and historical diversity, which represent crucial factors in shaping its overall tourism landscape.

#### *Predictive Econometric Analysis of Tourism Revenues in Algeria*

Forecasting the future has become a scientific field that relies on modern methodologies, where experts use various tools to collect and analyze information, along with mathematical and statistical models to predict potential developments based on current trends.

These methods enable the extrapolation of possible future paths and the proposal of solutions and necessary measures to achieve the desired future outcomes.

At the national economic level, forecasting has become a key tool for strategic decision-making. Governments rely on it to design effective fiscal and monetary policies for example, by forecasting inflation rates or for economic predictions that guide investment decisions, whether in stocks or real estate.

In this context, and given our focus on the tourism sector in Algeria, we pursued forecasting its revenues based on data covering the period from 2000 to 2023.

#### *Forecasting Mechanism and Model Used*

To forecast tourism revenues in Algeria, we used an annual time series covering the period 000–2023, represented by the study variable Total Tourism Revenues, denoted as TR.

For greater accuracy and to obtain a larger sample size, the annual data were converted into monthly data. Thus, the series includes ...

Note: Data Source:

[<https://ar.tradingeconomics.com/algeria/tourism-revenues>](<https://ar.tradingeconomics.com/algeria/tourism-revenues>) The forecasting was carried out using ARIMA time series models through the Orange artificial intelligence software.

#### *Introduction to the ARIMA Model:*

The ARIMA (p, d, q) model short for AutoRegressive Integrated Moving Average is a discrete-time linear model with noise, expressed in the following general form: (Inipi, n.d.).

$$\left(1 - \sum_{k=1}^p \alpha_k L^k\right) (1 - L)^d X_t = \left(1 + \sum_{k=1}^q \beta_k L^k\right) \varepsilon_t.$$

It is a special case of ARMA models but with a specific structure. We set  $Y_t := (1 - L)^d X_t$ , thus  $Y_t$  becomes an ARMA(p, q) model.

$$\left(1 - \sum_{k=1}^p \alpha_k L^k\right) Y_t = \left(1 + \sum_{k=1}^q \beta_k L^k\right) \varepsilon_t$$

And  $X_t$  is obtained from  $Y_t$  through d successive integrations. Thus, d represents the order of integration.

We say that the time series  $\{y_t\}$  follows an ARIMA (p, d, q) process if  $w_t = \Delta^d y_t = (1 - L)^d y_t$

is an ARMA (p, q) process. This means that:  $\Phi(L) (1 - L)^d y_t = \theta(L) \varepsilon_t$

Applying the operator  $(1 - L)$  to a time series is called “differencing.”

#### **Note:**

If  $y_t$  is non-stationary, but  $\Delta^d y_t$  is stationary, then  $y_t$  is said to be integrated of order d, or I(d).

A time series that contains a unit root is I(1), whereas a stationary time series is I(0).

(R. Susmel, 2023, p. 25).



**Figure 01: Evolution Curve of Tourism Revenues during the Period (2000–2023).**

**Source:** Prepared by the researchers using the Orange artificial intelligence software.

Based on the curve above, which illustrates the evolution of tourism revenues during the period (2000–2023), we observe significant fluctuations throughout the study period. The years 2000–2010 witnessed slow growth, reaching their highest level in 2005 at approximately 477 million USD.

This was followed by a period of stagnation and decline in tourism revenues during 2011–2021, coinciding with the drop in oil prices and the COVID-19 pandemic, both of which contributed to the neglect of the tourism sector in Algeria. During this period, revenues fell to 50 million USD.

Tourism revenues then experienced a noticeable increase in the period 2022–2023, reflecting the state's serious steps toward supporting and reforming the tourism sector.

#### *Results of Applying the ARIMA Model Using the Orange Artificial Intelligence Software*

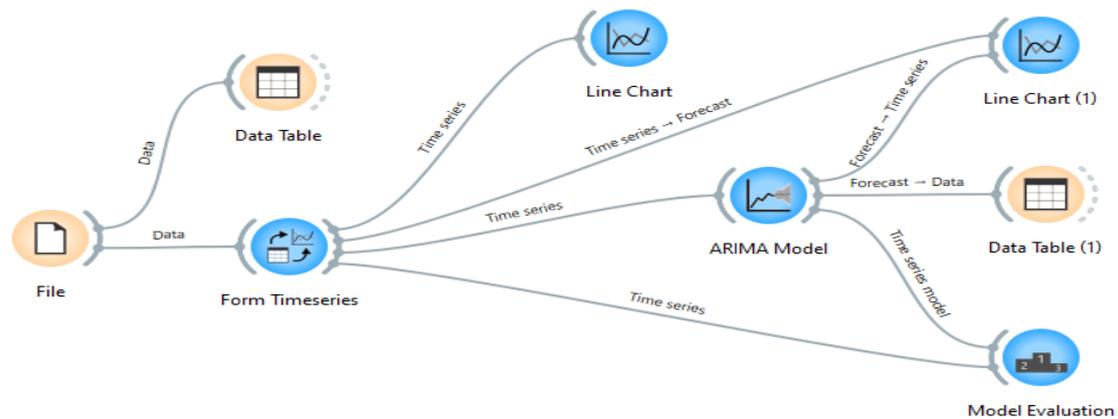


Figure 02: Stages of Applying the ARIMA Model Using the Orange Artificial Intelligence Software

**Source:** Prepared by the researchers using the Orange artificial intelligence software.

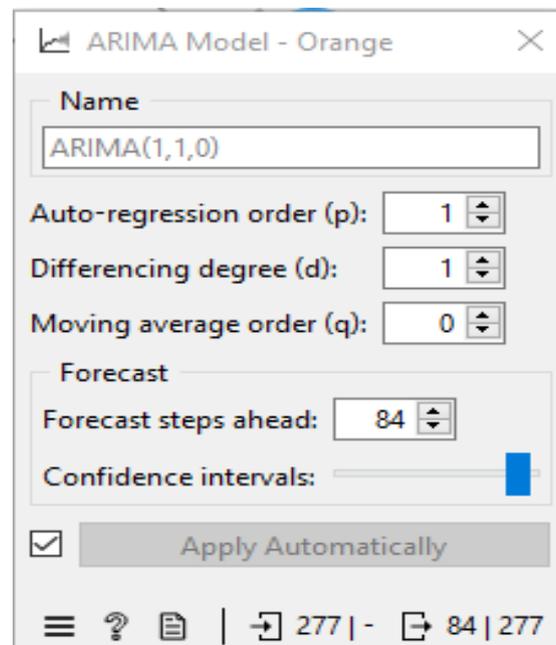


Figure 03: Applied ARIMA Model Using the Orange Artificial Intelligence Software.

**Source:** Prepared by the researchers using the Orange artificial intelligence software.

From Figure (3) above, we observe that the estimated model is of the type ARIMA(1,1,0). The results can be interpreted as follows:

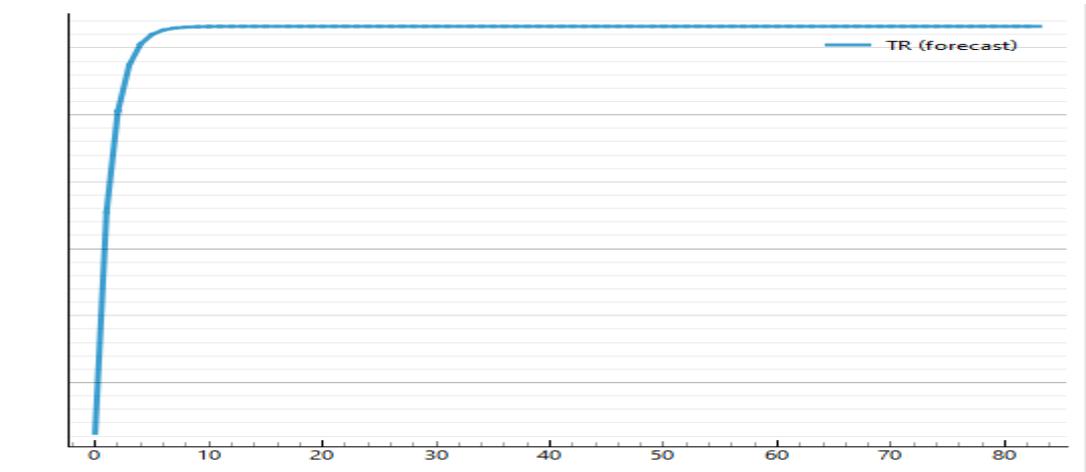
- **Autocorrelation Function (ACF):** The ACF value equals 1, which indicates the presence of correlation between the current value of total exports and the value of the previous year.
- **Stationarity Tests (Augmented Dickey–Fuller, ADF):** The test confirms that the time series is stationary after differencing, meaning the differenced series satisfies the stationarity condition required for ARIMA modeling.
- **Partial Autocorrelation Function (PACF):** The PACF shows  $q = 0$ , which means that the number of Moving Average (MA) terms included in the model is zero.
- Thus, the model ARIMA (1,1,0) is validated based on the ACF, PACF, and stationarity test results.

*Predictive Values of Tourism Revenues for the Next 7 Years Using the ARIMA Model Through Orange Software.*

20	6.66603e+08	5.06114e+08	8.27092e+08		TR (forecast)	TR (95%CI low)	TR (95%CI high)
21	6.66603e+08	5.01853e+08	8.31353e+08	1	6.36215e+08	6.15973e+08	6.56458e+08
22	6.66603e+08	4.97699e+08	8.35506e+08	2	6.52738e+08	6.16979e+08	6.88498e+08
23	6.66603e+08	4.93645e+08	8.3956e+08	3	6.60277e+08	6.11146e+08	7.09408e+08
24	6.66603e+08	4.89684e+08	8.43522e+08	4	6.63717e+08	6.03035e+08	7.24398e+08
25	6.66603e+08	4.8581e+08	8.47396e+08	5	6.65286e+08	5.94477e+08	7.36095e+08
26	6.66603e+08	4.82017e+08	8.51189e+08	6	6.66002e+08	5.86159e+08	7.45845e+08
27	6.66603e+08	4.783e+08	8.54906e+08	7	6.66329e+08	5.78298e+08	7.5436e+08
28	6.66603e+08	4.74655e+08	8.5855e+08	8	6.66478e+08	5.70926e+08	7.6203e+08
29	6.66603e+08	4.71079e+08	8.62127e+08	9	6.66546e+08	5.6401e+08	7.69082e+08
30	6.66603e+08	4.67566e+08	8.6564e+08	10	6.66577e+08	5.57497e+08	7.75657e+08
31	6.66603e+08	4.64115e+08	8.69091e+08	11	6.66591e+08	5.51335e+08	7.81847e+08
32	6.66603e+08	4.60721e+08	8.72485e+08	12	6.66597e+08	5.4548e+08	7.87715e+08
33	6.66603e+08	4.57382e+08	8.75824e+08	13	6.666e+08	5.39891e+08	7.9331e+08
34	6.66603e+08	4.54096e+08	8.7911e+08	14	6.66602e+08	5.34537e+08	7.98667e+08
35	6.66603e+08	4.5086e+08	8.82346e+08	15	6.66602e+08	5.29391e+08	8.03814e+08
36	6.66603e+08	4.47671e+08	8.85535e+08	16	6.66603e+08	5.2443e+08	8.08775e+08
37	6.66603e+08	4.44529e+08	8.88677e+08	17	6.66603e+08	5.19637e+08	8.13568e+08
38	6.66603e+08	4.4143e+08	8.91776e+08	18	6.66603e+08	5.14995e+08	8.1821e+08
				19	6.66603e+08	5.10492e+08	8.22714e+08

58	6.66603e+08	3.86566e+08	9.4664e+08
59	6.66603e+08	3.84102e+08	9.49104e+08
60	6.66603e+08	3.8166e+08	9.51546e+08
61	6.66603e+08	3.79238e+08	9.53968e+08
62	6.66603e+08	3.76837e+08	9.56369e+08
63	6.66603e+08	3.74455e+08	9.58751e+08
64	6.66603e+08	3.72093e+08	9.61113e+08
65	6.66603e+08	3.69749e+08	9.63457e+08
66	6.66603e+08	3.67424e+08	9.65782e+08
67	6.66603e+08	3.65117e+08	9.68089e+08
68	6.66603e+08	3.62827e+08	9.70379e+08
69	6.66603e+08	3.60554e+08	9.72652e+08
70	6.66603e+08	3.58298e+08	9.74908e+08
71	6.66603e+08	3.56059e+08	9.77147e+08
72	6.66603e+08	3.53835e+08	9.7937e+08
73	6.66603e+08	3.51628e+08	9.81578e+08
74	6.66603e+08	3.49435e+08	9.83771e+08
75	6.66603e+08	3.47258e+08	9.85948e+08
76	6.66603e+08	3.45095e+08	9.88111e+08
77	6.66603e+08	3.42947e+08	9.90259e+08
78	6.66603e+08	3.40813e+08	9.92393e+08
79	6.66603e+08	3.38693e+08	9.94513e+08
80	6.66603e+08	3.36587e+08	9.96619e+08
81	6.66603e+08	3.34494e+08	9.98712e+08
82	6.66603e+08	3.32414e+08	1.00079e+09
83	6.66603e+08	3.30346e+08	1.00286e+09
84	6.66603e+08	3.28292e+08	1.00491e+09
39	6.66603e+08	4.38373e+08	8.94833e+08
40	6.66603e+08	4.35357e+08	8.97849e+08
41	6.66603e+08	4.3238e+08	9.00826e+08
42	6.66603e+08	4.2944e+08	9.03766e+08
43	6.66603e+08	4.26536e+08	9.0667e+08
44	6.66603e+08	4.23666e+08	9.0954e+08
45	6.66603e+08	4.2083e+08	9.12375e+08
46	6.66603e+08	4.18027e+08	9.15179e+08
47	6.66603e+08	4.15255e+08	9.17951e+08
48	6.66603e+08	4.12513e+08	9.20693e+08
49	6.66603e+08	4.098e+08	9.23406e+08
50	6.66603e+08	4.07116e+08	9.2609e+08
51	6.66603e+08	4.04459e+08	9.28747e+08
52	6.66603e+08	4.01829e+08	9.31377e+08
53	6.66603e+08	3.99224e+08	9.33982e+08
54	6.66603e+08	3.96645e+08	9.36561e+08
55	6.66603e+08	3.9409e+08	9.39116e+08
56	6.66603e+08	3.91559e+08	9.41647e+08
57	6.66603e+08	3.89051e+08	9.44155e+08

**Source:** Prepared by the researchers using the Orange artificial intelligence software

*Predictive Curve of Tourism Revenues for the Next 7 Years Using the ARIMA Model Through Orange Software:*

**Source:** Prepared by the researchers using the Orange artificial intelligence software.

The predictive values of tourism revenues for the next 7 years indicate stability in tourism revenues, as they remain around  $3.3303e+08$  USD throughout the entire forecast period. This implies no long-term change in total tourism revenues in Algeria, meaning that the sector...

*Evaluation of the Tourism Revenue Forecasting Model:*

Model	RMSE	MAE	MAPE	POCID	R <sup>2</sup>	AIC	BIC
ARIMA(1,1,0)	33e+07	1.163e+07	0.110	66.1	0.952	7497.7	7504.4
ARIMA(1,1,0) (in-sample)	40e+07	1.677e+06	0.021	71.0	0.990	9728.0	9735.2

**Source:** Prepared by the researchers using the Orange artificial intelligence software

From the evaluation results of the model, we find the following:

- **RMSE (Root Mean Squared Error):** The RMSE values inside the sample ( $240e+07$ ) and outside the sample ( $3.033e+07$ ) indicate a limited variance between the predicted and actual values. This suggests that the model performs better in fitting historical data than in forecasting future values.
- **MAE (Mean Absolute Error):** The high MAE value indicates that the model has lower accuracy in predicting exact values.
- **MAPE (Mean Absolute Percentage Error):** The MAPE values are relatively close for both in-sample and out-of-sample results, which indicates good relative accuracy in the predictions.

- POCID (Percent of Correctly Identified Direction): The percentage of correctly identified directions is high, meaning the model performs well in predicting the direction of change even if the magnitude of the values varies.
- R-squared ( $R^2$ ): The  $R^2$  values are close inside and outside the sample, indicating that the model explains the variance in the data effectively and represents the data well.

## Conclusion

The forecasting results of tourism revenues indicate that they remain stable throughout the prediction period in Algeria, at approximately 3.3303e+08 USD, based on the ARIMA model analysis using the ORANGE artificial intelligence software.

This stability can primarily be attributed to the absence of a clear governmental strategy to develop and diversify the tourism sector. This is reflected in the country's heavy dependence on the hydrocarbons sector and the neglect of other sectors, including tourism. The lack of investment in the tourism industry, the administrative and legal obstacles faced by both investors and tourists, the weakness of infrastructure and services such as transportation networks and tourism facilities along with the absence of an effective promotional strategy, all hinder the revitalization of tourism in Algeria.

## Recommendations

To support and develop the tourism sector in Algeria, attention should be directed toward the following:

- Developing infrastructure, including hotels and transportation, while simplifying administrative procedures and visa processes.
- Effective tourism promotion, along with training and qualifying tourism professionals to enhance the quality of services provided.
- Encouraging foreign direct investment in major projects that contribute directly and indirectly to revitalizing the tourism sector.
- Improving data accessibility, which enhances the reliability of analytical results and contributes positively to society while accelerating progress.
- Adopting digital transformation by equipping economists and researchers with the necessary skills to work with modern technologies such as artificial intelligence and machine learning, enabling fast and efficient processing and analysis of economic data to uncover hidden trends.

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