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Impact of Public Spending on Economic Growth in Algeria

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Abstract

This study aims to analyze the impact of public spending on Algeria's economic growth from 1983 to 2023 using descriptive analysis and an ARDL model. Results show that capital expenditures have no significant effect on growth in the short or long term, while current expenditures are positively correlated to long-term growth. These results suggest that the effectiveness of public spending, particularly investment expenditures, should be reassessed within the framework of fiscal policies aimed at sustainably boosting growth.

Keywords: Fiscal policy; public spending; economic growth; ARDL models.

1. Introduction

Many economies around the world rely heavily on oil revenues to finance their public budgets, and Algeria is a prominent example. Since gaining independence, the oil sector has been the cornerstone of the country's development strategy, with hydrocarbon revenues forming the bulk of the state budget. The sustained rise in oil prices since the early 2000s has significantly boosted Algeria's oil exports, foreign exchange reserves, and public expenditure. This paper seeks to assess whether Algeria has successfully translated its oil-financed public spending into meaningful development outcomes. Specifically, it examines whether public expenditure—particularly capital expenditure—has had a positive impact on economic growth. To

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address this question, we first review the existing literature on the relationship between public spending and economic growth, with a particular focus on public investment. We then analyze Algeria's fiscal policy, emphasizing how budget revenues have been allocated. The paper concludes with an empirical investigation that evaluates the impact of public spending and other key variables on Algeria's economic growth.

2. Brief Literature Review

In theory, efficient public spending management is expected to act as a key trigger of economic growth. Public investment in infrastructure contributes to enhanced growth performance and stimulates private sector investment(1), as well as total factor productivity (TFP). Infrastructure development plays a crucial role in triggering economic take-off. A distinction is typically made between economic infrastructure (such as electricity, transportation, and communications) and social infrastructure (such as education and social services). The impact on growth is linked to market expansion, economies of scale, and the synergies generated between sectors and regions. The positive effect on private investment arises from an increase in the marginal productivity of capital and labor, which in turn improves investment returns and stimulates demand for further investment.

In 1989, David Aschauer conducted an empirical study on the relationship between public spending and productivity in the United States using an aggregate production function. He found that the elasticity of private sector productivity with respect to infrastructure spending (e.g., highways, electricity, water) was approximately 0.24 between 1949 and 1985. However, Aschauer's approach was later criticized for potential spurious regression issues, as both series (capital expenditure and productivity) were non-stationary time series(2). Later, for checking purposes(3), employed more advanced econometric techniques, particularly error correction models, and arrived at similar

(2) Marie Ange Veganzones, Infrastructures, investissement et croissance : un bilan de dix années de recherches, CERDI, Clermont Ferrand, France 2000.
(3) Aschauer David A., "Is public expenditure productive?", *Journal of Monetary Economics* 23, 1989, pp. 177-200.
(4) Heintz James, "The Impact of Public Capital on the U.S. Private Economy: New Evidence and Analysis", *International Review of Applied Economics*, Vol. 24, N° 5, 2010, pp. 619–632.

conclusions—confirming a long-run (cointegrating) relationship between public capital stock and private sector productivity.

Public investment tends to support long-term growth through productivity gains. In resource-rich countries, the effect of public investment on growth depends on the country's income level(1). In petroleum-rich economies, increases in oil prices often prompt governments to launch large-scale investment projects, many of them ending up with low returns and often referred to as "white elephants"(2). These projects are frequently concentrated in heavy industry and are typically misfits with the prevailing structure of the domestic economy(3). Additionally, such investments, funded by oil rents, often face limitations related to the economy's failure to cope with the huge increase in capital capacity to due to the absence of a robust productive base. Job creation in these sectors tends to be limited and temporary.

Moreover, Ross (2001) argues that in oil-rich countries, governments often use oil revenues to maintain social peace through expansive social transfers and a lenient tax regime, aiming to divert public interest away from democratic demands. In a study on Argentina between 1983 and 2013(4), found that, during oil crises, certain provincial governments exhibited counter-cyclical behavior by increasing employment-related public spending targeting their core electorate to enhance political security and reduce social tensions.

A few empirical studies have been conducted on Algeria(5), using an econometric model, found no significant effect of public spending on

(2) Topcu Ebru, Altinoz Buket and Aslan Alper, "Global evidence from the link between economic growth, natural resources, energy consumption, and gross capital formation". *Resources Policy*, vol. 66, issue C, 2020.
(3) Robinson James A., Torvik Ragnar, "White Elephants",*Journal of Public Economics* 89, pp. 197–210. 2005. Danforth Jeff, Medas Paulo A., Salins Veronique, " Fiscal Policy: How to Adjust to a Large Fall in Commodity Prices. IMFWorking Paper, 2016.
(4) Philippot Louis-Marie, "Rente naturelle et composition des dépenses publiques". Document De travail. Centre d'études et de recherches sur le développement international (CERDI). Avril 2008.
(5) Gonzàlez Lucas I., "Oil Rents and Patronage: The Fiscal Effects of Oil Booms in the Argentine Provinces", *Comparative Politics*, Volume 51, Number 1, 2018, pp. 101-126.
(6) Yagoub Mohamed, "L'incidence des dépenses publiques « fonctionnement et d'équipement » sur la croissance économique en Algérie à l'aide de modèle ECM". Revue DIRASSAT. V. 6 N. 2. Université de Laghouat, 2015, pp. 39-52.

economic growth. More recently[1], using a NARDL (nonlinear ARDL)[2] model, found that reductions in public spending had a more pronounced positive impact on economic activity than the negative effect of increased public spending They concluded that high levels of public spending could hinder economic growth in Algeria.

3. Fiscal Policy in Algeria

3.1. Budget Revenues

Algeria's state budget is composed of ordinary revenues—primarily income tax —and oil-related revenues in the form of hydrocarbons taxation (petroleum tax collected). Since the 1970s, hydrocarbons revenues has consistently accounted for more than 60% of total budget receipts. However, this share began to decline following the sharp drop in oil prices in 2014, causing export revenues to significantly decrease and averaging 40% of total budget revenues over the period 2015- 2023.

Fiscal policy in Algeria has consistently followed an expansionary trajectory. Public spending has increased significantly, particularly during periods of high oil prices (notably between 2000 and 2014, and again from 2022 onward), making it inherently pro-cyclical. Algeria's fiscal strategy has been largely centered around large-scale public infrastructure investment programs implemented in the early 2000s which aimed at strengthening the supply-side of the economy.

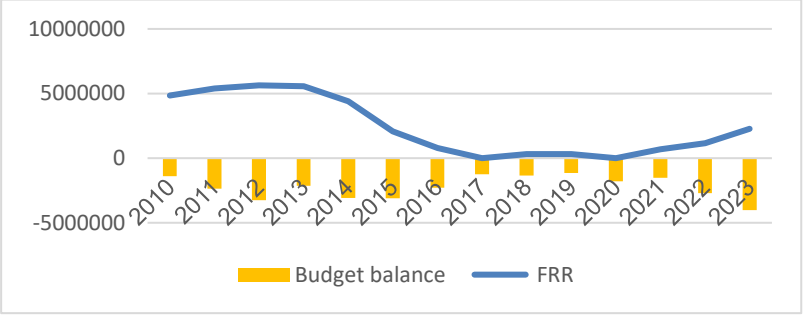
Between 2000 and 2014, the Algerian government launched an ambitious public investment plan, primarily to make up for the country's infrastructure deficits. This policy was justified by the persistently low economic growth rates that fell short of the levels required to reduce unemployment. The limited contribution of the private sector to value-added production prompted the state to intervene through increased public spending to lever and accelerate economic growth. In addition, this expansionary fiscal stance was driven by the

(2) Tiab Fayçal et Abderrahmani Fares, " L'impact des dépenses publiques sur la croissance économique de l'Algérie : une approche par un modèle ARDL non linéaire (1970-2019)". Revue Etudes Economiques. Volume: 16/ N°:02, 2022, pp 718-732.
(1) The NARDL model allows for the incorporation of potential asymmetric effects of positive and negative changes in the explanat0ory variables on the dependent variable.

political imperative of maintaining social stability, particularly in the aftermath of the 2011 uprisings in several Arab countries.

Following the renewed rise in oil prices starting in 2022, the same pattern has reemerged, with a notable increase in public expenditure. The following figure illustrates how these spending trends have affected the fiscal deficit. Each time the deficit widened, the government had recourse to the Revenue Regulation Fund (FRR) to fill the gap (see Figure 1).

Fig. 1: Revenue Regulation Fund (FRR) and Budget Balance in Million DZD (2010–2023)



Source: Ministry of Finance

3.2. The Use of Budget Revenues by the State Between 2000 and 2023: Import Financing and Public Expenditure

3.2.1. Import Financing

According to Sid Ahmed (1983), in oil-exporting countries, a significant portion of external rent is used to satisfy domestic consumption needs through imports. Indeed, during periods of financial ease, Algeria experienced a surge in the imports of goods and services to meet growing domestic demand. In 2014, imports peaked at USD 59.6 billion, representing a 6.4-fold increase compared to their 2000 level of USD 9.3 billion.

However, following the collapse in oil prices—which led to a sharp decline in financing capacity—imports steadily decreased, reaching USD 42.8 billion in 2023. Notably, In 2022, Algeria has recorded a substantial trade surplus for the first time since 2015. This

improvement is attributed to the rise in oil export revenues and the expansion of non-hydrocarbon exports, which reached USD 7 billion(1).

However, the structure of imports has remained broadly consistent with that of the previous years. In 2020, consumer goods—both food (mainly cereals and dairy products) and non-food (such as vehicles and pharmaceuticals)—accounted for the largest share at 40.1%, followed by capital goods at 26.5%, and semi-finished goods (notably iron and steel products) at 23.2%. However, the growing share of capital goods does not reflect increased dynamism in private investment. It mainly comprises imports of passenger vehicles and household appliances.

3.2.2. Current Expenditures

Oil profits are often channeled into high public-sector wages, which are difficult to scale back when oil prices decline(2).

Current expenditures rose sharply between 2000 and 2012, reaching DZD 4,782.63 billion, up from DZD 856.19 billion in 2000. Between 2012 and 2019, these expenditures stabilized at an average of approximately DZD 4,600 billion. Since 2019, there has been a significant increase, in current expenditures reaching DZD 8,615.69 billion in 2023— resulting in an annual growth rate of nearly 50% between 2021 and 2023. This surge is primarily attributed to the reevaluation of public-sector wages and pensions. Current transfers also represent a substantial share of government spending, averaging 17% between 2010 and 2021, and approximately 45% in 2023(3).

3.2.3 Capital Expenditures (Public Investment)

Between 2001 and 2014, the Algerian government implemented large-scale investment programs aimed at stimulating economic growth. These programs were primarily aimed at developing infrastructure and enhancing human resources, key ingredients for sustained growth. Their stated objectives included poverty reduction, job creation, and regional equity promotion.

However, some of these investment programs were subject to several criticisms, particularly regarding their design. Several shortcomings

(2) Banque d'Algérie (BA), Commerce extérieur, 2024.
(3) Medas Paulo and Zakharova Daria,"A Primer on Fiscal Analysis in Oil-Producing Countries", *IMF Working Paper*. WP/09/56, 2009.
(4)Ministère des finances, Budget de l'Etat, 2023.

were identified: first, projects lacked integration within coherent sectoral frameworks; second, there were neither systematic assessment of project implementation costs, nor real evaluation of their outcomes and impacts(1).

Since 2022, the government has initiated several new investment projects pertaining to different sectors such as (large-scale south agriculture, seawater desalination, rail infrastructure etc…). In October 2023, a housing project under the rent-to-own AADL(2) formula was also launched.

4. The Impact of Public Spending on Economic Growth: An Empirical Study

This section aims to empirically examine the impact of public spending on economic growth (expressed by the real GDP) in Algeria.

4.1- Methodology

Given the objective of this study-to assess the impact of public spending on economic growth -it is essential to adopt a long-term perspective, as the effects of such public spending unfold over extended periods. To this end, we employ the ARDL (Autoregressive Distributed Lag) approach, which offers several advantages for a long-run analysis:

1. Unlike some other methods, the ARDL approach does not require that all variables be integrated in the same order, offering greater flexibility(3);
2. It retains the information embedded in time series data by using appropriate lag structures for each variable, thereby improving the statistical power of the analysis(4).
3. ARDL model coefficients have intuitive interpretations in terms of both short-run and long-run effects, making the results more accessible;

(2) Evaluation of the Economic Recovery Support Plan (PSRE, 2001–2004) and the Complementary Growth Support Plan (PCSC, 2005–2009). Ministry of Finance, 2008.
(3) National Agency for Housing Improvement and Development.
(4) Pesaran, M. Hashem, General diagnostic tests for cross-sectional dependence in panels. *EmpirEcon* 60, 2004, pp. 13–50.
(5) Ibid.

4. The approach is generally robust to autocorrelation issues, thanks to the inclusion of lag terms in the model(1).

4.2. Data

Evaluating the influence of public investment on economic growth requires the identification of relevant explanatory variables to understand how these investments interact with macroeconomic performance. Drawing from both the economic literature on public investment and our contextual understanding of Algeria's economics, we selected the following variables over the period 1983–2023:

Dependent variable :

- **Real Gross Domestic Product (PIBR):** Widely used in the literature as a measure of a country's economic growth.

Explanatory variables :

- **Capital Expenditures (Depc):** Reflects the volume of public investment by the state. This measure has been widely used in empirical studies(2).
- **Current Expenditures (Depf):** According to some studies(3), an increase in transfers—one component of current expenditures—can stimulate savings and, in turn, investment, ultimately supporting growth(4). Uremadu et al. (2019) found that the effects of current expenditure components vary significantly in Nigeria.
- **Oil Price (PP):** Since a large portion of Algeria's budget is financed by oil revenues, fluctuations in oil prices are likely to affect economic growth. This relationship has been confirmed in various natural resource-rich countries.

(2) Shin Yongcheol, Byungchul Yu & Matthew Greenwood-Nimmo, Modelling Asymmetric Cointegration and Dynamic Multipliers in a Nonlinear ARDL Framework. *Festschrift in Honor of Peter Schmidt, W.C. Horrace and R.C. Sickles, eds*, 2013.

(3) Barro Robert. J., "Government Spending in a Simple Model of Endogenous Growth", *Journal of Political Economy*, 98, (5), 1990,pp. S103-26.

(4)Arezki Rabah, Alichi Ali, "An Alternative Explanation for the Resource Curse: The Income Effect Channel". IMF Working Paper, WP/09/112, 2009.

(5) Uremadu, Sebastien O., Orikara, Patience C., and Uremadu, Charity E,. "Testing Relationship between Government Current Expenditures and Economic Growth in Nigeria". *Theoretical Economics Letters*, 9, 2019, pp. 584-604.

- **Inflation Rate (INF):** Inflation can significantly influence GDP levels, as argued by Barro(1) (1995).

All data series were obtained from publications of the Algerian Ministry of Finance, except for the inflation series, which was sourced from the World Bank's *World Development Indicators (WDI)* database.

4.3. Results

4.3.1. Stationarity of Variables

All variables were transformed into logarithmic form prior to analysis. The Augmented Dickey-Fuller (ADF) test results show that all variables in level form (LOG(INF), LOG(PIBR), LOG(DEPC), LOG(DEPF), LOG(PP)) have unit roots (not stationary), as all tests at level are not statistically significant. However, at first differences, all variables become stationary (all test statistics are significant), confirming that they are integrated of order one, I (1).

4.3.2. Model Estimation

We begin by selecting the optimal model and assessing its overall significance before proceeding with the bounds test and the estimation of both long-run and short-run relationships.

a. Model Selection and Significance

The optimal model was selected using the Akaike Information Criterion (AIC) in EViews 12. Out of 19 tested models, the ARDL (1,3,0,1,3) specification was identified as the most suitable, delivering the lowest AIC value and statistically significant . This model structure indicates the appropriate lags for each variable, ensuring robust estimation properties.

b. Cointegration test.

The cointegration test performed on the estimated ARDL (1,3,0,1,3) model—selected as optimal based on the lowest Akaike

(1) Barro Robert J., "Inflation and Economic Growth". *NBER WorkingPapers 5326*, National Bureau of Economic Research, Inc, 1995.

Information Criterion (AIC)—yields the following results:

Fig.2: Bounds Cointegration Test

Null hypothesis: No levels relationship Number of cointegrating variables: 4 Trend type: Rest. constant (Case 2) Sample size: 41						
Test Statistic			Value			
F-statistic			12.4772			
	10%		5%		1%	
Sample Size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
40	2.427	3.395	2.893	4	3.967	5.455
45	2.402	3.345	2.85	3.905	3.892	5.173
Asymptotic	2.2	3.09	2.56	3.49	3.29	4.37

* I(0) and I(1) are respectively the stationary and non-stationary bounds.

Source: EViews 12

By comparing the F-statistic value from the bounds testing procedure with the critical values reported by Pesaran et al. (2001), we observe that it exceeds the critical values at the 1%, 5%, and 10% significance levels (12.4 > 5.17; 3.90; 3.34). This result leads to the rejection of the null hypothesis of no cointegration among the variables.

c- Estimation of Short-Run and Long-Run Relationships

The following figure presents the estimation of the short-run relationship:

Fig. 3: Error Correction Regression Estimation of the ARDL Model

Dependent Variable: DLOG(PIBR)
Method: ARDL
Sample: 1983 2023
Included observations: 41
Selected model: ARDL(1,3,0,1,3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ*	-0.27163	0.028918	-9.39317	0.0000
DLOG(INF)	0.00011	0.0038	0.029397	0.976724
DLOG(INF(-1))	0.01613	0.00445	3.62006	0.0009759
DLOG(INF(-2))	0.00858	0.003989	2.151937	0.0388
DLOG(DEPC)	0.003536	0.013462	0.262736	0.79438
DLOG(DEPF)	-0.041569	0.026358	-1.57755	0.1245
DLOG(DEPF(-1))	-0.06469	0.026972	-2.39868	0.0222
DLOG(DEPF(-2))	-0.11382	0.02918	-3.9003	0.000445
R-squared	0.57256	Meandependent var		0.024792
Adjusted R-squared	0.4818	S.D. dependent var		0.023567
S.E. of regression	0.147766738	Akaike info criterion		-5.142321
Sumsquaredresid	0.0094961	Schwarz criterion		-4.80796
Log likelihood	113.41758	Hannan-Quinn criter.		-5.0205
F-statistic	6.3148	Durbin-Watson stat		1.68831
Prob(F-statistic)	0.00009			

* p-values are incompatible with t-Bounds distribution.

Source: Eviews 12

Note: * indicates significance at the 5% level (p-value < 0.05).

- Short-Run Results

In the short run, the results show that all variables have a statistically significant impact on real GDP (PIBR), except for capital expenditures (DEPC). The current expenditures (DEPF), lagged by one and two periods and exert a negative effect on (PIBR). Conversely, inflation

(INF) which lagged by one and two periods has a very slight positive effect on PIBR.

The figure above shows that the error correction coefficient—often referred to as the speed of adjustment—is significantly negative and falls within the expected range [0, 1], with an estimated value of -0.27. This indicates the presence of an error correction mechanism, which is a key characteristic of the model. The coefficient suggests a relatively slow adjustment process: about 27% of disequilibrium is corrected in the first year, implying that it would take approximately three and a half years for short-run imbalances to be fully adjusted and for the system to converge toward a new long-run equilibrium.

We now move to the estimation of the long-run relationship, with the results presented in the following figure:

Fig. 4: Estimation of the Long-Run Relationship

Variable *	Coefficient	Std. Error	t-Statistic	Prob.
LOG(INF(-1))	-0.07128	0.01946	-3.66278	0.0008
LOG(PP)	0.11560	0.04458	2.5928	0.0136
LOG(DEPC(-1))	-0.07610	0.04698	-1.6197	0.1140
LOG(DEPF(-1))	0.4022	0.0372	10.7930	0.0000
C	5.9598	0.17537	33.9826	0.0000

Source: Eviews 12

Note: * indicates significance at the 5% level.

- **Long-Run Results**

In the long run, the results indicate statistically significant relationships for the following variables: current expenditures (DEPF), oil prices (PP), and inflation (INF).

Current expenditures (DEPF) are positively correlated with economic growth, with a long-run coefficient of +0.40. This means that a 1 % increase in current expenditures is associated with a 0.40% increase in real GDP (PIBR) in the long term. Oil prices also have a positive effect on economic growth, with a coefficient of +0.11, This

implies that a 1 % increase in Oil prices increases economic growth by 0.11 % in the long term. highlighting the structural dependence of Algeria's economy on hydrocarbon revenues. Conversely, inflation (INF) is negatively associated with long-term growth, with a coefficient of –0.07. This implies that a 1 % increase in inflation reduces economic growth by 0.07 % in the long term. Overall, the results validate the hypotheses formulated in this study. It is worth noting that capital expenditures (DEPC) did not reach statistical significance in either the short or long term, suggesting that their impact on economic growth is economically negligible

d- Discussion

The absence of a significant effect of capital expenditures—both in the short and long run—on real GDP raises concerns about the quality of public investment in Algeria, particularly in infrastructure. Infrastructure development is theoretically expected to generate positive externalities, attract domestic and foreign investment, and stimulate long-term growth. However, these expected outcomes have not materialized.

There is a pressing need to invest not only in physical infrastructure but also in human capital. For example, under the Public Investment Program (PIP), 49% of the budget is allocated to constructing schools and training centers, while less than 2% is directed to scientific research. It is insufficient to expand educational infrastructure without simultaneously ensuring the quality of teaching and administrative staff—especially in an economy seeking sustainable development.

For public investment to be effective, public administration must be effective. some authors(1) have proposed the concept of 'investing in investment', i.e. investing first in improving the quality of public administration in order to develop institutional know-how. This would

(1) Arezki Rabah, Dupuy Arnaud, Gelb Alan (2013), "Resource Windfalls, Optimal Public Investment and Redistribution : The Role of Total Factor Productivity and Administrative Capacity", CEPS/ INSTEAD. Working Paper N° 2013-12.

enhance the productivity of public investments and foster a better business climate.

Haque and Kneller (2012) urther showed that information asymmetry between governments and bureaucrats often leads to inflated project costs through false billing, with actual services being delivered at lower cost and (lower) quality(1). This undermines the productivity of public investment and hampers economic growth. Their empirical findings suggest that in highly corrupt economies, although public investment increases, it is so inefficient that its impact on growth is minimal.

In the short term, the positive effect of inflation on GDP is very weak and ephemeral. In the long term, however, inflation has a negative impact on growth. This can be attributed to increased economic uncertainty, which discourages investment due to higher production costs and shrinking demand as purchasing power declines.

The positive effect of oil prices on GDP stems from the fact that the hydrocarbon sector's value added, which heavily depends on global oil prices, has long represented a substantial share of Algeria's GDP.

Although that current expenditures lagging by one period is not a significant fact in the short term, they become significant and positively correlated with growth in the long term. Increases in public wages and current transfers stimulate consumption, thereby boosting aggregate demand and ultimately, GDP over time.

5. Conclusion

According to the econometric findings of this study, public investment—represented by capital expenditures—has no significant effect on real GDP in either the short or long term. This result casts doubt on the effectiveness of Algeria's public dominated investment

(8) Haque M. Emranul and Kneller Richard, "Why public investment fails to raise economic growth In some countries?: The role of corruption". Centre for Growth and Business Cycle Research, Economic Studies, Discussion Paper Series. University of Manchester, 2012.

strategy in infrastructure, which was expected to stimulate private investment and foster economic growth. The absence of such an effect raises concerns about the public investment as to both its targeting and its institutional quality

The Algerian state should invest more in education and human capital, and endeavor in creating a favorable business environment to encourage the private sector to move beyond traditional activities (services and trade) toward growth generating sectors such as manufacturing.

From a fiscal policy perspective, Algeria is beginning to transition toward a more modern system of public financial management. Until 2022, budget revenues were primarily used to finance capital expenditures and current expenditures. Since 2023, the government has started implementing the Organic Law on Finance Laws (LOLF)—originally adopted in 2018—which aligns Algeria's public finance system with international standards of performance-based budgeting.

This reform replaces traditional budgeting with a program-based approach that defines clear objectives and assigns responsibility to spending units. It aims to improve efficiency, effectiveness, and transparency, thereby reducing corruption and increasing returns on public spending.

Finally, the Revenue Regulation Fund (FRR) should no longer serve to solely cover budget deficits. Instead, its assets should be invested, with savings preserved for future generations. Algeria could take inspiration from Norway's sovereign wealth fund—the largest in the world—whose assets are invested abroad, and whose fiscal rule allows the government to draw only the expected return (around 3%) for budgetary purposes. This ensures long-term sustainability and intergenerational equity.

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- **Banque Mondiale (BM)**, World development indicators. https://databank.worldbank.org/source/2?country=IRN&l=en 2024.
- **Ministère des finances**, www.mf.gov.dz/index.php/fr
  Budget de l'Etat, 2024
- **Office Nationale des Statistiques (ONS).** www.ons.dz 2024

7. Annex

7.1. Unit root test results (Source: Eviews 12)

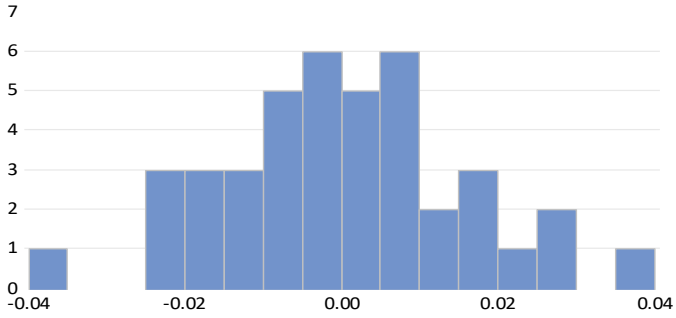
Fig. I : ADF Unit Root Test Results

UNIT ROOT TEST RESULTS TABLE (ADF) Null Hypothesis: the variable has a unit root						
		At Level				
With Constant	t-Statistic	LOG(INF) -2.8717	LOG(PIBR) -0.35466	LOG(DEPC -1.22335	LOG(DEPF) -0.635486	LOG(PP) -0.6831
	Prob.	***0.057053***	***0.90774***	***0.655758***	***0.85178***	***0.83977***
		*	n0	n0	n0	n0
With Constant & Trend	t-Statistic	-3.013398	-2.314439	-1.70230	-2.26058	-2.402292
	Prob.	***0.140498***	***0.417092***	***0.733058***	***0.445489***	***0.3732749***
		n0	n0	n0	n0	n0
Without Constant & Trend	t-Statistic	-1.21074	7.08598	0.99366	2.95014	0.50901
	Prob.	***0.20358***	***0.99999***	***0.91275***	***0.99890***	***0.82134***
		n0	n0	n0	n0	n0
		At First Difference				
With Constant	t-Statistic	d(LOG(INF))	d(LOG(PIBR))	d(LOG(DEPC))	d(LOG(DEPF))	d(LOG(PP))
	Prob.	-8.68318	-4.4590	-5.47392	-5.73228	-5.88415
		0.000	***0.0009***	***0.00005***	***0.00002***	***0.00001***
		***	***	***	***	***
With Constant & Trend	t-Statistic	-8.6334	-4.39776	-5.38640	-5.66295	-5.9144
	Prob.	***0.000***	***0.00584***	***0.00036***	***0.00017***	***0,000***
		***	***	***	***	***
Without Constant & Trend	t-Statistic	-8.789904	-1.937012	-5.413052	-5.070828	-5.89450
	Prob.	***0.000***	***0.05133***	***0.00***	***0.00***	***0.00***
		***	*	***	***	***

Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1% and (no) Not Significant

7.2. Validation tests of the model (Source: Eviews 12)

Fig. II: Normality test of the residuals



Series: Residuals	
Sample 1983 2023	
Observations 41	
Mean	-3.75e-15
Median	-0.000430
Maximum	0.038757
Minimum	-0.037197
Std. Dev.	0.015408
Skewness	0.158073
Kurtosis	3.126229
Jarque-Bera	0.197965
Probability	0.905759

Fig. III : Breusch-Godfrey test for autocorrelation of errors

Breusch-Godfrey Serial Correlation LM Test:			
Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.36320	Prob. F(2,26)	0.6989
Obs*R-squared	1.1143	Prob. Chi-Square(2)	0.5728

Fig. IV: Heteroskedasticity Test (ARCH)

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
Nullhypothesis: Homoskedasticity			
F-statistic	1.2506	Prob. F(12,28)	0.300094
Obs*R-squared	14.3069	Prob. Chi-Square(12)	0.28153
Scaledexplained SS	7.0937	Prob. Chi-Square(12)	0.85135

Fig. V : CUSUM and CUSUM of squares

