Qədim Diyar Oktyabr 2026, Cild: 8, Sayı: 10, s. 62−82
Ancient Land October 2026, Volume: 8, Issue: 10, pp. 62−82
DOI: https://doi.org/10.36719/2706-6185/64/62-82

Determinants of Public Revenues in Algeria: An Econometric Analysis of the Role of Economic Growth, Fiscal Discipline, and Oil Prices over the Period 2000–2025

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Abstract. *This study examines the determinants of government revenues in Algeria, with particular emphasis on the roles of economic growth, fiscal discipline, and oil prices over the period 2000–2025. The study employs an Autoregressive Distributed Lag (ARDL) model to investigate both the short-run and long-run relationships among the variables. The empirical analysis is based on annual data, and a series of diagnostic and stability tests are conducted to assess the reliability and adequacy of the estimated model. The bounds testing approach confirms the existence of a long-run cointegration relationship among government revenues, economic growth, fiscal discipline, and oil prices. The estimated error correction model further indicates a significant adjustment mechanism toward long-run equilibrium following short-run deviations. The results highlight the importance of economic and fiscal conditions, together with fluctuations in oil prices, in explaining the dynamics of government revenues in Algeria. These findings provide useful implications for fiscal policy and revenue-management strategies, particularly in the context of Algeria's dependence on hydrocarbon revenues. The study concludes that strengthening fiscal discipline, supporting sustainable economic growth, and reducing vulnerability to oil-price fluctuations are important for improving the stability and sustainability of public revenues.*

Keywords: *government revenues, economic growth, fiscal discipline, oil prices, ARDL, Algeria*

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Received: 17 April 2026; Accepted: 12 Agustos 2026; Published online: 28 October 2026
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Əlcəzairdə dövlət gəlirlərini müəyyən edən amillər: 2000–2025-ci illər ərzində iqtisadi artım, fiskal intizam və neft qiymətlərinin rolunun ekonometrik təhlili

Trad Murad[1*], Laouar Nuara[2]

Xülasə. *Bu tədqiqat Əlcəzairdə dövlət gəlirlərini müəyyən edən amilləri, xüsusilə 2000–2025-ci illər ərzində iqtisadi artım, fiskal intizam və neft qiymətlərinin roluna diqqət yetirməklə araşdırır. Tədqiqatda dəyişənlər arasındakı həm qısamüddətli, həm də uzunmüddətli əlaqələri təhlil etmək üçün Avtoreqressiv Paylanmış Gecikmə (ARDL) modelindən istifadə olunur. Empirik təhlil illik məlumatlara əsaslanır; qiymətləndirilmiş modelin etibarlılığını və adekvatlığını yoxlamaq üçün bir sıra diaqnostik və dayanıqlılıq testləri aparılmışdır.*

Sərhəd testi (bounds testing) yanaşması dövlət gəlirləri, iqtisadi artım, fiskal intizam və neft qiymətləri arasında uzunmüddətli kointeqrasiya əlaqəsinin mövcudluğunu təsdiqləyir. Qiymətləndirilmiş xəta düzəltmə modeli (error correction model) həmçinin göstərir ki, qısamüddətli kənarlaşmalardan sonra uzunmüddətli tarazlığa qayıtmaq üçün əhəmiyyətli bir tənzimləmə mexanizmi mövcuddur. Nəticələr, Əlcəzairdə dövlət gəlirlərinin dinamikasını izah etməkdə iqtisadi və fiskal şərtlərin, eləcə də neft qiymətlərindəki dalğalanmaların vacibliyini vurğulayır. Bu tapıntılar, xüsusilə Əlcəzairin karbohidrogen gəlirlərindən asılılığı kontekstində, fiskal siyasət və gəlirlərin idarə edilməsi strategiyaları üçün faydalı tövsiyələr təqdim edir. Tədqiqatda belə nəticəyə gəlinir ki, fiskal intizamın gücləndirilməsi, dayanıqlı iqtisadi artımın dəstəklənməsi və neft qiymətlərinin dəyişməsinə qarşı həssaslığın azaldılması dövlət gəlirlərinin sabitliyini və davamlılığını artırmaq üçün mühüm əhəmiyyət kəsb edir.

Açar sözlər: *dövlət gəlirləri, iqtisadi artım, fiskal intizam, neft qiymətləri, ARDL, Əlcəzair*

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Daxil oldu: 17 Aprel 2026; Qəbul edildi: 12 Avqust 2026; Onlayn dərc edildi: 28 Oktyabr 2026
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Introduction

Fiscal discipline constitutes a fundamental pillar of sound public financial management and long-term fiscal sustainability. It seeks to maintain consistency between public resources and expenditures, contain budgetary imbalances, and improve the efficiency of resource allocation. In this regard, effective fiscal discipline depends not only on the control of public expenditure but also on the government's ability to mobilize stable and sufficient revenues. A sound revenue base therefore represents an essential element of fiscal capacity and an important prerequisite for maintaining sustainable public finances (Muslim, 2024).

In Algeria, fiscal discipline has increasingly been incorporated into the broader framework of public financial management reform. This process has been supported by legal and institutional reforms aimed at modernizing budgetary management, improving the preparation and execution of public budgets, strengthening fiscal transparency, and enhancing the efficiency of public resource allocation. These reforms reflect a gradual transition from a predominantly annual budgetary approach toward a medium-term framework in which fiscal decisions are increasingly linked to available resources, expenditure priorities, and long-term fiscal sustainability (Meziti, 2024).

A central component of this institutional framework is Organic Law No. 18-15 on Finance Laws, as amended and supplemented. The law provides the legal foundations for strengthening fiscal discipline and improving the management of public finances. (Bensaid, 2025) In particular, it introduces medium-term budgetary planning mechanisms that integrate revenue and expenditure projections into a broader fiscal framework. Article 5 provides for a Medium-Term Budgetary Framework (CBMT), covering the forthcoming fiscal year and the two subsequent years, including forecasts of revenues and expenditures, the budget balance, and, where applicable, public debt. This approach strengthens the connection between annual budget decisions and medium-term fiscal objectives and encourages greater consistency between planned expenditures and the state's capacity to mobilize financial resources.

The legal framework also emphasizes the importance of financing current expenditures through ordinary resources. Article 3 gives priority to covering operating expenditures from ordinary revenues, thereby reinforcing the principle of fiscal sustainability and reducing excessive reliance on exceptional resources or potentially unsustainable financing mechanisms. This principle is particularly relevant to fiscal discipline because the ability to finance recurrent expenditures through stable ordinary revenues contributes to the resilience and sustainability of public finances over time (Lysiak, 2020).

Budgetary reform in Algeria is further supported by medium-term planning instruments, particularly the Medium-Term Budgetary Framework (CBMT) and the Medium-Term Expenditure Framework (CDMT). These instruments contribute to establishing clearer budget constraints, setting expenditure ceilings, improving the consistency between expected revenues and planned expenditures, and directing public resources toward national and strategic priorities. At the same time, the gradual transition toward program-based budgeting and results-oriented public management strengthens the link between budget allocations, policy objectives, expected outcomes, and managerial accountability. Such reforms are intended to improve both the effectiveness of public spending and the overall efficiency of public financial management (Martí, 2018).

Within this institutional and fiscal framework, Government Revenue (REV) represents a key component of the state's fiscal capacity, The ability to mobilize adequate and relatively stable government revenues is essential for financing public services, supporting development priorities, maintaining fiscal balance, and reducing dependence on exceptional sources of financing. Government revenue is, however, influenced by a combination of economic and fiscal conditions, particularly economic growth, fiscal balances, and developments in international oil prices (Al Jabri et al., 2022).

These factors are especially relevant in Algeria given the significant role historically played by the hydrocarbon sector in the country's public finances. Changes in economic activity can affect the government's revenue base, while fluctuations in international oil prices can influence fiscal resources and the overall budgetary position. At the same time, fiscal imbalances may interact with government revenue dynamics through their implications for fiscal adjustment and public resource mobilization. The interaction of these factors therefore provides an important basis for understanding the evolution of government revenue within the Algerian fiscal system (Abdlemalek, 2025).

Against this institutional and economic background, the present study examines the dynamics of government revenue in Algeria by considering economic growth, oil prices, and the fiscal deficit as key explanatory factors. The study applies the Autoregressive Distributed Lag (ARDL) approach to distinguish between short-run dynamics and long-run relationships among the variables. By combining the institutional dimension of fiscal discipline with the empirical analysis of the principal economic determinants of government revenue, the study contributes to a broader understanding of fiscal revenue dynamics and provides evidence relevant to the strengthening of fiscal management and the sustainability of public finances in Algeria (Sehli & Mili, 2026).

Literature review

The economic literature has shown growing interest in examining the relationship between government revenues, fiscal policy, and economic growth, particularly in developing economies and resource-dependent countries. Over time, this literature has gradually evolved from focusing on the determinants of tax revenues and revenue mobilization capacity to examining the effectiveness of fiscal policy and, more recently, the role of external shocks, particularly oil price fluctuations, in shaping governments’ fiscal behavior.

In this context, the study by (Boukbech, 2019) made an important contribution to the analysis of tax revenue determinants by examining a sample of 29 lower-middle-income countries over the period 2001–2014. The study distinguished between tax capacity and tax effort, an important distinction for understanding differences in countries' ability to mobilize revenues. The findings showed that GDP per capita and agricultural value added were positively and significantly associated with tax revenues, whereas the effect of trade openness was positive but statistically insignificant, while population growth had a negative and insignificant effect. The results also indicated that inflation and public expenditure had positive effects on tax effort, whereas foreign public aid and external debt exerted negative effects. The importance of this study lies in its confirmation that the level of economic activity, economic structure, and selected fiscal variables are important determinants of a country's revenue mobilization capacity. However, the study focused on tax revenues rather than total government revenues and relied on an international sample without directly addressing the institutional and economic characteristics of oil-dependent economies such as Algeria.

In a broader perspective, (Teixeira, 2026) examined the relationship between fiscal policy and economic growth by comparing developed and developing economies over the period 2000–2023. The study relied on data from the World Bank, the International Monetary Fund, and the Organisation for Economic Co-operation and Development (OECD), employing multiple regression and correlation analysis. It focused on the tax burden, revenue composition, public expenditure, and the budget balance as important elements influencing economic performance. The findings indicated that fiscal policy plays a more stable role in developed economies, whereas fiscal constraints and economic volatility limit its effectiveness in developing economies. The study also emphasized that institutional quality, expenditure efficiency, fiscal policy composition, and policy credibility may be more important than the absolute size of taxation or government expenditure. This study therefore adds an important institutional dimension to the literature. Nevertheless, its primary focus is on explaining economic growth, rather than on analyzing the determinants of government revenue as the dependent variable.

With increasing attention to the role of oil resources in public finance, (Sadraoui, 2025)examined the dynamic interactions between oil price volatility and fiscal policy in the Gulf Cooperation Council (GCC) countries over the period 2000–2024. The study employed a Panel Vector Autoregression (PVAR) model, together with fiscal impulse-response functions, to analyze how government expenditure and budget balances respond to oil shocks. The findings revealed substantial differences across GCC countries in terms of the speed and magnitude of their responses to oil price shocks. The results also indicated that countries with more diversified sources of revenue have a greater capacity to absorb oil price fluctuations. The importance of this study for resource-dependent economies lies in its confirmation that oil price volatility represents a major factor influencing government fiscal behavior. However, the study focuses on GCC countries and on fiscal responses to oil shocks, rather than directly examining the determinants of total government revenue in Algeria.

Regarding the Algerian case, (Sehli?2026) examined the relationship between fiscal policy and economic growth in Algeria over the period 1990–2023 using the ARDL Bounds Testing approach. The study found evidence of a cointegrating relationship among the variables, with the bounds test statistic exceeding the critical values at the 1% significance level. The findings also revealed a procyclical pattern in Algerian fiscal policy, reflecting the relationship between fiscal performance and developments in terms of trade and oil-related resource prices. Furthermore, the results indicated that fiscal interventions may be associated with temporary short-run responses in economic growth, whereas the long-run fiscal multipliers were not statistically significant. The study also identified evidence of instability and structural shifts associated with oil boom-and-bust cycles, representing a challenge for models that assume a stable economic system throughout the entire study period. This study is particularly close to the present research in terms of its economic context and econometric

methodology. However, it focuses on the relationship between fiscal policy and economic growth, rather than on the determinants of government revenue.

Comparative analysis of previous studies

A comparative analysis of the previous studies reveals a gradual evolution in the direction of economic research. The literature initially focused on the determinants of tax revenues and revenue mobilization capacity, as illustrated by Boukbech et al. (2019). It subsequently expanded toward examining the relationship between fiscal policy, economic growth, and institutional dimensions, as in Teixeira (2025). More recent studies have increasingly focused on the effects of oil price fluctuations and fiscal responses to external shocks, as demonstrated by Sadraoui and Mili (2025). In the Algerian context, research has moved toward the use of dynamic econometric models such as ARDL to examine the relationship between fiscal policy and economic growth, as shown by Sehli and Mili (2026).

Despite differences in economic contexts and methodologies, these studies share the view that government fiscal performance is not determined by a single factor but is influenced by a combination of economic, fiscal, institutional, and external factors. The literature also indicates that developing and resource-dependent economies face additional challenges related to revenue volatility, a narrow revenue base, and exposure to external shocks, particularly fluctuations in oil prices.

Another important difference concerns the dependent variable. Boukbech et al. (2019) focused on tax revenues, while Teixeira (2025) examined economic growth. Sadraoui and Mili (2025) focused on fiscal responses to oil shocks, whereas Sehli and Mili (2026) examined the relationship between fiscal policy and economic growth in Algeria. Consequently, total government revenue has received comparatively limited attention, particularly within a country-specific time-series framework for Algeria that simultaneously incorporates economic activity, fiscal conditions, and oil prices.

The studies also differ in terms of the econometric methodologies employed. Boukbech et al. (2019) relied on panel data, Teixeira (2025) employed multiple regression and correlation analysis, Sadraoui and Mili (2025) used a PVAR model, while Sehli and Mili (2026) applied the ARDL methodology. This methodological diversity reflects differences in the nature of the research questions and the characteristics of the data. In this regard, the ARDL Bounds Testing approach provides an appropriate framework for the present Algerian case because it allows the analysis of both short-run dynamics and long-run relationships within a single time-series model, provided that the required conditions for its application are satisfied.

Research gap

Despite the important contributions of previous studies, their comparison reveals a clear research gap, namely the limited number of studies examining total government revenue in Algeria as the dependent variable while simultaneously incorporating economic, fiscal, and external determinants within a single dynamic econometric framework.

Previous research has addressed, to varying degrees, the determinants of tax revenues, fiscal policy effectiveness, the relationship between fiscal policy and economic growth, and the response of public finances to oil price fluctuations. However, the dynamic relationship between Government Revenue (REV), Gross Domestic Product (GDP), Fiscal Deficit (DEF), and Oil Prices (OIL) has received insufficient attention in the Algerian context within an ARDL framework that incorporates these variables into a unified model.

This research gap is particularly important given the specific characteristics of the Algerian economy, which combines the significant role of the hydrocarbon sector in generating public resources with the

need to strengthen non-hydrocarbon revenues and achieve greater fiscal discipline and fiscal sustainability. Therefore, analyzing the determinants of government revenue can provide a deeper understanding of how economic activity, fiscal conditions, and oil price fluctuations affect the government's capacity to mobilize public resources.

Accordingly, the main contribution of the present study is to shift the focus from examining the effects of fiscal policy on economic growth toward analyzing the determinants of government revenue itself, by incorporating economic growth (GDP), fiscal deficit (DEF), and oil prices (OIL) into a single econometric model. Furthermore, the ARDL Bounds Testing approach makes it possible to distinguish between short-run dynamics and long-run relationships, thereby providing a more precise basis for understanding how government revenue responds to economic, fiscal, and oil-market developments in Algeria over the period 2000–2025.

1.3 Research hypotheses and their empirical assessment

1. The first hypothesis (H1) states that there is a long-run cointegration relationship between government revenue, economic growth, fiscal deficit, and oil prices in Algeria. This hypothesis is examined using the ARDL bounds testing approach. A calculated F-statistic exceeding the upper critical bound provides evidence against the null hypothesis of no long-run relationship and supports the existence of cointegration among the variables.
2. The second hypothesis (H2) states that economic growth, fiscal deficit, and oil prices have statistically significant effects on government revenue in both the short run and the long run. This hypothesis is assessed by examining the estimated short-run and long-run coefficients of the ARDL model. The statistical significance, sign, and magnitude of these coefficients provide evidence regarding the direction and strength of the effects. In addition, the significance and negative sign of the error correction term confirm the existence of an adjustment mechanism through which short-run deviations are corrected toward the long-run equilibrium.

Methods

This study employs the Autoregressive Distributed Lag (ARDL) approach to examine the determinants of government revenue in Algeria over the period 2000–2025. The analysis investigates the relationship between government revenue and three key explanatory variables: economic growth, fiscal deficit or surplus, and oil prices. The ARDL framework is particularly appropriate for the study because it allows for the simultaneous estimation of short-run and long-run relationships and can be applied when the variables are integrated at different orders, provided that none of the variables is integrated of order two, I(2). The empirical analysis begins with descriptive statistics and correlation analysis, followed by unit root tests to determine the order of integration of the variables. Subsequently, the ARDL bounds testing procedure is employed to test for the existence of a long-run equilibrium relationship among the variables. Once cointegration is established, the selected ARDL model is estimated to identify both the short-run dynamics and long-run coefficients. Finally, an error correction model is used to assess the speed at which government revenue adjusts toward its long-run equilibrium following short-run deviations. A set of diagnostic tests is also conducted to verify the adequacy and stability of the estimated model.

Results

This section presents the main findings obtained from the econometric analysis, with particular emphasis on assessing the adequacy and validity of the estimated econometric model. The results are presented sequentially, beginning with the descriptive statistics and unit root tests, followed by the cointegration analysis, estimation of the ARDL model, and examination of the short-run and long-run relationships. Diagnostic tests are also conducted to verify the validity of the model and ensure

that it is free from econometric problems that could affect the reliability of the estimates. This approach provides a sound basis for interpreting the estimated economic relationships and assessing the robustness of the empirical findings.

Mathematical specification of the model

This stage aims to specify the econometric model employed in the study and to identify its main variables based on the relevant economic literature concerning the determinants of government revenues. The primary objective of the model is to examine the effects of the budget deficit (DEF), economic growth (GDP), and oil prices (OIL) on government revenues (REV) in Algeria over the period under consideration,Accordingly, the general functional relationship between government revenues and the explanatory variables can be expressed as follows:

$$REVt=f(DEFt,GDPt,OILt)$$

Accordingly, the proposed model equation, in its explicit linear form, can be expressed as follows:

$$\Delta REV_t = \alpha_0 + \Sigma_{i=1}^{p-1} \alpha_i \Delta REV_{t-i} + \Sigma_{j=0}^{q1-1} \beta_j \Delta DEF_{t-j} + \Sigma_{k=0}^{q2-1} \gamma_k \Delta GDP_{t-k} + \Sigma_{l=0}^{q3-1} \delta_l \Delta OIL_{t-l} + \lambda[REV_{t-1} - \theta_0 - \theta_1 DEF_{t-1} - \theta_2 GDP_{t-1} - \theta_3 OIL_{t-1}] + \varepsilon_t$$

Where:

- Δ : The first-difference operator, capturing short-run dynamics.
- Δ REVt: The short-run change in total government revenues at time t
- ΔDEFt−j :The short-run change in fiscal discipline (or fiscal deficit/balance) at lag j.
- ΔGDPt−k : The short-run change in Gross Domestic Product (economic growth) at lag k
- ΔOILt−l: The short-run change in oil prices at lag l.
- p,q1,q2,q3: The optimal lag length for each variable, determined by information criteria (e.g., AIC or BIC).
- αi,βj,γk,δl: The short-run dynamic coefficients to be estimated.
- θ1,θ2,θ3: The long-run elasticity parameters of the explanatory variables.
- λ: The Error Correction Term (ECT) coefficient, indicating the speed of adjustment toward long-run equilibrium following a short-run disturbance (expected to be statistically significant and negative, $0>\lambda>-1$).
- εt: The white-noise stochastic error term.

1.1.1.Study Data:

This study relies on annual data for Algeria covering the period 2000–2025, with the aim of analyzing the determinants of total government revenues, focusing on fiscal discipline, economic growth, and oil prices. The data were obtained from annual reports and statistical bulletins issued by the National Office of Statistics (ONS) and the World Bank's World Development Indicators (WDI) database, as well as statistics from the U.S. Energy Information Administration (EIA), which are considered reliable official and international sources providing consistent and comparable time-series data. This dataset enables the estimation of both short-run and long-run relationships, while taking into account potential structural changes in the time series.

Table 1
Research Variables

Variable	Symbol	Variable Type	Definition	Data Source
Government Revenue	REV	Dependent Variable	Government revenue	National Office of Statistics (ONS)
Fiscal Discipline	DEF	Independent Variable	Fiscal Deficit or Surplus as a Percentage of GDP (%)	National Office of Statistics (ONS)
Gross Domestic Product	GDP	Independent Variable	Gross domestic product	National Office of Statistics (ONS)
Oil Prices	OIL	Independent Variable	Brent crude oil price in US dollars per barrel	Investing.com – Brent Oil Futures Historical Data

Source. Prepared by the researcher.

1.1.2 Descriptive and exploratory data analysis
1.1.2.1 Descriptive statistical analysis of the study variables
The descriptive statistics indicate considerable variation across the study variables. Government revenue (REV) ranges from 25.33% to 45.09%, with a mean of 32.80% and a median of 32.70%. The close values of the mean and median suggest a relatively balanced distribution of government revenue over the study period.

The fiscal deficit (DEF) ranges from -13.88% to 12.87%, with a mean of -2.246% and a median of -4.22%. The negative mean indicates that the government recorded a fiscal deficit on average during the study period, while the wide range reflects substantial fluctuations in the fiscal position.

GDP growth (GDP) ranges between 0.90% and 6.50%, with an average of 3.405% and a median of 3.60%. The relatively close mean and median indicate a generally stable distribution of economic growth, although the minimum and maximum values reveal some variation in economic performance.

Oil prices (OIL) exhibit the largest range among the variables, increasing from a minimum of 25.00 USD per barrel to a maximum of 111.63 USD, with a mean of 66.98 USD and a median of 68.04 USD. This substantial variation reflects the significant fluctuations in international oil prices during the study period and highlights the potential importance of oil price movements for government revenues and public finances.

Table 2
Descriptive statistics of the study variables

Variable	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
REV	25.33	29.75	32.70	32.80	35.01	45.09
DEF	-13.88	-7.45	-4.22	-2.246	4.26	12.87
GDP	0.90	2.60	3.60	3.405	4.10	6.50
OIL	25.00	45.88	68.04	66.98	80.00	111.63

Source. Prepared by the researcher.

1.1.3 Correlation matrix of the study variables

Figure 01 below presents the correlation matrix among the study variables. The results indicate a relatively strong positive relationship between government revenue (REV) and the fiscal deficit (DEF), with a correlation coefficient of 0.76. In contrast, the relationship between government revenue and GDP is positive but weak, with a correlation coefficient of 0.25, while the relationship between government revenue and oil prices (OIL) is also positive and weak, with a correlation coefficient of 0.22.

The results further reveal a moderate positive relationship between the fiscal deficit (DEF) and GDP, with a correlation coefficient of 0.36, whereas the relationship between the fiscal deficit and oil prices is weak and negative, with a coefficient of -0.19. The relationship between GDP and oil prices is very weak and negative (-0.06), indicating virtually no meaningful linear association between the two variables.

Overall, the correlation coefficients among the explanatory variables (DEF, GDP, and OIL) are relatively low, with the highest coefficient being 0.36 between the fiscal deficit (DEF) and GDP. Therefore, the correlation matrix does not indicate a serious multicollinearity problem among the explanatory variables. Although the correlation between government revenue (REV) and the fiscal deficit (DEF) is relatively high, at 0.76, this does not constitute evidence of multicollinearity because REV is the dependent variable in the model.

Nevertheless, it should be noted that correlation coefficients measure the degree of linear association between variables and should not be interpreted as evidence of causal relationships. To further assess the presence of multicollinearity, the Variance Inflation Factor (VIF) can be employed as a more direct diagnostic test.

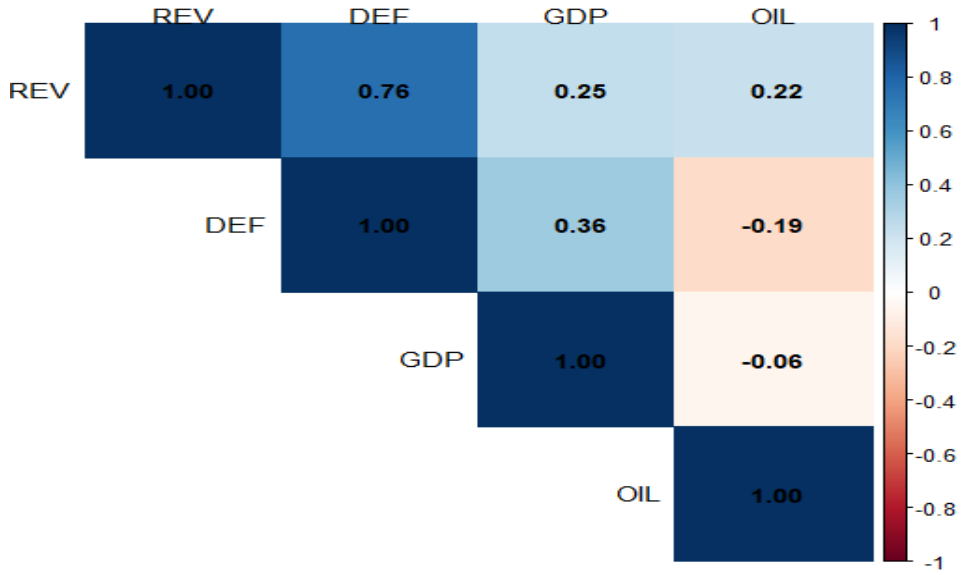


Figure 1

Correlation Matrix of the Study Variables

Source. Prepared by the researcher based on R 4.6.0

1.1.4 Multicollinearity Test

The figure 02 presents the results of the Variance Inflation Factor (VIF) test for the explanatory variables DEF, GDP, and OIL. The results indicate that the VIF values are very low, reaching approximately 1.19 for DEF, 1.15 for GDP, and 1.04 for OIL. These values are close to one and well

below the commonly accepted thresholds of 5 and 10, indicating that there is no significant multicollinearity among the explanatory variables. Therefore, the independent variables exhibit an appropriate degree of independence from one another, and multicollinearity does not pose a substantial problem for model estimation or the interpretation of the estimated coefficients. Table No. (4): Results of the Variance
Inflation factor (vif) multicollinearity test

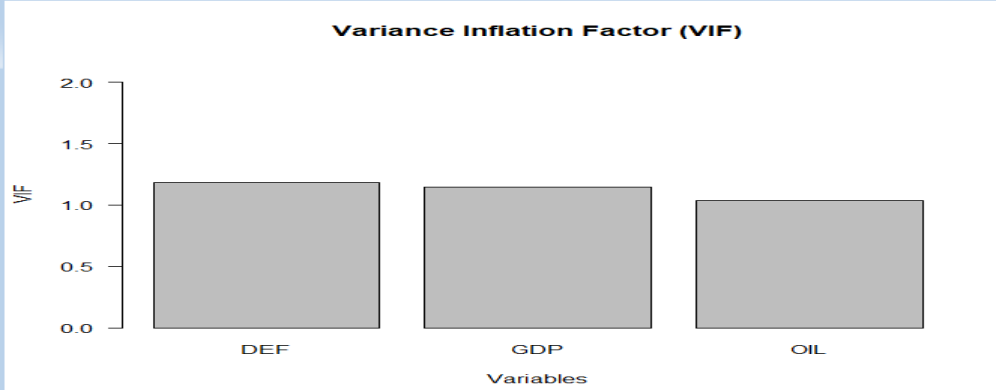


Figure 2
Multicollinearity Test

Source. Prepared by the researcher using R 4.6.0.

1.1.5 Historical paths and time trends
The preceding figure 03 illustrates the temporal evolution of the study variables, namely Government Revenue (REV) as the dependent variable, and Fiscal Discipline (DEF), Gross Domestic Product (GDP), and Oil Prices (OIL) as independent variables, over the period 2000–2025. An initial examination of these time series makes it possible to identify their general patterns, assess the extent of their fluctuations, and highlight the main structural changes and shocks that characterized their evolution during the study period.
First: Government Revenue (REV).

The figure shows that the Government Revenue (REV) series exhibited a considerable degree of fluctuation throughout the study period. Revenue levels were relatively low at the beginning of the period, after which they followed a gradual upward trend from the middle of the 2000s, reaching relatively high levels during approximately 2008–2014. However, this upward trend was not sustained, as government revenues declined noticeably from 2015 onward, with some temporary improvements in subsequent years. Another significant decline can be observed around 2020, followed by a gradual and increasingly pronounced recovery from 2021 to the end of the study period. This behavior indicates that government revenues were sensitive to changes in economic and fiscal conditions, particularly developments in oil prices, given the importance of oil-related revenues in the economy under study.
Second: Fiscal Discipline (DEF).

The DEF series reveals substantial fluctuations over the period 2000–2025. It recorded relatively high levels during the early years, particularly between 2000 and 2007, before declining and moving into negative values toward the end of the first decade. The series also experienced repeated fluctuations during 2010–2014, followed by a sharp decline in 2015. Thereafter, it remained at relatively low levels for a significant part of the subsequent period, although some temporary improvements were observed. This evolution reflects changes in the

government's fiscal position, which may be associated with developments in public revenues and expenditures, as well as with economic cycles and fluctuations in oil-related resources.
Third: Gross Domestic Product (GDP). The GDP series displays a fluctuating pattern, with an overall tendency toward growth during a substantial part of the study period, although it experienced several temporary declines. GDP improved during the early years, particularly over 2000–2005, before adopting a more volatile path in subsequent years, characterized by alternating increases and decreases. The year 2020 represents an exceptional turning point, as GDP experienced a sharp decline before resuming an upward trajectory from 2021 onward. This decline reflects the nature of the economic shock experienced by the global economy during that year, while the subsequent improvement reflects the gradual recovery of economic activity.

Fourth: Oil Prices (OIL)
The OIL series is among the most volatile time series included in the study. Oil prices were relatively low at the beginning of the period, before increasing significantly from the middle of the 2000s and reaching high levels during 2010–2014. This was followed by a sharp decline during 2015–2016, followed by a partial recovery in 2017–2018, before experiencing another major shock in 2020. From 2021 onward, oil prices increased strongly and remained at relatively high levels during the final years of the study period. This variable is particularly important in the model because fluctuations in oil prices may transmit their effects to government revenues, fiscal conditions, and overall economic activity.

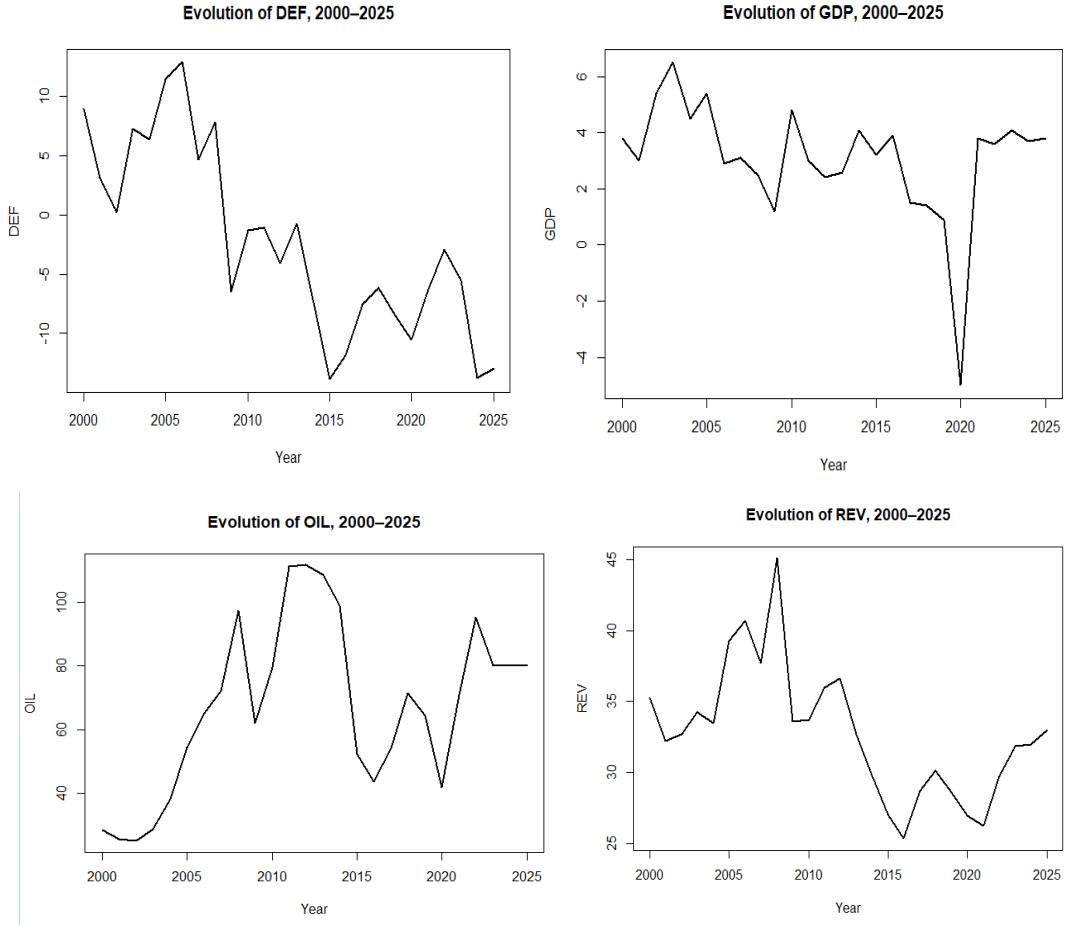


Figure 3
The time trend of the study variables during the period 2000–2025
Source. Prepared by the researcher based on R 4.6.0.

1.1.6 Analysis of the Relationship Between the Explanatory Variables and Government Revenue
First: Relationship between DEF and Revenue (REV)
The figure indicates a relatively clear positive linear relationship between DEF and Revenue (REV), as the regression line shows an upward trend as DEF increases. This suggests that an increase in DEF is, on average, associated with an increase in revenue. Although some dispersion and outliers are observed, most observations are relatively close to the fitted regression line. Therefore, the relationship between DEF and Revenue appears to be stronger and more consistent than the relationships observed for the other explanatory variables. However, confirming the statistical significance of this relationship requires examining the correlation coefficient and the results of the relevant statistical tests.

Second: Relationship between GDP and Revenue (REV)
The figure shows a weak positive relationship between GDP and Revenue, as the regression line has a slight upward slope as GDP increases. This indicates that an increase in GDP may be associated with an increase in revenue. However, the observations are considerably dispersed around the regression line, suggesting that the linear relationship is relatively limited. Therefore, GDP may contribute to explaining variations in revenue, but its apparent linear effect is weaker than that of DEF.

Third: Relationship between OIL and Revenue (REV)
The relationship between OIL and Revenue appears to be very weakly positive, as the regression line has only a slight upward slope. This suggests that changes in OIL are not associated with large or consistent changes in revenue within the sample. The observations are also widely dispersed around the fitted line, with some noticeable outliers, indicating a weak linear association between the two variables. Consequently, OIL appears to be the least strongly associated with Revenue among the three explanatory variables from a descriptive perspective. Nevertheless, statistical tests are required to determine whether this relationship is statistically significant.

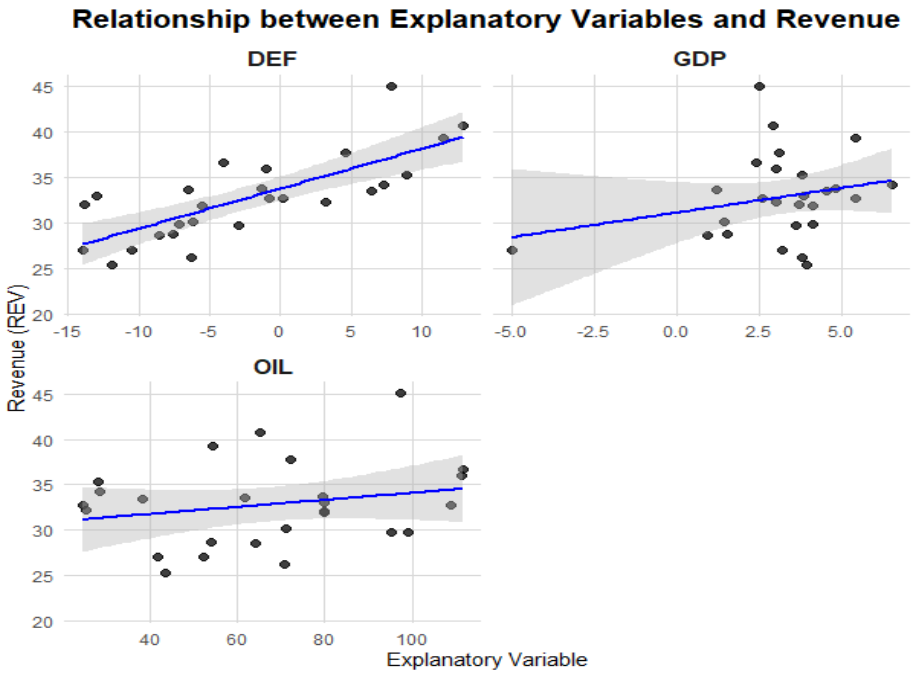


Figure 4
Scatter Plots Showing the linear relationships between revenue (REV) and DEF, GDP, and OIL

Source. Prepared by the researcher based on R 4.6.0.

1.2 Stationarity Test of the Time Series

Testing the stationarity of a time series is based on determining whether the series contains a unit root. The presence of a unit root indicates that the series is non-stationary, which may lead to spurious regression results and consequently affect the reliability of econometric analysis. (Sims, 1990). Several tests can be used to examine the stationarity of time series, including the Augmented Dickey–Fuller (ADF) test. In this study, the appropriate lag length was considered when conducting the stationarity analysis, and the test was performed using the EViews software. (Cevher, 2015). The ADF test is used to determine whether each study variable is stationary at level [I(0)] or becomes stationary after first differencing [I(1)]. This distinction is particularly important for the application of the ARDL methodology, which permits a combination of variables integrated of order zero and order one, provided that none of the variables is integrated of order two, I(2) (Paparoditis & Politis, 2018, pp. 955-973).

Table 3

ADF unit root test for the stationarity of the study time series

Variable	Level: ADF (p-value)	1st Difference: ADF (p-value)	Order
REV	−2.97 (0.15)	−5.94 (0.00)	I(1)
GDP	−3.80 (0.30)	−7.34 (0.00)	I(1)
DEF	−2.97 (0.15)	−5.94 (0.00)	I(1)
OIL	−2.04 (0.54)	−4.51 (0.00)	I(1)

Source. Prepared by the researcher based on the outputs of Eviews 13

1.3 Analysis of the ADF Unit Root Test Results

The results of the Augmented Dickey-Fuller (ADF) test indicate differences in the stationarity properties of the variables at level and first difference. The findings show that REV, DEF, and OIL are non-stationary at level but become stationary after first differencing, indicating that they are integrated of order one, I(1). The GDP variable exhibits non-stationarity under some test specifications at level, while the intercept specification indicates stationarity, with an ADF statistic of −3.57 and a p-value of 0.01. Nevertheless, GDP also becomes stationary after first differencing under all specifications. Overall, the ADF test results confirm that none of the variables is integrated beyond the first order, and no variable is I(2). This finding is methodologically important because it satisfies the basic requirement for applying the ARDL model, which allows for the estimation of dynamic relationships among the variables and the examination of their effects in both the short and long run.

1.4 Optimal Lag Length Selection Test

Based on the Akaike Information Criterion (AIC), the optimal lag length was determined. The results indicate that the ARDL(1,3,2,2) model is the optimal specification, as shown in the following figure.

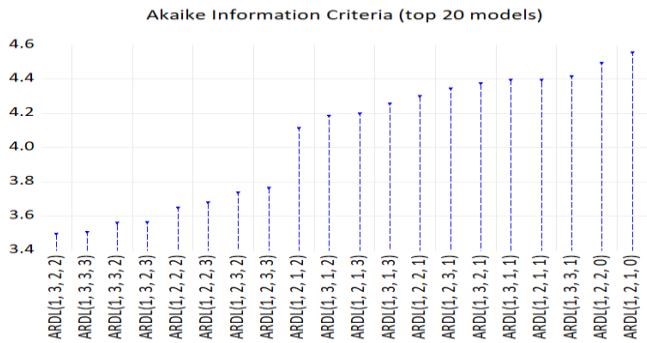


Figure 5

Results of the optimal lag length selection test for the ARDL model

Source. Prepared by the researcher based on the outputs of Eviews 13

The ARDL model selection results indicate that the ARDL(1.3.2.2) specification is the optimal model based on the Akaike Information Criterion (AIC), recording the lowest AIC value of 3.4952 among the estimated specifications. The selected model also reports a BIC value of 4.0876, an HQ value of 3.6442, and an adjusted R-squared of 0.9417, indicating a high level of explanatory power. Accordingly, the model captures the dynamic effects of the explanatory variables on government revenues by allowing for different lag structures across the variables. However, given the relatively small effective sample size, the selection of the optimal lag structure should not be based solely on the information criterion. Therefore, the adequacy and robustness of the selected ARDL(1.3.2.2) model should subsequently be assessed through the bounds test for cointegration, short- and long-run estimations, residual diagnostic tests, and parameter stability tests.

1.5. Bounds Test for Cointegration

Based on the figure below, it can be observed that the calculated F-statistic is 9.71 which exceeds the upper-bound I(1) critical values at the 10%, 5%, 2.5%, and 1% significance levels. Furthermore, the calculated statistic exceeds the finite-sample upper-bound critical values, which are 4.194 at the 5% significance level and 5.816 at the 1% significance level. Accordingly, the null hypothesis of no levels relationship is rejected, confirming the existence of a long-run cointegrating relationship among government revenues (REV), fiscal deficit (DEF), gross domestic product (GDP), and oil prices (OIL). Therefore, the bounds test results provide statistical support for proceeding with the estimation of the long-run coefficients and the short-run error correction model within the ARDL framework.

Table 4

ARDL bounds test for cointegration

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	9.716859	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66
Actual Sample Size	23	Finite Sample: n=35		
		10%	2.618	3.532
		5%	3.164	4.194
		1%	4.428	5.816

Source. Prepared by the researcher based on the outputs of EViews 13.

1.6 Diagnostic Tests for the ARDL(1.3.2.2) Model

Based on the table below, it can be observed that the ARDL model exhibits satisfactory statistical properties, as the diagnostic tests indicate the absence of major specification problems. The Ramsey RESET test reports a p-value of 0.16, which is greater than the 5% significance level, indicating no evidence of model misspecification. Similarly, the Breusch–Pagan–Godfrey test yields a p-value of 0.19, suggesting the absence of heteroskedasticity. The ARCH test also reports a p-value of 0.16, indicating no evidence of conditional heteroskedasticity. Furthermore, the Breusch–Godfrey test for serial correlation records a p-value of 0.56, confirming the absence of serial correlation in the model residuals. Finally, the Jarque–Bera test produces a p-value of 0.53; therefore, the null hypothesis of normally distributed residuals cannot be rejected. Overall, these findings indicate that the model is

correctly specified and does not suffer from serial correlation or heteroskedasticity, while its residuals are normally distributed. These results support the reliability of the ARDL model for estimating the short- and long-run relationships among the variables.

Table 5
Diagnostic tests of the ARDL(1.3.2.2) model

Test	Test Statistic	p-value	Decision
Ramsey RESET	(F)2.22	0.16	Correct specification
Breusch-Pagan-Godfrey	(F)0.16	0.19	No evidence of heteroskedasticity
ARCH	(F)0.18	0.16	No evidence of conditional heteroskedasticity
Breusch-Godfrey (Serial Correlation)	0.56 (F)	0.25	No serial correlation
Jarque-Bera	1,25	0.53	Residuals are normally distributed

Source. Prepared by the researcher based on the outputs of EViews 13.

Analysis of the CUSUM and CUSUMSQ Tests for Structural Stability of the ARDL(1.3.2.2) Model
To assess the stability of the estimated model parameters over time, the Cumulative Sum of Structural Stability Tests of the Model
To ensure the quality of the estimation and verify the model's suitability for econometric analysis, the structural stability of the model parameters over the study period was examined using the Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares of Recursive Residuals (CUSUM of Squares) tests. The graphical results of both tests show that the cumulative paths of the test statistics remained entirely within the critical bounds at the 5% significance level, with no violations of these bounds.

Accordingly, there is no statistical evidence of structural changes or instability in the model parameters over the study period. Therefore, the model can be considered structurally stable. This finding supports the reliability of the estimated coefficients and confirms the model's suitability for explaining the dynamic relationships among the variables under investigation. It also strengthens the validity of relying on the results to derive economic implications and formulate relevant policy recommendations.

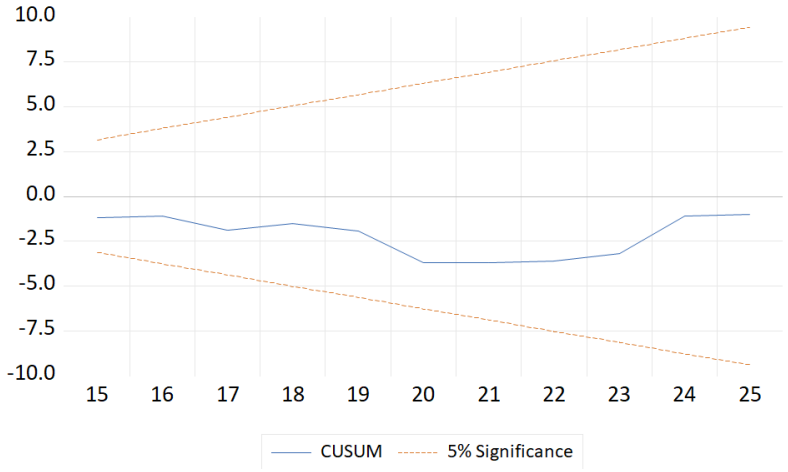
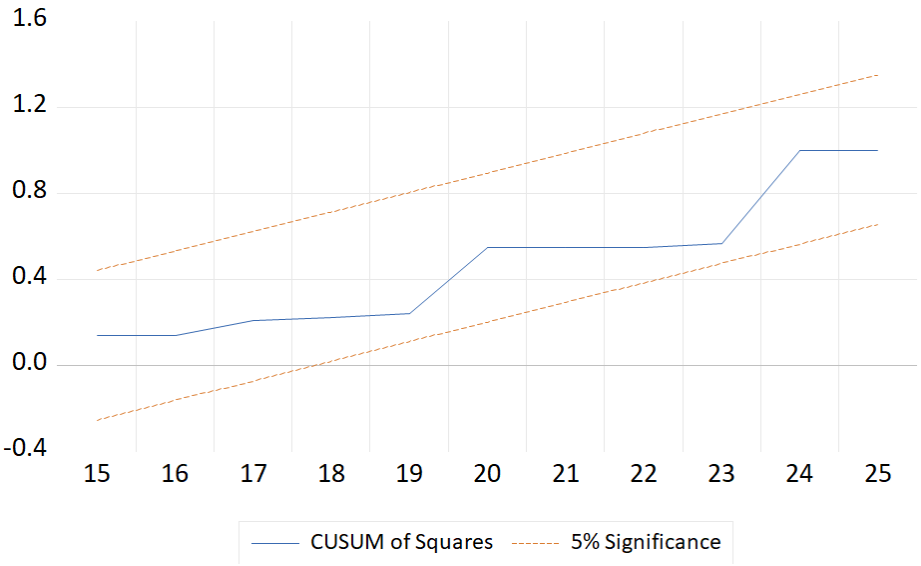


Figure 5
CUSUM and CUSUMSQ tests for the structural stability of the ARDL(1.3.2.2) model



Source. Prepared by the researcher based on the outputs of EViews 13.

1.7 Estimation of the Parameters of the Proposed ARDL(1.3.2.2) Model for the Dependent Variable Government Revenue (REV)

This section presents the results of estimating the ARDL model with the aim of analyzing the nature of the relationship between Government Revenue (REV), fiscal discipline (DEF), economic growth (GDP), and oil prices (OIL) in Algeria. This methodology makes it possible to distinguish between short-run dynamics and long-run equilibrium relationships, in addition to employing the Error Correction Model (ECM) to identify the immediate and lagged dynamic responses of the dependent variable and to measure the speed at which the system returns to its equilibrium path following any deviation from the long-run relationship.

Accordingly, the short-run parameters are first presented and interpreted to determine the direction and magnitude of the immediate and lagged effects of the explanatory variables, namely fiscal discipline (DEF), economic growth (GDP), and oil prices (OIL), on Government Revenue (REV). This is followed by the presentation and analysis of the long-run results to identify the nature of the stable equilibrium relationship among the variables and to assess the extent to which these findings are consistent with the expected economic relationships.

Table 6

Estimation Results of the Error Correction Model (ECM) for the ARDL(1.3.2.2) Model

ARDL Error Correction Regression
Dependent Variable: D(REV)
Selected Model: ARDL(1, 3, 2, 2)
Case 2: Restricted Constant and No Trend
Date: 09/12/26 Time: 08:50
Sample: 2000 2025
Included observations: 23

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEF)	0.018647	0.068172	0.273530	0.7895
D(DEF(-1))	-0.650780	0.090822	-7.165469	0.0000
D(DEF(-2))	-0.153238	0.068651	-2.232143	0.0473
D(GDP)	0.322540	0.104855	3.076061	0.0105
D(GDP(-1))	0.646726	0.151592	4.266228	0.0013
D(OIL)	0.130792	0.016585	7.885994	0.0000
D(OIL(-1))	0.116347	0.020755	5.605637	0.0002
CointEq(-1)*	-1.182849	0.145322	-8.139491	0.0000

Source. Prepared by the researcher based on the outputs of Eviews 13

Long-Run Dynamics and the Nature of Adjustment

The value of the error correction coefficient, CointEq(-1) = −1.1828, which is highly statistically significant, indicates the existence of a long-run equilibrium relationship between government revenues and economic growth, oil prices, and fiscal discipline. The negative sign of the coefficient confirms the presence of a self-correcting mechanism that brings the dependent variable back toward its long-run equilibrium path following short-run shocks or disequilibria.

The absolute value of the error correction coefficient is 1.1828, which exceeds unity. This indicates that the adjustment process does not occur gradually but is characterized by over-correction. In other words, government revenues do not return smoothly to their equilibrium level; instead, the adjustment exceeds the magnitude of the initial disequilibrium, potentially generating fluctuations around the equilibrium path before stability is restored. This behavior may be attributed to strong fiscal policy responses, oil-price shocks, or sudden changes in macroeconomic conditions that cause the adjustment process to overshoot the equilibrium level.

Short-Run Transmission Dynamics

First: The Effect of Oil Prices (OIL)

- Oil prices exert a positive and direct effect on government revenues, with the coefficient of the contemporaneous change amounting to 0.1308, while the coefficient of the lagged change is 0.1163. This result indicates a rapid transmission of changes in oil prices to government revenues, which can be explained by the degree of dependence of public finances on oil-related revenues. Accordingly, an increase in oil prices contributes to higher government revenues, whereas a decline in oil prices may exert direct pressure on the government's financial resources.
- Second: The Effect of Economic Growth (GDP)
- GDP exhibits a positive effect on government revenues, with the coefficient increasing from 0.3225 in the contemporaneous period to 0.6467 in the first lagged period. This suggests that the impact of economic activity on government revenues is not fully transmitted immediately but becomes stronger over time. This pattern can be explained by the time lag between the expansion of economic activity and its effects on tax collection and public revenues, as well as the time required for increases in production, investment, and consumption to be translated into actual revenue flows to the public treasury.
- Third: The Effect of Fiscal Discipline (DEF)
- The results indicate that the coefficient of the contemporaneous change in fiscal discipline, D(DEF), is statistically insignificant, whereas the lagged coefficient D(DEF(-1)) = −0.6508 is negative and statistically significant. This indicates that changes in fiscal discipline do not have an immediate significant effect on government revenues; rather, their effect becomes more evident in the subsequent period.
- This lagged effect may be explained by the fact that measures aimed at strengthening fiscal discipline, including expenditure control, resource rationalization, and improved public financial management, require time before their effects are fully reflected in government revenue performance. Moreover, the negative effect of fiscal discipline in the previous period may reflect a short-run transitional effect resulting from expenditure-control measures or reductions in certain government expenditures that indirectly affect economic activity and revenue collection. Therefore, this finding does not necessarily imply that fiscal discipline reduces government revenues in the long run; rather, it suggests the existence of a lagged short-run effect that should be interpreted in light of the nature of fiscal policy and the structure of government revenues.

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Long-Run Results

After establishing the existence of a long-run relationship, the long-run coefficients should be obtained:

Table 7
Long-Run results of the ARDL (1.3. 2.2) model

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEF	0.422809	0.048835	8.657830	0.0000
GDP	0.599395	0.184551	3.247856	0.0078
OIL	0.033432	0.013155	2.541437	0.0274
C	28.65035	1.051661	27.24296	0.0000

EC = REV - (0.4228*DEF + 0.5994*GDP + 0.0334*OIL + 28.6504)

Source. Prepared by the researcher based on the outputs of Eviews 13

Long-Run Results
The long-run results reveal several important economic implications regarding the determinants of Government Revenue (REV) in Algeria.
The estimated long-run relationship indicates that fiscal discipline (DEF), economic growth (GDP), and oil prices (OIL) are all positively associated with government revenue (REV), reflecting the characteristics of the Algerian economy and the mechanisms underlying public revenue generation. These findings confirm that improvements in economic and fiscal conditions contribute, to varying degrees, to strengthening the government's capacity to mobilize revenues.

Regarding fiscal discipline (DEF), the positive relationship indicates that improved fiscal discipline in public financial management is associated with higher government revenue in the long run. This can be explained by the fact that stronger fiscal discipline contributes to improving collection efficiency, rationalizing the management of public resources, and reducing fiscal imbalances, thereby enhancing the government's ability to mobilize additional and more sustainable revenues. Improved public financial management may also strengthen confidence in economic policies and reduce behaviors that contribute to weak fiscal and tax compliance.

With respect to economic growth (GDP), the results show a positive relationship with government revenue, which is consistent with the economic rationale that an expansion of economic activity broadens the tax base and the base for various fees and other government revenues. Higher GDP is generally associated with increased production, income, profits, and the volume of economic transactions, thereby strengthening the government's revenue-raising capacity. This finding is particularly important because it suggests that achieving sustainable economic growth can constitute a more stable source of government revenue enhancement over the long term.

As for oil prices (OIL), the positive relationship with government revenue reflects the central role of the hydrocarbon sector in Algeria's public finances. Higher oil prices improve hydrocarbon-related receipts and increase revenues that can be transmitted to the public sector, thereby strengthening the government's capacity to mobilize revenues. However, the smaller coefficient of oil prices compared with those of economic growth and fiscal discipline indicates that, according to the estimated model, the response of government revenue to changes in oil prices is relatively weaker than its response to the other two variables. This does not necessarily imply that oil is less important to the Algerian

economy; rather, it reflects the estimated magnitude of the response given the measurement units of the variables and the specification of the model.

Overall, the findings suggest that strengthening government revenue should not rely primarily on external conditions associated with oil price fluctuations, but should also involve supporting economic growth and improving fiscal discipline. Economic growth contributes to broadening the revenue base, while fiscal discipline improves the efficiency of resource management and mobilization. Therefore, combining policies aimed at diversifying economic activity, broadening the tax base, improving collection efficiency, and strengthening discipline in public financial management can help Algeria build a more stable revenue base that is less vulnerable to fluctuations in global oil markets.

2. Hypothesis Testing and Discussion of Results

- ✍ The econometric results provide strong evidence in support of the hypotheses formulated in this study. Regarding the first hypothesis, which assumes the existence of a cointegration relationship between government revenues, economic growth, fiscal discipline, and oil prices, the *Bounds Test* indicates that the calculated *F-statistic is 9.716859.* This value is sufficiently high to reject the null hypothesis of no long-run relationship among the variables. This finding indicates that government revenues in Algeria are not determined independently of economic activity, fiscal conditions, and oil price developments; rather, a long-run equilibrium relationship exists among these variables. From an economic perspective, this relationship reflects the characteristics of the Algerian economy, where the government's capacity to mobilize revenues is closely linked to macroeconomic developments, fiscal conditions, and fluctuations in international oil markets. Accordingly, *the first hypothesis is accepted.*
- ✍ Regarding the second hypothesis, which assumes that economic growth, fiscal discipline, and oil prices have statistically significant effects on government revenues in both the short and long run, its assessment requires distinguishing between short-run dynamic effects and the long-run equilibrium relationship. This distinction is particularly important within the ARDL framework because the response of government revenues to changes in the explanatory variables is not necessarily immediate; rather, the effects may be transmitted gradually over time. Moreover, the statistical significance of the error correction coefficient, $CointEq(-1) = -1.1828,$ together with its negative sign, confirms the existence of an adjustment mechanism toward long-run equilibrium. This means that short-run deviations from the long-run equilibrium path do not persist indefinitely but are corrected in subsequent periods.
- ✍ The value of the error correction coefficient, $-1.1828,$ indicates a relatively high speed of adjustment toward long-run equilibrium. Since its absolute value exceeds unity, the adjustment process involves an *overshooting mechanism.* In other words, the system does not return to equilibrium in a purely gradual manner; instead, it may temporarily move beyond the equilibrium level before converging toward it. This behavior may be explained by the characteristics of government revenues in Algeria and their sensitivity to changes in economic and fiscal conditions, particularly those associated with oil price fluctuations.
- ✍ Therefore, the model results confirm not only the existence of a statistically significant relationship among the variables but also reveal a *strong adjustment dynamic* between the short-run and long-run relationships. Consequently, the second hypothesis receives empirical support, *subject to identifying which variables exert statistically significant effects in the short and long run based on the estimated model coefficients*. This distinction makes it possible to differentiate between variables whose effects on government revenues are persistent and those whose effects are temporary or primarily associated with short-run fluctuations.
- ✍ Overall, the hypothesis-testing results demonstrate that government revenues in Algeria are influenced by a complex interaction among economic, fiscal, and oil-related factors. The relationship among these variables is not merely contemporaneous but extends into the long run

through a clear equilibrium and adjustment mechanism. This finding highlights the importance of adopting fiscal and economic policies that reduce the vulnerability of government revenues to external shocks and strengthen the capacity of public finances to maintain a more stable trajectory in the face of fluctuations in economic activity and oil prices.

Conclusion

The present study examined the main determinants of government revenues in Algeria over the period 2000–2025, with particular emphasis on economic growth, fiscal discipline, and oil prices. The overall findings indicate that government revenue performance should be understood within an integrated macroeconomic and fiscal framework. In this regard, the study highlights the interconnected nature of economic activity, fiscal conditions, and external developments in shaping the evolution of public revenues.

From an economic and policy perspective, the findings emphasize the importance of strengthening the resilience of public finances. The sustainability of government revenues cannot depend excessively on conditions prevailing in the hydrocarbon sector, given the volatility of international oil markets. A more diversified revenue structure would therefore provide greater fiscal stability and improve the government's capacity to respond to economic fluctuations while maintaining its development objectives.

Accordingly, several policy priorities can be identified. These include broadening the domestic revenue base, improving tax administration and collection efficiency, strengthening compliance, and enhancing the effectiveness of public financial management. At the same time, fiscal policy should promote a more prudent management of oil-related revenues by directing temporary windfalls toward strengthening fiscal buffers and supporting productive economic activities. Such measures could contribute to reducing fiscal vulnerability and establishing a more sustainable revenue system.

Finally, this study is subject to certain limitations that provide opportunities for future research. Further studies could incorporate additional macroeconomic, institutional, and structural variables, such as inflation, exchange rates, public expenditure, institutional quality, tax reforms, and the degree of dependence on hydrocarbon revenues. Alternative econometric approaches and longer periods of observation could also provide additional insights into the structural and dynamic determinants of government revenues in Algeria.

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