

Determinants of External Debt in Developing Countries: The Case of Algeria

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ABSTRACT

Background: Developing countries seek to eliminate external debt problems towards financial obligations with a view of alleviating the debt burden to avert economic volatility in the context of debt accumulation. Since the beginning of the 1970s, developing countries, including Algeria, have experienced rapid growth in external debt accumulation in an effort to finance domestic deficits and not enter into economic recession. All these reasons ignore the topic of external debt as an interesting topic of study. This study attempts to analyse and measure some of Algeria's external debt indicators during the study period.

Purpose: This research paper focuses on identifying the determinants of external debt in Algeria.

Methods: The study utilized the autoregressive distributed lag (ARDL) model and cointegration test to analyze both short- and long-term relationships among the study variables from 1990 to 2021.

Results: The findings show that the exchange rate and government spending significantly and positively impact external debt in the long run, whereas GDP per capita and foreign direct investment are significantly negatively correlated with external debt. The short-term results align with those of the long term.

Conclusions: The paper advises that the Algerian government and other developing countries should assess their foreign debts, rationalize government spending, diversify their economies, and enhance their investment climates.



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1. Introduction

Since the 1960s, many developing countries have initiated and implemented ambitious development plans and programs. Due to the scarcity of local financial resources allocated to meet economic development needs and the difficulty in accessing alternative local resources, these countries have turned to international markets and financial institutions for borrowing. The justification for this is that external borrowing enhances domestic savings and helps to bridge the gap between the required savings and investment, leading to an increased demand for borrowing (Borensztein, 1989). However, this can lead to a problem of external debt and significantly increase the financial burden of servicing these debts, especially in developing countries facing various economic challenges.

As for Algeria, being one of the prominent developing economies in the Arab and African regions, it too resorted to external borrowing, which dates back to the early 1970s (Benachhou, 1983). However, starting from 1986 and

due to the global oil crisis, Algeria faced its external debt problem for the first time when the government was unable to meet its external debt obligations. This led to deficits in the balance of payments and the general budget, resulting in an economic recession. Consequently, Algeria resorted to rescheduling its external debts with the Paris Club and the London Club as part of the structural adjustment programs with the International Monetary Fund (1994-1998). From the year 2000, due to several factors, including rising international fuel prices, Algeria's economic opening to the world after abandoning the socialist economic model towards a free-market economy, and various accompanying structural economic reforms, the levels of external debt were significantly reduced, thereby enhancing Algeria's external financial position by bringing external debt indicators to sustainable levels (Bank of Algeria, 2008).

The main objective of this study is to identify the main determinants of external debt in developing countries, with a focus on Algeria during the period (1990-2021). This

will involve examining the impact of four macroeconomic variables on Algeria's external debt: the exchange rate, government spending, GDP per capita, and foreign direct investment. For this purpose, a quantitative study using EVIEWS 12 was conducted to analyze these effects using the ARDL model and cointegration test to track the short- and long-term relationships between the study variables. The results of this study will be useful for studying Algeria's most important external debt determinants by providing the results of this study with information on the negative and positive effects of external debt. It helps policymakers develop strategies. Further research could include a greater number of revisions through the data and statistics examined in the study.

Following this brief introduction, this paper is divided into four sections. The first section reviews previous literature focusing on the topic of external debt in developing and emerging countries. The second section discusses the methodology of the study, detailing data acquisition procedures and processing methods. The third section presents and discusses the findings of the econometric study, including unit root tests and the results of the ARDL and cointegration tests. The fourth section concludes with a summary of the main findings of the study and provides useful recommendations.

2. Literature Review

Since 1982, the world has witnessed four major periods during which debts accumulated in several emerging and developing markets, accompanied by severe financial crises. It began with the Latin American debt crisis in 1982, which saw a significant decline in investment rates in most debtor countries (Borensztein, 1989), followed by the financial crisis in Asia in the late 1990s, then the global financial crisis in 2008, known as the US subprime mortgage crisis, and currently, the African debt crisis.

Generally, indebtedness refers to an agreement between the debtor and the creditor whereby the debtor undertakes to repay what is owed to the creditor within an agreed period, including the accrued interest on the debt. By applying this definition to external transactions, it becomes clear that external debt is the obligation to pay in foreign or local currency, borne by the debtor country over a certain period and at a specified interest rate (Samuelson & Nordhaus, 2006).

Thus, external debt refers to the amounts in foreign currency lent to companies or governments for a specific period and with a specific interest rate (Arruda & Lenny, 2000). In other words, external debt represents the flow of capital from advanced countries to developing countries to meet their needs (Sağdıç & Yildiz, 2020), as the main

problem for developing countries is the accumulation of capital deficiency and inadequate domestic savings, forcing them to resort to external borrowing to continue their economic development process.

External debt results in two types of loans (Arnaud, 1984):

- Loans resulting from agreements between governments directly or between governments and specialized international organizations such as the International Monetary Fund, known in this case as public debts.
- Loans from foreign banks to other governments, private or public projects, or even to other banks in those countries, known as private debts.

External debt is divided into three categories (Kusumasari, 2020):

- Short-term debts, which do not exceed one year from the original due date.
- Long-term debts, which exceed one year from the original due date.
- Loans provided by the International Monetary Fund.

When examining previous studies that addressed the topic of external debt, most attempted to uncover the impact of external debt on economic growth in various countries, especially in developing and emerging countries. Table 1 shows these impacts varied between positive and negative.

Table 1: Some previous studies on the impact of external debt in developing countries

Researchers	Application Countries	Nature of Impact
(Choong <i>et al.</i> , 2010)	Group of Countries	Positive
(Safdari & Mehrizi, 2011)	Iran	Negative
(Ajayi and Oke, 2012)	Nigeria	Negative
(Sichula, 2012)	Group of Sub-Saharan African Countries	Positive
(Azam <i>et al.</i> , 2013)	Indonesia	Negative
(Korkmaz, 2015)	Turkey	Positive
(Senadza <i>et al.</i> , 2018)	Group of Sub-Saharan African Countries	Negative
(Abdelaziz <i>et al.</i> , 2012)	Group of Low-Income Countries	Positive
(Dawood <i>et al.</i> , 2019)	Group of Emerging and Developing Asian Countries	Positive
(Daba <i>et al.</i> , 2013)	Group of Sub-Saharan African Countries	Negative

Source: Compiled by researchers based on studies listed in the table.

Most previous studies agree that external debt has a positive impact on a country's economic growth if it is efficiently allocated to support domestic investment, as well as its positive effect on private capital inflows, including foreign direct investment and portfolio investment (Daud & Podivinsky, 2012). Conversely, an increase in external debt will have a negative impact on economic growth. When these debts accumulate, governments may resort to debt conversion through unfavorable measures such as high taxes, currency devaluation, or reducing beneficial

public investments. This may lead investors to retreat or reduce spending or investment abroad, negatively affecting economic growth and welfare-related investments such as education and health (Beyene & Kotosz, 2023).

Regarding previous studies that aimed to elucidate the various determinants of external debt in developing and emerging economies, they are numerous and diverse. Therefore, the focus will be on the latest of these studies over the past ten years, as indicated in the following table:

Table 2: Previous studies that attempted to identify determinants of external debt in developing and emerging countries during the last ten years (2014-2024)

Study	Study Period	Countries of Application	Studied Debt Determinants
(Imimole <i>et al.</i> , 2014)	1986-2010	Nigeria	Exchange rate, debt service, and GDP.
(Bittencourt, 2015)	1976-2003	Group of South American Countries	Economic growth, trade openness, income inequality, liquid liability, and inflation.
(Al-Fawwaz, 2016)	1990-2014	Jordan	Trade openness, term of trade, exchange rate, and GDP.
(Ozata, 2017)	2000-2016	Turkey	Interest rate, exchange rate, budget deficits, and domestic savings.
(Gokmenoglu & Rafik, 2018)	1970-2013	Malaysia	GDP, recurrent, and capital expenditure.
(Brafu <i>et al.</i> , 2019)	1970-2012	Ghana	Reduction in regulatory restrictions on external borrowing, a widening of disparity between domestic and international rates, economic growth performance, and domestic financial deepening.
(Sağdıç & Yildiz, 2020)	1995-2017	Countries of central Asia and the Caucasus	Public expenditures, debt service, current account of the balance, inflation rate, and domestic savings.
(Beyene & Kotosz, 2023)	1981-2016	Ethiopia	Savings-investment, trade deficit, budget deficit, debt service, trade openness, the growth rate of major advanced countries, inflation rate, and GDP.
(Omar & Ibrahim, 2021)	1980-2018	Somalia	Exchange rate, domestic investment, GDP, and government expenditure.
(Dawood <i>et al.</i> , 2019)	1995-2019	Group of Emerging Markets Economies	Economic growth, investment, exchange rate, trade openness, inflation, and government expenditure.
(Sascena & Shanker, 2021)	1990-2017	India	Gross fiscal deficit, net domestic savings, net domestic capital formation, exports, imports, real effective exchange rate, foreign exchange reserves, net terms of trade, consumer price index, debt service ratio, net foreign direct investment, GDP, and real interest rate.
(Ilhan, 2023)	2005-2020	Emerging Markets Economies	Gross domestic Product, inflation rate, exchange rate, trade openness, and domestic credit.
(Harsono <i>et al.</i> , 2024)	2008-2019	Group of ASEAN Member States	Inflation rate, interest rate, institutional quality, exchange rate, and trade openness.

Source: Compiled by researchers based on studies listed in the table.

Through the above table, it can be observed that previous studies have employed various determinants for external debt, including trade openness, debt service, inflation rate, GDP, income inequality, institutional quality, domestic savings, exchange rate, government expenditure, etc. Diverse standard models have been applied, especially models such as GMM, Granger causality, VECM, ARDL, OLC, etc., to verify the impact of these determinants and macroeconomic variables on external debt in a group of African, Asian, and South American developing and emerging countries. The effects of these determinants on external debt in these countries have varied from negative to positive impacts.

In Algeria, previous studies that addressed the topic of external debt are very few, and most of them are prepared in Arabic or French. What is available in English is very scarce. One such study is by Melakhessou (2021), which attempted to uncover the impact of external debt on Algeria's overall economic indicators. It concluded that external debt has a negative impact on economic growth in Algeria due to several indicators such as domestic consumption, savings, investment, and trade deficit.

Practically, most of the local previous studies, whether in Arabic, French, or even English, despite their rarity, agree on the negative impact of external debt on economic growth and various macroeconomic indicators. This perspective is widespread among newly independent developing countries, especially Arab countries, including Algeria.

According to the aforementioned proposition, Algeria has adopted a clear policy over the past three decades to reduce its external indebtedness as part of supporting its economic independence and avoiding the escalation of interest rates on these debts, which peaked in 1996 (Bank of Algeria, 2022).

Figure 1 illustrates the decline in Algeria's external debt balance over the past three decades as a result of the policy pursued by the Algerian government.

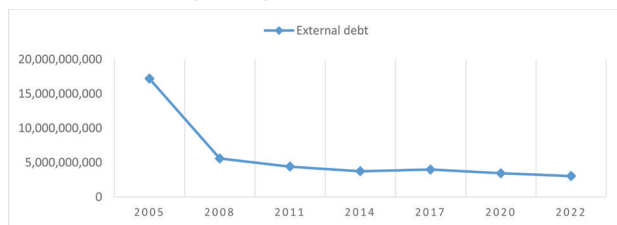


Figure 1: Algeria's external debt balance during the period (2005-2022)

Source: Compiled by researchers based on Bank of Algeria, (2022).

What can be observed from the preceding figure is the significant decline in Algeria's external debt balance, especially over the last three decades, from \$33.84 billion in 1996, which recorded the highest balance of Algeria's external debt, to \$17.19 billion in 2005, and finally reaching

\$3.03 billion in 2022. This decline can be attributed to several factors, most notably the rise in fuel prices in international markets and economic reforms within the framework of a free market economy. This led the Algerian government to announce a cessation of borrowing in 2004 and the initiation of prepayment of external debts, as well as the conversion of a portion of them into foreign direct investment. Consequently:

- There was an increase in remittances abroad.
- The volume of medium and long-term debts decreased.
- The relative importance of debt servicing decreased.

Therefore, it can be said that the Algerian economy experienced a significant imbalance in its external financial position before 2000, bearing the costs of economic plans. However, by gradually eliminating these imbalances starting from 2004, it managed to strengthen its external financial position. External balances no longer pose any obstacle to development policy in Algeria.

3. Study Methodology

Regarding the limitations of the research, the data used in this study was obtained from the World Bank database during the period 1990-2021. This period was chosen due to the unavailability of data for some variables before 1990. The study employed economic measurement and descriptive analysis to methodically analyze the main determinants of external debt in Algeria.

The Autoregressive Distributed Lag (ARDL) model was applied to test external debt in Algeria during the period 1990-2021 in both the long and short terms. Short-term relationships were examined based on the Error Correction Model (ECM). Literature on external debt was referenced, such as studies Dawood *et al.* (2019), Omar & Ibrahim (2021), and Sascena & Shanker (2021).

$$ED = \beta_0 + \beta_1 ER_t + \beta_2 X_t + \beta_3 GDP_C_t + \beta_4 GE_t + \beta_5 FDI_t + \varepsilon_t \tag{1}$$

The primary variables in the model are represented as follows:

ED for external debt, ER for exchange rate, GDP_C for per capita gross domestic product (GDP), GE for government expenditure, FDI for foreign direct investment, and ε for error correction model.

$$\begin{aligned} \Delta ED_{it} = & C_0 + \alpha_1 ED_{t-1} + \alpha_2 ER_{t-1} + \alpha_3 X_{t-1} + \alpha_4 GDP_C_{t-1} \\ & + \alpha_5 GE_{t-1} + \alpha_6 FDI_{t-1} + \sum_{i=1}^n \alpha_1 \Delta ED_{t-i} + \sum_{i=1}^n \alpha_2 \Delta ER_{t-i} \\ & + \sum_{i=1}^n \alpha_3 \Delta X_{t-i} + \sum_{i=1}^n \alpha_4 \Delta GDP_C_{t-i} + \sum_{i=1}^n \alpha_5 \Delta GE_{t-i} \\ & + \sum_{i=1}^n \alpha_6 \Delta FDI_{t-i} + \varepsilon_i \end{aligned} \tag{2}$$

The symbol Δ represents short- and long-term dynamics by measuring long-term relationships with variables. The study applied the Error Correction Model in the short term. This is illustrated in Equation 3:

$$\begin{aligned} \Delta ED_t = & C_0 \sum_{i=1}^n \alpha_1 \Delta ED_{t-1} + C_0 \sum_{i=1}^n \alpha_2 \Delta ER_{t-1} \\ & + \sum_{i=1}^n \alpha_3 \Delta X_{t-1} + \sum_{i=1}^n \alpha_4 \Delta GDP_{t-1} - C_{t-1} \quad (3) \\ & + \sum_{i=1}^n \alpha_5 \Delta GE_{t-1} + \sum_{i=1}^n \alpha_6 \Delta FDI_{t-1} \\ & + ECM_{t-1} + \varepsilon_i \end{aligned}$$

ED represents total external debt, ER represents the official exchange rate, X represents exports of goods and services, GDP_C represents per capita gross domestic product, GE represents total government final expenditure, and FDI represents foreign direct investment.

Based on the time series data for the period from 1990 to 2021, the data is denominated in US dollars and was obtained from the World Bank. The ARDL model was applied for testing cointegration to examine long-term relationships, and the error correction model was used to determine whether there is a relationship between variables in the short term. The following table provides a description of the study variables:

Table 3: Data Description

Variables	Measurement	Source
ED	Total external debt stock(DoD, current US\$)	The World Bank
ER	Real exchange rate (LCU per US\$, period average)	The World Bank
X	Export of goods and services (current US\$)	The World Bank
GDP_C	GDP per capita(current US\$)	The World Bank
GE	General government final consumption expenditure(current US\$)	The World Bank
FDI	Foreign direct investment, net inflows(Bop, current US\$)	The World Bank

Source: Prepared by the researchers.

Total external debt owed by non-residents and payable in currency, goods, or services. Total external debt includes the sum of guaranteed long-term public debt, unguaranteed short-term private debt, the use of credit from the International Monetary Fund, and short-term debt. Short-term debt includes all debts with a maturity of one year or less, and late interest on long-term debt is denominated in US dollars. The official exchange rate is the value of the Algerian currency against the US dollar.

Per capita gross domestic product (GDP_C) is a measure of the economic output of a country, taking into account the number of people in that country. Government expenditure represents the total current expenditure on goods and services, and it is a final expenditure for public consumption.

The study was conducted using quantitative analysis, and the ARDL test was performed to verify the presence of short-term and long-term relationships between the study variables. This study used the time series framework of the ARDL model to test cointegration for examining long-term relationships and the error correction model to determine if there is a short-term relationship between the variables. Pesaran *et al.* (2001) presented the ARDL cointegration test, which indicates that cointegration provides a clear picture when conducting tests for study variables. Nkoro & Uko (2016) suggest that the ARDL model is applied at integration degree I(0) or (1) or a mix of both, and each variable has a lag degree during the period. We used Phillips-Peron (PP) unit root tests and Dickey-Fuller (ADF) tests to determine stationary variables and avoid spurious effects following the study by Adenomon & Ojo (2021).

4. Results and Discussion

In this section, we present the results obtained from the outputs of the standard analysis using EVIEWS12 software. We applied a unit root test to assess the stability of the data, then identified the factors that determined external debt in Algeria from 1990 to 2021. Previous studies that addressed this topic can also be consulted.

4.1. Unit Root Test

Unit root tests, including Phillips-Perron and augmented Dickey-Fuller tests, were conducted to evaluate the integration level of each variable using unit root tests. One of the basic assumptions of the ARDL model is that integration does not exceed one. Pesaran *et al.* (2001) noted that if integration is greater than one for all variables, there is a critical link. The results of the unit root tests are shown in Table (4).

Using PP and ADF tests, the results indicate that the variables are stationary at the first difference at a significance level of 5%. External debt, exchange rate, exports of goods and services, per capita gross domestic product (GDP_C), government final consumption expenditure, and foreign direct investment (FDI) are stationary at the first difference (I(1)). Therefore, the ARDL model is most suitable for testing the cointegration between variables.

Table 4: Unit Roots Test Results

Phillips–Perron(PP)						
Level						
Variables		ED	EX	FDI	GDP_C	GE
Intercept	t-statistic	-0.913842	-1.498417	-2.31055	-1.053643	-0.97824
	Prob*	0.7703	0.5211	0.1751	0.721	0.7485
Trend and Intercept	t-statistic	-1.545368	-1.627958	-2.655861	-1.720262	-1.863452
	Prob*	0.7912	0.75	0.2603	0.7179	0.649
None	t-statistic	-1.508516	–	-1.085685	-0.035128	0.0058918
	Prob*	0.121	0.5291	0.2452	0.6633	0.6941
1st Difference						
Variables		ED	EX	FDI	GDP_C	GE
Intercept	t-statistic	-3.416811	-5.568112	-8.650395	-5.198685	-4.136779
	Prob*	0.0182	0.0001	0	0.0002	0.0031
Trend and Intercept	t-statistic	-3.260752	-5.510506	-8.575616	-5.162039	-4.05814
	Prob*	0.0923	0.0005	0	0.0012	0.0173
None	t-statistic	-3.436779	-5.629775	-8.745007	-5.209932	-4.080741
	Prob*	0.0012	0	0	0	0.0002
Conclusion		I(1)	I(1)	I(1)	I(1)	I(1)
Augmented Dickey-Fuller						
Level						
Variables		ED	EX	FDI	GDP_C	GE
Intercept	t-statistic	-0.813503	-1.516703	-2.393242	-0.974675	-0.731054
	Prob*	0.8012	0.512	0.1517	0.7497	0.8242
Trend and Intercept	t-statistic	-1.249815	-0.63203	-2.588214	-1.471965	-2.924689
	Prob*	0.8817	0.7566	0.2877	0.8177	0.1703
None	t-statistic	-1.654675	-0.405643	-0.712416	0.020172	0.422338
	Prob*	0.0918	0.5291	0.3996	0.6816	0.7987
1st Difference						
Variables		ED	EX	FDI	GDP_C	GE
Intercept	t-statistic	-3.6014	-5.568763	-8.428197	-5.199631	-4.04676
	Prob*	0.0118	0.0001	0	0.0002	0.0039
Trend and Intercept	t-statistic	-3.549721	-5.513442	-8.420883	-5.162937	-3.975547
	Prob*	0.052	0.0005	0	0.0012	0.0208
None	t-statistic	-3.501295	-5.629775	-8.544235	-5.211012	-3.961843
	Prob*	0.001	0	0	0	0.0003
Conclusion	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)

Source: Prepared by the researchers based on outputs from EViews12 software.

4.2. ARDL Long-Run and Short-Run Tests

To examine the presence of short-term or long-term relationships between the study variables, the ARDL model was applied, which is the most suitable model in this case to determine the integration between the variables.

The results of the ARDL model (see Table 5) indicate that the exchange rate has a long-term positive relationship with external debt, consistent with theoretical expectations. This means that the exchange rate contributes to a significant increase in the level of long-term external debt. This result is also consistent with the findings of studies by Imomile *et al.* (2014); Ozata (2017); Omar & Ibrahim (2021); Dawood *et al.* (2019); Sascena & Shanker (2021); and Harsono *et al.* (2024). Furthermore, the results of the ARDL model indicate that government expenditure has a long-term positive relationship with external debt, which is also consistent with theoretical expectations. This means that government expenditure contributes to an increase in the level of long-term external debt. This result is also consistent with the findings of studies by Sağdıç & Yildiz (2020) and Dawood *et al.* (2019), unlike the study by Omar & Ibrahim (2021), which found a negative effect of government expenditure on external debt in the long run.

The negative relationship between per capita GDP and external debt in the long run indicates that per capita GDP deterioration leads to deteriorating living conditions for individuals, a decline in national income, and savings rates, resulting in a decrease in external debt. This finding is consistent with studies by Al-Fawwaz (2016); Beyene & Kotosz (2023); Omar & Ibrahim (2021); and Dawood *et al.* (2019). Thus, the results of these studies indicate heterogeneity and differences in the time impact of debt on economic growth, unlike studies by Imomile *et al.* (2014); Ozata (2017); and Sascena & Shanker (2021), which found a positive effect of per capita GDP on external debt.

The study results also indicate that foreign direct investment (FDI) has a negative impact in the long run on external debt. This means that a decrease in foreign direct investment inflows leads to a decline in government spending and an increase in the government's need to borrow to cover the financial deficit, resulting in an increase in long-term external debt accumulation. This finding is consistent with the study by Dawood *et al.* (2019), unlike the study by Sascena & Shanker (2021), which confirmed a positive impact of foreign direct investment on external debt.

Table 5: ARDL Long- and Short-Run Test Results

Long Run Test of ARDL				
Variables	Coefficient	Std. Error	t-statistic	Prob [*]
EX	0.404708	0.244842	1.652938	0.1494
FDI	-1.468331	2.301293	-6.380459	0.0007
GDP_C	-1.2036492	5.2993885	-2.271300	0.0636
GE	0.474978	0.304660	1.559045	0.1700
Short Run Test of ARDL				
Variables	Coefficient	Std. Error	t-statistic	Prob [*]
D(EX)	0.002562	0.107579	0.023819	0.9818
D(FDI)	-2.736521	0.718305	-3.809694	0.0089
D(GDP_C)	-3.949120	-3.272597	0.000000	0.0000
D(GE)	0.783788	0.301083	2.603228	0.0405
ECT(-1)	-1.393044	0.162617	-8.566429	0.0001

Note: ***, **, and * indicate statistically significant levels at 1%, 5%, and 10%, respectively.

Source: Compiled by the researchers based on the outputs of EViews12 software.

The ARDL model corrects errors to estimate short-term coefficients with adjustment speed, where the coefficient of the error correction term measures the adjustment speed. In the long run, we infer a long-term relationship between the dependent variable (external debt) and the explanatory variables (exchange rate, government expenditure, foreign direct investment, per capita GDP).

The short-run coefficients denoted by D indicate short-term elasticity. The error correction model coefficient (-1.39) in the short term is insignificant, implying an adjustment of approximately 139% to achieve long-term equilibrium after one year. In the short term, the exchange rate and government expenditure have a significantly positive impact on external debt, while foreign direct

investment and per capita GDP are negatively associated with external debt. The short-term results align with the long-term results, fully agreeing with the findings of Dawood *et al.* (2019) and partially with Omar & Ibrahim

(2021), whose results align completely with ours except for the government expenditure variable, which had a negative effect on external debt in both short and long terms according to their study.

Table 6: Cointegration and ARDL Diagnostic Test Results

Cointegration				
No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None*	0.613779	28.54036	33.87687	0.1897
At most 1	0.595341	27.14129	27.584334	0.0569
At most 2	0.396395	15.14508	21.13162	0.2789
At most 3	0.250017	8.631156	14.2646	0.3181
At most 4	0.04117	1.261241	3.841465	0.2614
ARDL Diagnostic Tests				
Test	Null hypothesis		Prob.**	
Breuch-God Frey LM Test	No serial correlation		0.2195	
ARCH	No heteroscedasticity		0.4167	
Jarque-Bera (JB)	There is a normal distribution		0.09	
Ramsey Test	There is not a problem		0.3786	

Source: Compiled by the researchers based on the outputs of EViews12 software.

4.3. Cointegration and ARDL Diagnostic Tests

Cointegration was tested to determine whether there exists a long-term equilibrium relationship among the study variables. The maximum eigenvalue test was used, along with other tests on all variables, while considering the assumption of trend and intercept. The ARCH test indicates conditional heteroskedasticity, showing instability in variance. The results of the Breusch-Godfrey test reveal no issue of serial correlation among residuals, and normal distribution is confirmed using the Jarque-Bera test. The subsequent table presents the results of the cointegration and diagnostic tests for the ARDL model.

The results of the Johansen cointegration test confirm a cointegrating relationship among the study variables at a significance level of 10%. This implies a significant long-term effect on external debt in Algeria. The results also indicate that at a significance level of 5%, there is no single cointegrating equation. Diagnostic test results demonstrate the absence of autocorrelation and variance in the model. Additionally, the Ramsey RESET test and the Jarque-Bera test suggest that the ARDL model follows a normal distribution.

5. Conclusion

Most emerging countries require external borrowing and substantial foreign debt to achieve sustainable economic

development. This research paper discussed the determinants of external debt in Algeria from 1990 to 2021, using the ARDL model to test for cointegration and examine the long-term regression model and error correction to identify short-term relationships among the study variables. This study follows and extends the current determinants of external debt literature, particularly the works of Omar & Ibrahim (2021) and Dawood *et al.* (2019), by including the variable of foreign direct investment, which has not been adequately considered in most previous studies on external debt determinants, except for the study by Sascena & Shanker (2021).

The results indicate that the exchange rate and government spending have significant and positive effects in both the long and short terms. However, per capita GDP and foreign direct investment have significant negative effects in both the long and short terms. Hence, there is consistency in the long-term results with those of the short term. This fully agrees with the findings of Dawood *et al.* (2019) and partially with those of Omar & Ibrahim (2021).

6. Recommendations

Based on the aforementioned conclusions, the following recommendations can be offered for the Algerian economy in particular, and for various economies of developing and emerging countries in general:

- There is a need to establish a specialized ministerial committee for external debt evaluation processes to avoid problems of external borrowing.
- Efforts should be made to rationalize government spending to achieve financial sustainability at the level of the Algerian economy.
- There should be a focus on economic diversification in sectors capable of creating value-added to generate diverse sources of wealth, thereby reducing debt and external dependency, and moving the Algerian economy away from excessive reliance on hydrocarbons.
- Encouraging an investment-friendly climate by activating legislation and mechanisms that stimulate foreign investors and increase inflows of foreign capital, thereby avoiding exchange rate fluctuations and financial crises resulting from foreign exchange reserves.

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Authorship Contribution

The two researchers collected data, analysed it, interpreted the results, and provided recommendations.

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