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# Impact of Domestic Public Debt on Algeria's Economic Growth During the Period (1990-2022)

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**Abstract:** Domestic public debt is one of the tools on which the State relies to guide fiscal policy and correct imbalances affecting economic balance and growth. This study seeks to measure the impact of domestic public debt on Algeria's economic growth during the period 1990-2022, using the autoregressive distributed lag (ARDL) through the UECM unrestricted error correction model. This study found a long-term inverse relationship between the two, as increased State recourse to domestic public debt leads to lower economic growth. This is confirmed by the value of the corrected determination factor, which showed that 46.65% of changes in economic growth were caused by changes in domestic public debt, but in the short term the impact of domestic public debt on economic growth did not appear.

**Keywords:** Algeria; Domestic Public Debt; Economic Growth.

## 1. Introduction

Fiscal policy plays a crucial role in the economies of both developed and developing countries, being the primary influencer on the State's financial situations, the manager of its directions and the determinant of its financial and economic stability.

The Algerian State's political orientation and control over economic activity and directing it towards the service of its development schemes require a massive mobilization of financial resources in order to achieve the objectives of these schemes. Owing to the lack of diversification of revenue sources and insufficient State financial savings, the latter intervenes through the fiscal policy instruments of public revenues and public expenditures in an effort to ensure their financial stability and economic growth. However, because the national economy is a rentier economy based on the revenues of the burning sector, which creates imbalances in the State budget parallel to changes in oil prices, the decline in its prices and the decline in its revenues leave a budgetary deficit requiring the State's intervention and, in view of its inability to reduce its current private expenditures, it is left with two options: Either covering the deficit internally through cash issuance against its own gold and cash reserves, or through loans (internal indebtedness), or covering the deficit externally by borrowing from global financial markets or international institutions (external indebtedness). In contrast to the latter's restrictions on its funding to States, the Government

preferred to resort more to internal indebtedness during 2010-2021 owing to the diversity of internal public debt instruments and their ease of issuance and trading.

Financing public expenditure through domestic public debt is highly controversial among economists, as the nature of its impact on economic growth may take the opposite direction ; thus, in case this debt accumulates and may amount to the Government's inability to pay it, which creates a challenge for the State about its ability to put the national economic situation to safety. Through this presentation we can ask the following key question:

**How did domestic public debt affect Algeria's economic growth during the period 1990-2022?**

This study seeks a key answer to the This study seeks a key answer to the question posed through a range of sub-questions:

- What are the theoretical aspects of domestic public debt and economic growth and what are the channels for the transition of its impact ?
- What is the relationship between Algeria's domestic public debt and economic growth during 1990-2022, and how does it affect it?

It is based on the following hypotheses:

- Domestic public debt has a negative relationship with economic growth;
- Domestic public debt adversely affects economic growth.
-

*1.1 The Importance of the Study*

Determining how domestic public debt affects economic growth is crucial as it enables the State to pursue a more effective fiscal policy. Therefore, we will try to demonstrate the nature of the relationship between domestic public debt and economic growth and shed light on the channels for transmitting its impact. This isto ascertain the extent to which domestic public debt affects them in order to verify the optimal use of borrowed funds, as well as to ensure that taxes are not excessively increased in order to service domestic public debt.



*1.2 Objectives of the Study*

Through this topic, we seek to achieve a number of objectives, the most important of which are:

- Familiarity with theoretical concepts of domestic public debt and economic growth and recognize the determinants of growth that are influenced by internal public debt and act as conveyor channels for its impact on economic growth.
- Understand the reasons for the increase in Algeria's domestic public debt during the study period and the extent to which it affects the direction of the State's fiscal policy.
- Follow-up on the development of domestic public debt and its impact on economic growth during the study period to understand the relationship between each of these variables and their impact on it ;
- Highlight the economic implications of the Government's choice to use the domestic public debt instrument as an alternative in light of the current economic conditions.

*1.3 Prior Studies*

- **Mostafa sayed study 2019 : Could Egyptian government use inflation to erode public debt ?**

This study was presented in an analytical framework to determine the impact of inflation on nominal public debt while imposing that other factors remain unchanged. The researcher found that the ratio of public debt to GDP could be reduced from its current rate through a moderate inflation rate of more than 12.28% in the short term and 7.35% in the long term. However, the maximum level of inflation that can affect the real value of the

internal public debt is 125.6%, which is equal to its impact on the high value of the external public debt.

- **Hamdi Ahmed Ali Al-Hindawi Study 2019: The Impact of Local Public Debt on the Determinants of Economic Growth**

This study sought to determine the impact of domestic public debt on economic growth determinants, that are investment (public and private), savings (public and private), long-term interest rate, inflation, taxes, total productivity of factors of production, and public debt payments. The researcher tracked the behaviour of these determinants in the Egyptian economy during the period 2001-2015 accompanied the developments in the values of the local public debt to ascertain the fact that they evolved with the evolution of the debt and whether that debt was stimulating or discouraging economic growth. Reaching The confirmaion on the applicability of displacement and superindebtedness mechanisms in addition to the fact that the impact of the increase in domestic public debt on the determinants of economic growth has tended to decrease both overall savings and public and private investment during the study period. while Its impact on both inflation and interest rates and public debt interest tended to rise, proving that Egypt's economic growth rate was low and slowing compared with many similar groups of countries.

- **Abdel Haq bin Tafat et al. 2021 study: The Impact of Public Debt on Egypt's Economic Growth**

The researcher attempted to measure the impact of public debt on Egypt's economic growth using the ARDL methodology, and he was able to establish that public debt had nothing to do with short-term economic growth and that its impact was neutral. While demonstrating a long-term balance between economic growth expressed in GDP and public debt. This has confirmed the stability of the economic relationship between them. It is a direct relationship since an increase in public debt by one unit increases economic growth by about 0.12 units. To emphasize that the proper use of public debt, such as investment and the creation of productive jobs, would drive the country's economic growth and, conversely, its abuse would have a direct impact on the reduction of economic growth.



## 2. Theoretical aspect of Domestic Public Debt and Economic Growth

### *2.1 Theoretical aspect of Domestic public debt*

The ever-increasing public debt of States has led economists, researchers and even politicians to pay great attention to it, with a view to finding appropriate solutions to the problems resulting from its increase and from States' inability to pay it.

#### *2.1.1 The Concept of Domestic Public Debt, Characteristics and Objectives*

Some economists define public debt as the group of obligations the State has undertaken and has committed itself to fulfilling by a particular State towards creditors, whether from within or outside (al-Shamri & Haider, 2015).

Public debt is divided into two parts: domestic public debt and external public debt.

Internal debt arises when the government borrows from natural and moral persons within the country, regardless of their nationality. It is the total debt existing in government and public entities and institutions towards the national economy, or what is owed by the State to its citizens (Shanaz & Busha, 2021, p. 508).

*General Objectives of Domestic Public Debt*

The main objective of States' recourse to domestic public debt is to meet their financing needs away from the political and trade pressures imposed by international institutions in exchange for lending to States and that domestic borrowing in local currency is less costly, giving Governments broad freedoms (as sovereign powers they possess) in dealing with dates of maturity and the nature of the formulas used.

Among the general objectives of the internal debt are (Suhair , Nevin, others, & and others, 2002, p. 45) :
- Provide the funds required to finance the State's general budget deficit.
- Ensure that the national economy is able to sustain this debt's burden and growth rates.
- Ascertain the state's ability to service this debt from its various regular resources and not by borrowing.
- Establish a clear holistic framework for public debt management to enable the Government to continue to sustain the levels of such debt due to the negative effects of late payment.

*2.1.2 Public Debt in Economic Thought*

The idea of public debt dates back almost to the beginning of the eighteenth century, and most economic thinkers then took a hostile stance on policies of recourse, most notably Ricardo, Adam Smith and Bastille.

Classics considers that the majority of loans received by States in the past were to finance consumer spending or to finance wars and therefore do not benefit society (Khafaji, 2020, p. 14).The Classics therefore oppose the idea of public debt because it has a negative impact on the State's economy. If it resorts to it, it must be within the strictest limits so that it can dispose of its burden as quickly as possible.

Keynesian thought underscored the importance of public debt in the national economy as one of the Government's important financial instruments along with taxes and expenditures (Khafaji, 2020, p. 14), driving economic growth by stimulating borrowing-enhanced public spending.

After the decline of Keynesian ideas as a result of its failure to resolve the problems that had emerged after the global recession, the monetary school that had criticized Keynesian thinking had emerged in growing debt, and called for the need to address the accumulated public budget deficit by reducing social public expenditures through the State's elimination of social benefits to eliminate the budget deficit.

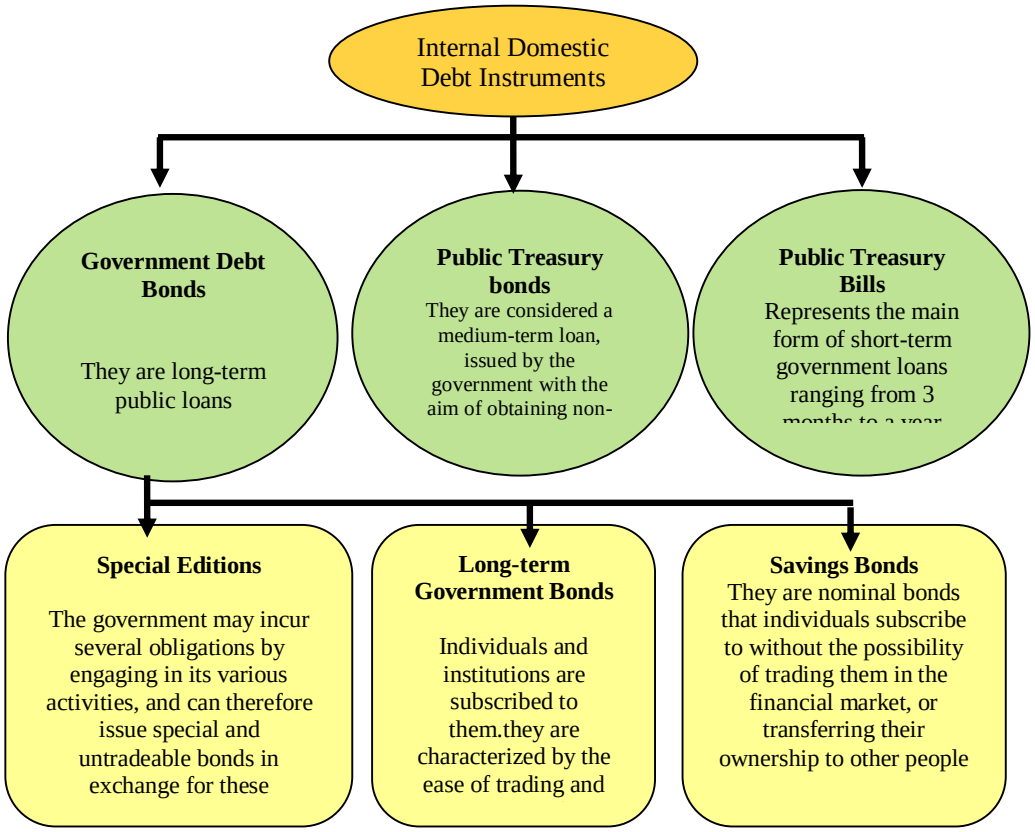


*2.1.3 Public Debt Instruments*

The types of debt instruments are varied according to the following considerations : interest rate pattern, calculation mechanisms, maturities. The choice of each type of debt instrument depends on three important factors in relation to the efficient management of the Government's debt portfolio: market preferences and this for tradeable debt, government cost, monetary policy considerations.

The State's debts from its issuance of bonds are classified by maturity period, taking the above considerations into account, to:

Fig.1. Internal Domestic Debt Instruments






Source: prepared by the two researchers depending on Mohamed Mayouf, Domestic Public Debt, Financial and Monetary Repercussions - The Case of Algeria 1990-2013, PhD thesis in Economics, University of Algiers 3, 2014/2015 pp. 10-12

*2.2 Theoretical Aspect of Economic Growth*

High rates of economic growth are indicative of the recovery of the national economy and the success of the State's economic policy.

*2.2.1 Definition of Economic Growth*

The simplest definition of economic growth is to increase real GDP, as defined as an increase in a country's quantity of goods and services produced over time (Tafat & Mohamed , 2021, p. 57).

Economic growth reflects the quantitative changes in available productive capacity and the extent to which such energy is exploited, the higher the utilization of available productive capacity in all economic capacities, the higher the growth rates in national income (Ezzedine & Saudi , 2021, p. 1002).

*2.2.2 Transmission Channels of the Impact of Domestic Public Debt on Economic Growth*

Domestic public debt exerts its influence on economic growth through seven direct and indirect channels. These channels overlap, making the determination of the nature of the public debt's relationship with economic growth highly controversial.

These channels are: investment (public and private), saving (public and private), long-term interest rate, inflation, taxes, total factor productivity, and public debt payments. Each

channel could not be studied individually due to the aforementioned overlap. These channels interact with each other through the mechanisms of displacement and superindebtedness (the debt the Government is unable to service in terms of both instalments and interest and once again resorts to borrowing to repay that debt) (Al-Hindawi, 2019, p. 522)

Theoretical studies and research have differed in the nature of the impact of internal public debt on economic growth across the aforementioned channels. This can be summarized at some points where increasing domestic public debt adversely affects economic growth by:

- The crowding out of public sector with private sector in borrowing, which leads to a decrease in private investment that contributes to increasing employment and increasing the overall productivity of factors of production. Public investment is also affected by the fact that funds which were intended for investment expenditures promoting economic growth will be spent on servicing public debt.
- The government's raising of interest rates to attract funds pushes investors to refrain from investing their money in various projects with a high interest alternative opportunity, in addition to low levels of private as well as public savings. This negatively affects economic growth.
- The ongoing increase in domestic public debt creates a burden that the Government loses its capacity to serve, resorting in either reducing government spending that could be deflationary, or raising taxes, both of which negatively affect economic growth rates (H.Elsayed, 2019, p. 8), through their impact on effective aggregate demand (low consumption, savings, investment, as well as productivity of factors of production) Domestic public debt.

On the other hand, positively affects and promotes economic growth in the following cases :

- If this debt is directed to productive and efficient investment expenses and not to current expenses.
- Unless this debt aggravates its burden and accumulation of both instalments and interest and the State's inability to pay it.



Some researchers, including Checherita and Rother (2010), Adofu and Abula (2010), Maana and all (2008), also consider that domestic public debt stock has a positive impact on economic growth while debt service negatively affects growth.

## 3.Analysis of the Relationship between Algeria's Domestic Public Debt and Economic Growth during the period 2010-2021

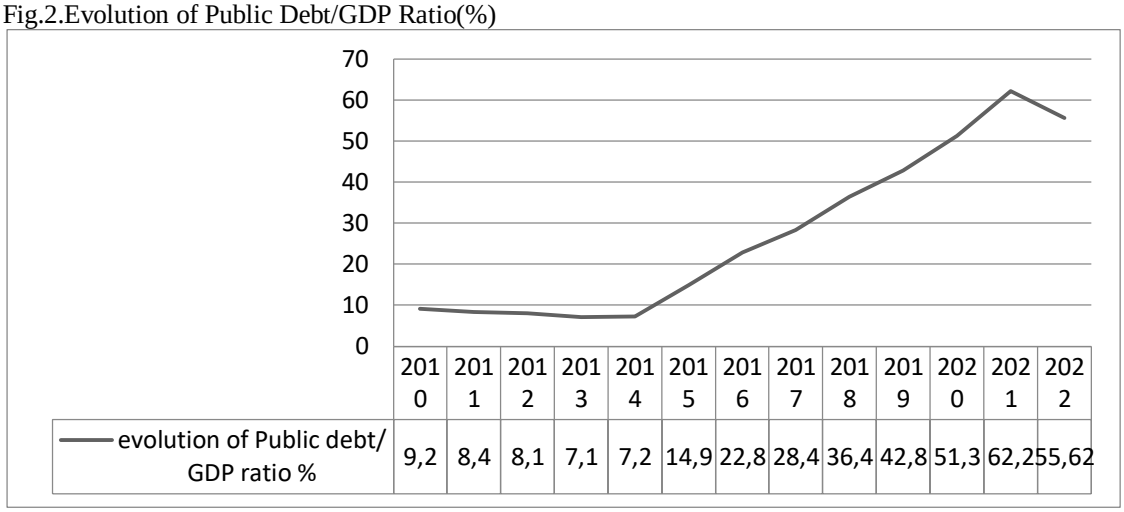
Public debt is one of the economic guidance tools for contributing to development by financing productive projects subject to optimal and efficient use of such financing. The amount of government debt changes throughout the year according to surplus or deficit in that year (Al-Azzari & Hussam El-Din , 2020, p. 132).

### *3.1 Evolution of Algeria's Domestic Public Debt during the period 2010-2022*

The strategy of reducing external indebtedness in advance repayments of external debt towards both the Paris Club and the London Club in 2006 has been an important component of the State's financial safety. It allowed external debt indicators to be moved to sustainable levels, with the external debt service ratio falling in 2010 to 1.1%, giving sustainability to the State's public finances. As a result of the continuous improvement in petroleum prices and the recording of significant surpluses at the level of the Revenue Control Fund, this prompted the State to abandon its external debt because of its negative and increasing impact and trend towards internal debt. The public treasury repaid the issued bonds in exchange for repurchasing ineffective debts of public institutions. As a result, the list of debts held by public banks on the treasury increased to 321 billion dinars, including 485.7 billion dinars in the form of treasury bills, and 56.2 billion dinars in the form of shareholding bonds. In 2013, these bonds rose to 98.2 billion dinars, confirming the state's orientation towards cleaning up

its public institutions, in addition to raising the capital of banks to enable them to meet capital requirements and increase their ability to grant credit and bear risks. This Government's approach has led to the accumulation of domestic public debt and to its acquisition of a stable position. Repayment of the debt has come to require significant financial resources.

Fig.2.Evolution of Public Debt/GDP Ratio(%)




| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| evolution of Public debt/ GDP ratio % | 9,2 | 8,4 | 8,1 | 7,1 | 7,2 | 14,9 | 22,8 | 28,4 | 36,4 | 42,8 | 51,3 | 62,2 | 55,62 |

Source: prepared by the researchers based on: - Bank of Algeria annual reports for 2013, 2016, 2018, 2022.



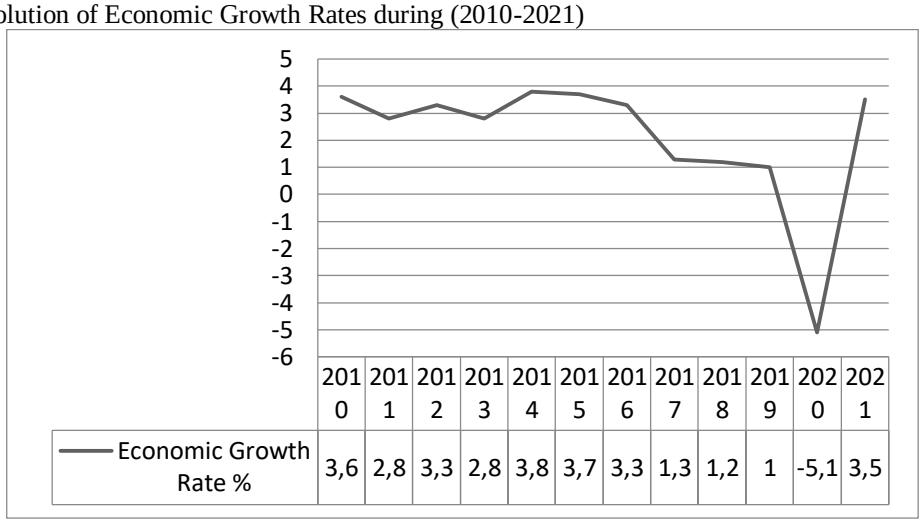
With figure N°(2), to address the development of internal public debt in some detail, we can divide the study period in terms of the reasons involved into two periods : The first period (2010-2014), which preceded the collapse of the State's finances, was due primarily to the fact that the public treasury cleared the debts of public institutions, including liquidated ones, and farmers' debts. (in 2013 it cleared 235,666 billion dinars), as well as recapitalizing banks by injecting liquidity into their accounts to help them expand credit grants and support their risk tolerance. The second period (2015-2022) was characterized by the worsening of the internal indebtedness situation as a result of substantial and persistent budget deficits caused by the sharp decline in oil revenues, which is the main source of public revenues, creating a permanent imbalance against the steady increase in public expenditures that the government failed to reduce in addition to the increased servicing of the debt burden. In the light of this situation, the containment of the internal public debt requires repeated recourse to the Revenue Control Fund. Article 10 of Act No. 2000-02 of 27 June 2000 was amended (in the Finance Act of 2016, art. 121). a clause of the public debt reduction and budget deficit expenditure was added to the Revenue Control Fund's account until its savings were fully exhausted in 2017. Where has another means been used to finance successive budget deficits and the continuous rise in domestic public debt (the highest since the beginning of the study period of 28.8%) represented by the unconventional financing process through Law No. 17/10 of 11 October 2017. In its amendment to the Monetary and Loan Act, the Public Treasury issued financial bonds to cover the financing needs of the budget, the financing of the internal public debt and the National Investment Fund, through which the Bank of Algeria injected liquidity into the economy by 2185 billion dinars in 2017 and 3371.2 billion dinars in 2018, 2471.2 billion dinars were directed to finance the internal public debt and the National Investment Fund. However, as this process is of a non-recurrent nature, it has not prevented the accumulation of internal debt, which is primarily intended to finance the budget deficit, especially in the light of the mismanagement of public debt owing to the lack of clear schemes for the disbursement of such funds, in addition to the lack of control and regulation of the borrowing policy. Domestic public debt continued to rise against the backdrop of the COVID-19 pandemic, which in turn contributed to reducing economic activity and increasing budgetary deficits

due to restrictions on the export of oil, which is the primary financier of the state budget. In the face of the option of external indebtedness or tax increases, the State has increased its domestic debt as the best option to cover its financing needs under current economic conditions.

*3.2 The Reality of Algeria's Economic Growth during the period (2010-2021)*

To study the evolution of economic growth rates, we will follow the growth of GDP, which is the biggest expression.

Fig.3. Evolution of Economic Growth Rates during (2010-2021)




Source: prepared by the researchers on the basis of the Bank of Algeria's annual reports for the period 2010-2022



As noted in figure (3) GDP has experienced a slowing growth during the study period of only 3.8% at best, as evidenced by the apparent fluctuation in growth ratios and successive declines from 2014 to low levels in 2020 (5.1%).

Growth rates reflect absolute dependency on the hydrocarbon sector, as the fluctuations in the sector's revenues directly lead to the imbalance in the State budget as well as the balance of payments being the main financier of the national economy. This has led the State to allocate substantial funds to materialize development schemes to support structural investments as well as to increase the intensity of the economic fabric through the establishment of small and medium enterprises and emerging enterprises, in order to achieve financial stability and economic revival. The first period of the study saw an increase in the establishment of SMEs in 2013, with an estimated 60,500 SMEs reaching 935,000 in 2015. This allowed the non-hydrocarbon sectors to increase their contribution to economic growth, as the services sector dominated the non-hydrocarbon growth (13%, 12.5%, 10.6%, 11.8%, 12.5%) during the years 2010-2014, followed by the construction and public works sector (8.9%, 5.2%, 8.2%, 6.6%, 6.8%) during the same period, followed by agriculture. The improvement in these sectors has brought the growth rate to 3.8% in 2014, compared to 2.4% in 2008. This recovery was driven by domestic demand reinforced by increased resources allocated by the State.

The nature of economic growth in the second period of the study varied, with two shocks. The first was the collapse of oil prices in 2014 (down to $45 per barrel from $112 per barrel in 2013), and the second was the 2019 COVID-19 health crisis, which restricted economic activity. This period has seen a decline in all sectors of activity, except for construction, public works and irrigation, supported by government investment in infrastructure under investment programmes; Agricultural sector growth fell to (6%, 1.8%, 1%, 3.5%, 2.7%, 1.3%, 1.3% and 1.3%) during 2015-2021 and services sector to (8.9%, 4.4%, 4.2%, 6.4%, 4.9%, 7.1-%, 5.9%), construction and public works to (4.7%, 5%, 4.6-%,

5.3%, 3.8%, 3.1-%, 5%) during the same period. In addition to the decline in the hydrocarbon sector, this reflected negatively on growth rates and caused a significant decline in economic activity reaching -5.1% in 2020.

## 4. Econometrics

In this axis, we shall determine the impact of Algeria's public debt growth on economic growth during the period 1990-2022.

To test the impact of internal public debt (IPD) on economic growth (EG) in Algeria during the period 1990-2022, we identify the study model as a first stage, and then as a second stage estimate the unqualified error correction formula by using the boundary test method for the co-integration proposed by Pesaran et al. (2001) and the ARDL model proposed by Pesaran and Shin (1999) in order to assess both short and long-term flexibilities.

### *4.1 Identification of the model used*

The objective of this study is to test the impact of domestic public debt on Algeria's economic growth during the period 1990-2022. In order to achieve this goal, the economic growth variables (EG) are employed as a subordinate variable and the domestic public debt as a proportion of gross domestic product (IPD) as an independent variable:

$$EG_t = f(IPD_t)$$

Economic growth is supposed to be inversely linked to domestic public debt. Increasing domestic public debt leads to so-called debt contraction, which means that GDP cannot repay debt, resulting in an increase in the percentage of debt to output that reduces economic growth.

It is worth mentioning that in this study we will use real annual data of the variables studied throughout the period 1990-2022. This study period has been selected according to the data availability standard. All the data used in this study from the IMF's data for Algeria are available on the website www.imf.org.



### *4.2 Measurement methodology and results analysis*

#### *4.2.1 Measurement methodology*

In this study we will use one of the modern approaches to co-integration: the circulated ARDL approach developed by Pesaran et al (2001), where this model is distinct from other standard models in that it does not require that the variables studied be integrated of the same degree. Nor does it require that the sample size (number of views) be large, as opposed to previous tests that produce inaccurate results if the sample size is small.

Since our study aims to test the impact of domestic public debt on Algeria's economic growth, co-integration in accordance with the ARDL approach is conducted through the UECM unrestricted error correction model of this model as follows:

$$\Delta \boldsymbol{EG_t} = \boldsymbol{\alpha_{0\,EG}} + \sum_{i=1}^{P} \boldsymbol{\beta_{1i}} \Delta \boldsymbol{EG_{t-i}} + \sum_{i=0}^{q} \boldsymbol{\beta_{2i}} \Delta \boldsymbol{IPD_{t-i}} + \boldsymbol{\theta_1 EG_{t-1}} + \boldsymbol{\theta_2 IPD_{t-1}} + \boldsymbol{\varepsilon_t}$$

Where α _ (0 EG) represents the constant in the model, β_ki represent short-term coefficients; while θ_1 and θ_1 represent long-term dynamic coefficients of the model.

The methodology used in this study is summarized in the following steps:

1- Testing the stability of the variables under study;

2- Co-integration test using the ARDL approach, where the calculated value is compared with the tabular values proposed by Pesaranetal (2001) at different levels of significance;

3- Estimate the error correction formula for the ARDL-ECM model in case of at least one integration relationship;

4- Testing the structural stability of the ARDL-ECM error correction formula parameters.

*4.2.2 Analysis of Results*

*A. Results of the ADF Unit Root Test*

Eviews 13.0 Time Chain Analysis Program creates unit root values for the chains studied in an automatic manner. The results of this test are shown in the following table:

Table .1. Stabilization test results for the variables studied

| **UNIT ROOT TEST RESULTS TABLE (ADF)** | | | | **UNIT ROOT TEST RESULTS TABLE (ADF)** | | |
|---|---|---|---|---|---|---|
| Null hypothesis: the variable has a unit root | | | | Null hypothesis: the variable has a unit root | | |
| **At Level** | | | | **At First Difference** | | |
| | | EG | IPD | | d(EG) | d(IPD) |
| With Constant | t-Stat | -3.9121*** | -0.8817 | t-Statistic | -9.1205*** | -3.9924*** |
| With Constant & Trend | t-Stat | -3.8464** | -0.5782 | t-Statistic | -8.9990*** | -4.1132** |
| Without Constant & Trend | t-Stat | -1.2648 | -0.1755 | t-Statistic | -9.2427*** | -4.0466*** |

(*): Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1% for ADF and PP Unit Root Tests



The results of the unit's root test using the ADF test for the two variables listed in the relationship (table 1 above) indicate that at different levels of significance (1%, 5% and 10%), the two variables are first-order integrated (X_i⇝I (1)), i.e. the first differences of these variables are stable and can therefore be included in the regression equation to reflect the possibility of a co-integration relationship (long-term balance relationship).

*B. Co-integration test results using the bounds test method*

To conduct co-integration test, four (04) consecutive procedures are required. The first procedure is to determine the optimal lag order for estimating the UECM formula. The second procedure is to estimate the UECM formula. The third procedure is to test the significance of the parameters for one-period lagged variables. The fourth and final procedure is to compare Fisher's calculated F-Statistics with the tabulated Fisher statistic presented by Pesaran et.al (2001) at different levels of significance.

**For the optimal delay period**, the Eviews13.0 program provides us with five different criteria for determining this period: (LR) criterion, FPE criterion, AKaike criterion, Schwarz criterion (SC) and HQ Hannan and Quinn criterion. All of these criteria have confirmed that the optimal delay period (the lowest value they possess) is equal to one (P = 1), as shown in the following table (2):

Table 2: Results of determination of optimal delay period

VAR Lag Order Selection Criteria
Endogenous variables: EG IPD
Exogenous variables: C
Date: 06/06/24 Time: 22:04
Sample: 1990 2022
Included observations: 29

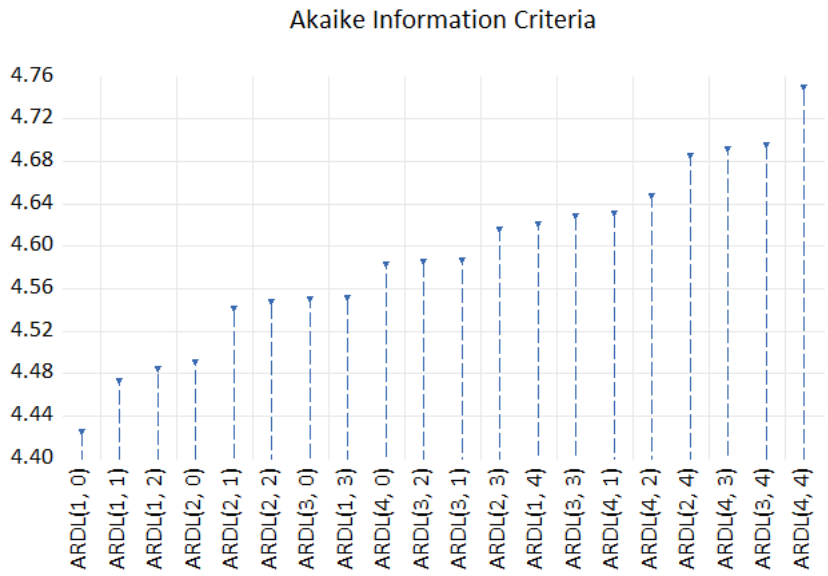
| Lag | LogL | LR | FPE | AIC | |
|---|---|---|---|---|---|
| 0 | -181.5477 | NA | 1077.890 | 12.65846 | 12 |
| 1 | -155.7260 | 46.30091* | 239.6668* | 11.15352* | 11 |
| 2 | -152.4653 | 5.397019 | 253.5874 | 11.20450 | 11 |
| 3 | -150.7513 | 2.600563 | 300.6181 | 11.36216 | 12 |
| 4 | -148.6192 | 2.940781 | 349.8682 | 11.49098 | 12 |

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion

By taking this delay period (P = 1), the Eviews13.0 programme found that the best model was ARDL (1.0) out of 20 candidate models, as illustrated in figure (4) below.

Fig .4. Results of selecting of the best candidate model.






The results of the Co-integration test using the bounds test are as follows:

Table .3. Co-Integration Test Results Using Bounds Test

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 8.469289 | 10% | 3.02 | 3.51 |
| k | 1 | 5% | 3.62 | 4.16 |
| | | 2.5% | 4.18 | 4.79 |
| | | 1% | 4.94 | 5.58 |

The above table shows that the value of Fischer's calculated statistic (F-statistic = 8.4692) is greater than the values of the upper limits at significance levels of 1%, 2.5%, 5% and

10%, respectively. This result means a long-term balance relationship between economic growth and Algeria's internal public debt. So we can estimate the long-term model using the ARDL model.

*C. Long-term model assessment (long-term balanced relationship assessment)*

After the results of the co-integration have confirmed a long-term balance relationship between the two variables in question, we can estimate this relationship, and it is estimated by the ARDL (p, q) model. Using the EViews13.0 programme, the results of the estimate are as follows:

Table .4. Long and short-term relationship assessment results using ARDL model

ARDL Long Run Form and Bounds Test
Dependent Variable: D(EG)
Selected Model: ARDL(1, 0)
Case 2: Restricted Constant and No Trend
Date: 06/06/24 Time: 23:50
Sample: 1990 2022
Included observations: 32

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 4.365748 | 1.128796 | 3.867614 | 0.0006 |
| EG(-1)* | -0.967347 | 0.192579 | -5.023115 | 0.0000 |
| IPD** | -0.070666 | 0.026707 | -2.645926 | 0.0130 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| IPD | -0.073051 | 0.022428 | -3.257196 | 0.0029 |
| C | 4.513115 | 0.709730 | 6.358920 | 0.0000 |
| IPD | -0.073051 | 0.022428 | -3.257196 | 0.0029 |
| C | 4.513115 | 0.709730 | 6.358920 | 0.0000 |

EC = EG - (-0.0731*IPD + 4.5131)

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | Asymptotic: n=1000 | | |
| F-statistic | 8.469289 | 10% | 3.02 | 3.51 |
| k | 1 | 5% | 3.62 | 4.16 |
| | | 2.5% | 4.18 | 4.79 |
| | | 1% | 4.94 | 5.58 |

The results of the long-term relationship assessment indicate that:

- The constant parameter value is in the range of 4.51 and is significant at 1% because the value (Prob = 0.000 < 0.01). This result means that when domestic public debt is non-existent, the value of economic growth will be in the long term within the range of 4.51%;
- There exists an inverse and significant relationship between domestic public debt and economic growth. Increasing public debt by 1% will lead to a decline in economic growth to 0.07%. This result is considered to be consensual with the economic logic in view of the fact that increasing the internal public debt is a cause of debt contraction, as noted above.

*D. Estimating short-term model (estimation of error correction model)*

The error correction model is based on the assumption that there is a state of balance of the function in the long term opposite the short term, where the function is unbalanced, it adjusts and restores it to the state of balance (of its natural condition) as well as measures the speed and time needed to return to balance. Using EViews 13.0 to estimate the error correction formula, the results are shown in the following table

Table .5. Results of estimating error correction formula

ARDL Error Correction Regression
Dependent Variable: D(EG)
Selected Model: ARDL(1, 0)
Case 2: Restricted Constant and No Trend
Date: 06/06/24 Time: 23:54
Sample: 1990 2022
Included observations: 32

ECM Regression
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| CointEq(-1)* | -0.967347 | 0.185616 | -5.211539 | 0.000 |

| | | | |
|---|---|---|---|
| R-squared | 0.466594 | Mean dependent var | 0.07500 |
| Adjusted R-squared | 0.466594 | S.D. dependent var | 2.80115 |
| S.E. of regression | 2.045811 | Akaike info criterion | 4.30021 |
| Sum squared resid | 129.7456 | Schwarz criterion | 4.34602 |
| Log likelihood | -67.80347 | Hannan-Quinn criter. | 4.31539 |
| Durbin-Watson stat | 1.844925 | | |

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationshi

| Test Statistic | Value | Signif. | I(0) |
|---|---|---|---|
| F-statistic | 8.469289 | 10% | 3.02 |
| k | 1 | 5% | 3.62 |
| | | 2.5% | 4.18 |
| | | 1% | 4.94 |

- The value signal of the adjustment parameter (CointEq (-1) *) was negative and significant at 1%, indicating an existing cointegration relationship between economic growth and domestic public debt variables. The previous year's value of 0.9673 means that about 96.73% of a deviation in the value of economic growth from its long-term balance level will be corrected in the current year and that the remainder will be realized in the coming years, while the time taken to reach its long-term balance values requires about 1.03 years (0.9673/1);
- The value of the internal public debt parameter did not appear in the short-term model, meaning that there was no short-term co-integration relationship between Algeria's domestic public debt and economic growth and that its impact might appear in the long-term, as the long-term results of the relationship had already shown;
- The value of the corrected determination coefficient $\overline{R^2} = 0.4665$enhance confidence in the results obtained, as 46.65% of changes in economic growth are due to changes in internal public debt and the remainder is due to other variables not included in this model.



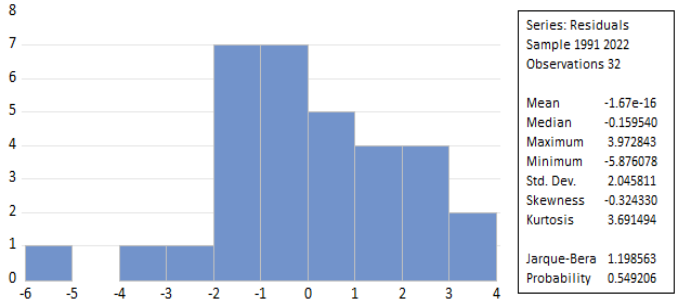
*E. Diagnosis of the estimated model*

Before adopting the obtained results, some diagnostic tests must be carried out that will enhance confidence in these results, including Serial Auto-Correlation Test resulting from the estimation process, Heteroskedasticity Test, CUSUM Test and CUSUM Squared.

*E.1 Test detection requirement for natural distribution of estimated residuals*

The Jarque-Bera test is used as one of the most important and widely used tests in detecting the natural distribution of estimated resiuals. The results of this test as shown in Table (6) below indicate acceptance of the hypothesis of natural distribution of the residuals, clearly demonstrated by the calculated Jarque-Bera value that came below the tabular value of the Kai Square Stat at 2 ° C $(Jarque - Bera = 1.1985 < \chi_2^2 = 5.99)$ with a probability of 0.5492 greater than 5%.

Table .6. Results of the Test for Natural Distribution of Estimated Residuals




*E.2 Serial Auto-Correlation Test*

To detect the existence of serial autocorrelation of errors resulting from the estimation process, we use one of the most common tests, which is the Breusch-Godfrey Serial Correlation LM Test. The results of the table below indicate that the estimated model is free of serial auto-correlation, as the test value was 0.2199 (LM= Obs*R-squqred = 0.2199) with a probability value greater than 5%, which means accepting the null hypothesis which indicates that there is no serial auto-correlation for the estimated errors.

Table .7. Serial Auto-Correlation Test Results

| Breusch-Godfrey Serial Correlation LM Test: Null hypothesis: No serial correlation at up to 2 lags | | | |
|---|---|---|---|
| F-statistic | 0.093415 | Prob. F(2,27) | 0.9111 |
| Obs*R-squared | 0.219905 | Prob. Chi-Square(2) | 0.8959 |



*E.3 Variance Instability Detection Test*

Among the important tests in detecting variability instability we find the ARCH test. This test is based on LM static. The results of table (8) below indicate that the test value was 1.2810 (Obs * R-aquared = 1.2810) with a probability greater than 5% (Prob. Chi-Square (1) = 0.2577), with this result implying acceptance of the null hypothesis that provides for constant variability of estimated errors.

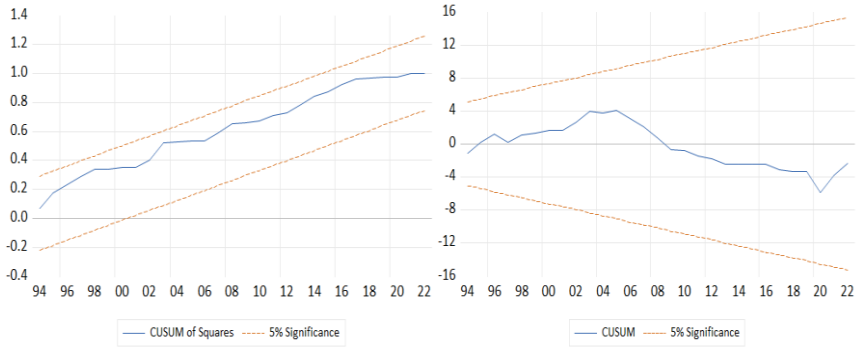
Table .8. Variance Instability Test Results for Estimated Errors.

| Heteroskedasticity Test: ARCH | | | |
|---|---|---|---|
| F-statistic | 1.250035 | Prob. F(1,29) | 0.2727 |
| Obs*R-squared | 1.281026 | Prob. Chi-Square(1) | 0.2577 |

*E.4 CUSUM Test and CUSUM Squared for Structural Stability of Estimated Features*

These tests are useful in detecting the structural stability of the estimated parameters of the ARDL-UECM model throughout the study period 1990-2022. The figures below show that the model is stable throughout the period 1990-2022.

Fig.5. Structural Stability Test Results for Estimated Features




## 5. Discussion of the Findings

Through the previous analysis we can draw a set of findings, the most important of which are :

- Economic growth rates (despite slowing growth) and domestic public debt growth took the opposite direction in the long term,as the economic conditions left behind by the financial crisis of 2008 and the 2014 oil crisis and the subsequent persistent public budget and balance-of-payments deficits weakened the economy and made it vulnerable to collapse. This led the State to expand domestic debt to fill successive deficits in order to maintain economic balance. The stringent measures taken by States to contain the spread of the COVID-19 virus have exacerbated the economic situation and widened the public deficit, recording the strongest economic downturn reaching 5.1% in 2020. This has led to a trend of substantial internal leveraging over the last two years of the study. The expansion of the State's borrowing will increase its internal debt burden to the point where it may amount to inability to pay because it is not properly managed and does not give a clear view of the results of the domestic debt. This is why we recognize the hypothesis put forward (internal public debt adversely affects economic growth).
- The previous result indicates that there is a certain level of internal public debt at which the relationship between domestic public debt and economic growth shifts from a positive-impact direct relationship to a negative-impact reverse relationship.



## 6. Conclusion

The study discussed the impact of domestic public debt on Algeria's economic growth rates during the period 1990-2022, and found the following results:

- Excessively increasing domestic public debt results in a significant build-up of its burden to become a source of, and not a supporter of, deficits;
- The steady increase in domestic public debt and its burden reflects the mismanagement of domestic borrowing policy and its failure to direct it out of the internal debt crisis;
- The standard study showed that there was no short-term co-integration relationship between Algeria's domestic public debt and economic growth, i.e. that domestic public debt did not show its impact on short-term economic growth when it proved a long-term balance between them;
- The estimated model showed that there is an inverse and significant relationship between domestic public debt and economic growth, i.e. that domestic public debt negatively affects economic growth as each 1% increase in public debt will be offset by a 0.07% decline in economic growth in the long term;

- The value of the corrected determination factor confirms that 46.65% of changes in economic growth are caused by changes in domestic public debt and that the remaining proportion is due to other variables that have not been included in this model.

**Accordingly, we make some recommendations that we deem necessary:**

- Creating local financial resources by stimulating and developing productive sectors to support growth and fill the budget deficit, which reduces borrowing;
- Reducing the ratio of domestic public debt to GDP by controlling the size of domestic public debt and working towards high levels of growth;
- Restructuring and activating the tax system in the interest of the State and its economic growth in order to avoid the Government's recourse to borrowing every time it faces a financial deficit;
- Researchers and economists should highlight the role of internal public debt in delaying the process of economic and inclusive development.

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Appendixe.1.

| year | Debt (percent of GDP) | year | Debt (percent of GDP) |
|---|---|---|---|
| 1990 | 38.82 | 2008 | 6.65 |
| 1991 | 36.13 | 2009 | 8.11 |
| 1992 | 50.67 | 2010 | 9.17 |
| 1993 | 69.76 | 2011 | 8.33 |
| 1994 | 50.22 | 2012 | 8.10 |
| 1995 | 33.62 | 2013 | 7.04 |
| 1996 | 28.45 | 2014 | 7.19 |
| 1997 | 20.80 | 2015 | 14.92 |
| 1998 | 21.77 | 2016 | 19.45 |
| 1999 | 22.46 | 2017 | 28.39 |
| 2000 | 24.81 | 2018 | 36.46 |
| 2001 | 23.64 | 2019 | 42.69 |
| 2002 | 21.68 | 2020 | 51.26 |
| 2003 | 18.70 | 2021 | 62.22 |
| 2004 | 16.26 | 2022 | 55.11 |
| 2005 | 14.47 | | |
| 2006 | 20.93 | | |
| 2007 | 11.16 | | |



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