Journal of Information Systems Engineering and Management
2025, 10(63s)
e-ISSN: 2468-4376
https://jisem-journal.com/

Research Article

A Data Driven ARDL Analysis of Foreign Trade and Economic Growth under the Dutch Disease : The Case of Algeria

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ARTICLE INFO

Received: 25 May 2025

Revised: 10 Oct 2025

Accepted: 20 Oct 2025

ABSTRACT

This study investigates the impact of foreign trade on economic growth in Algeria over the period 1990–2023, employing the Autoregressive Distributed Lag (ARDL) methodology to analyze both long-run and short-run relationships. The analysis focuses on five key variables: economic growth, exports, imports, trade openness, oil prices, and import-restriction policies (introduced as a dummy variable), in addition to the exchange rate as an influential factor shaping trade performance. The findings indicate that exportsprimarily composed of hydrocarbonsare positively associated with economic growth; however, this reliance simultaneously heightens the fragility of the Algerian economy due to fluctuations in global oil prices. Imports were shown to influence growth in a manner that deviates from economic theory, reflecting the economy's dependence on imported consumer goods and the weakness of domestic manufacturing industries. In contrast, trade openness exhibited a negative and statistically insignificant effect on growth, largely because it is dominated by imports in the absence of a strong domestic productive base. The results further reveal the limited effectiveness of import-restriction policies and currency depreciation in fostering economic growth. Overall, the study underscores the structural fragility of Algeria's growth trajectory and its persistent dependence on hydrocarbon revenues. Achieving sustainable growth, therefore, requires genuine economic diversification and the development of a robust and competitive productive base.

Keywords: Foreign Trade; Economic Growth; Dutch Disease; ARDL Methodology.

Introduction

The study of foreign trade has long been central to understanding the determinants of Gross Domestic Product (GDP) growth, as trade performance is significantly shaped by the volume and efficiency of exports and imports. Enhancing export capacity is particularly crucial for improving competitiveness

Journal of Information Systems Engineering and Management
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in global markets and for generating revenues that stimulate investment and reinforce their positive contribution to economic activity and growth.

Foreign trade dynamics constitute one of the most influential determinants of economic growth trajectories, especially in economies whose productive structures rely heavily on natural resources. In rentier economieswhere primary exports, particularly hydrocarbons, dominate foreign tradethe relationship between trade openness and economic growth becomes complex and does not necessarily conform to conventional economic theories that view trade as a catalyst for specialization, productivity, and efficiency.

Within this framework, the concept of the Dutch Disease has emerged as a pivotal analytical tool for explaining structural imbalances in resource-rich economies. The theory posits that external revenue inflows generated by the resource sector lead to an appreciation of the real exchange rate, which subsequently undermines the competitiveness of non-oil tradable sectors. Over time, this dynamic contributes to the contraction of the productive base and hampers economic diversification. Recent literature reinforces this view, showing that rentier dependence produces fragile foreign trade structures and volatile growth patterns, as highlighted in World Bank and IMF reports on economies in the Middle East and North Africa.

Algeria represents a clear manifestation of this phenomenon, as hydrocarbon exports account for more than 90% of total exports. This structural reliance has produced a fragile trade balance and unstable economic growth, alongside the limited contribution of non-hydrocarbon productive sectors. Recurring oil booms have exerted upward pressure on the Algerian dinar, restricting the economy's ability to develop a strong industrial and manufacturing basean outcome consistent with Dutch Disease hypotheses that describe how resource wealth can undermine productive sectors through exchange-rate appreciation and excessive public spending.

Against this backdrop, the present study seeks to analyze the dynamics of foreign trade and economic growth in Algeria during the period 1990–2023 using the ARDL approach. It further aims to assess the extent to which exports stimulate economic growth and to determine whether the rentier nature of the economy impedes the transmission of trade effects to real productive activity. This leads to the central research question: **To what extent is foreign trade effective in supporting sustainable economic growth and fostering genuine diversification in Algeria's economic structure?**

Previous Studies

The body of literature addressing the relationship between foreign trade and economic growth is both rich and diverse. Among the most relevant contributions are the following:

The study conducted by (Adelakun et al, 2025) aims to examine the validity of the Export-Led Growth Hypothesis (ELGH)—which posits that expanding exports drives long-term economic growth—across 22 economies of the East African Community (EAC) and the Southern African Development Community (SADC) during the period 1990–2022. The analysis employs a System Generalised Method of Moments (System GMM) along with Granger causality tests.The study finds that exports and technology significantly enhance GDP growth, whereas labor and foreign direct investment (FDI) have no statistically significant impact. Trade openness, however, exhibits a negative effect on growth, indicating the economies' vulnerability to external shocks. Additionally, a bidirectional Granger causality exists between exports and GDP. The results confirm the relevance of the Export-Led Growth Hypothesis and highlight the need for export diversification, technological upgrading, and

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institutional reforms to ensure sustainable growth in Africa.Another study conducted by(Sunde et al, 2023) examines the effects of exports, imports, and trade openness on Namibia's economic growth using the ARDL cointegration approach. The findings indicate a statistically significant negative impact of imports on economic growth, while exports and trade openness positively and significantly contribute to economic expansion. Additionally, short-term economic growth is influenced by all three factors—exports, imports, and trade openness. The study highlights that trade liberalization coupled with an export-led growth strategy plays a pivotal role in promoting Namibia's economic development. Overall, the results reinforce the mercantilist perspective, which stresses the importance of participation in global markets through enhanced exports and trade engagement

The study conducted by (Kamsin et al, 2021) examines the long-run relationship between trade openness and economic growth in both developing and developed countries, focusing on identifying the most influential indicators in this relationship. Generally, many studies have found a positive relationship between foreign direct investment (FDI) and capital formation, which is often used as a proxy for the link between trade openness and economic growth, without giving adequate attention to the crucial role of exports and imports. Addressing this gap, the study aims to highlight the importance of exports and imports as key indicators of trade openness and to analyze their direct contribution to explaining the impact of trade openness on economic growth, providing a more precise and comprehensive understanding of the dynamics of trade and growth in both developing and developed economies.

In the study conducted by (Samad, 2011), which sought to determine the relationship between exports and economic growth over the period 1970–2005, the author concluded that numerous structural and operational constraints hinder the marketing of Algeria's non-hydrocarbon exports. These include the limited use of modern and technical marketing methods, high production costs, and issues related to the availability and quality of local products. Such factors collectively diminish the competitiveness of Algerian exports relative to their global counterparts. Consequently, disruptions in export performance were found to significantly affect economic growth, indicating that the existing export structure cannot be relied upon to generate optimal growth outcomes.The paper suggests policy prescription that the government of Algeria should put emphasis on promoting growth and development of export industries by ensuring increased productivity in such sector. The paper suggests policy prescription that the government of Algeria should put emphasis on promoting growth and development of export industries by ensuring increased productivity in such sector.

The study by (Dib, Aouar, & Bendahmane, 2021)This paper investigated the relationship between trade openness, the real exchange rate, inflation, and economic growth in Algeria over the period 1990–2018. Contrary to many theoretical expectations, the study finds that trade openness exerts a negative and statistically significant effect on economic growth, both in the short term and over the long term. The authors interpreted this counter-intuitive result as reflecting structural characteristics of the Algerian economy: the concentration of exports in hydrocarbons, limited diversification, and insufficient competitiveness of non-hydrocarbon sectors. As such, liberalizing trade alone did not translate into growth; rather, the nature of trade, the structure of output, and competitiveness constraints appear to have undermined any positive growth effect. The study therefore concluded that trade openness cannot be assumed a "growth engine" for Algeria without accompanying structural reforms and diversification policies.In contrast, (Mekarssi & Berber , 2020)analyze trade composition and its role in GDP growth via descriptive indicators over 2000–2020. They show that Algeria's exports are dominated by hydrocarbons (≈95%), while imports are mostly capital goods and semi-finished products. Both exports and imports historically contributed significantly to GDP growth, though the GDP growth elasticity of imports varied: high during 2000–2010 (+2.62%) and negative in 2011–2020 (–0.53%), reflecting external shocks. Together, these studies suggest that while foreign

trade has the potential to support growth, the heavy reliance on hydrocarbons, lack of export diversification, and sensitivity to global shocks limit the effectiveness of trade openness in sustaining long-term economic Another important contribution is the study by(Ben slimane, 2020) which examined the impact of foreign trade on economic growth in Algeria compared with selected developing countries during the period 1980–2016, using a panel data approach. The study concluded that a long-run relationship exists between trade openness and economic growth in the sampled countries, implying that increasing trade openness can foster higher and more sustainable growth rates.

Furthermore, economic growth was found to be influenced not only by trade openness but also by human and physical capital, with these variables exerting a strong positive effect in Algeria relative to other developing countries. These findings were reinforced by the study of (Boukalikha, Belmokaddem , & Khatib, 2022) which also confirmed that foreign trade significantly affects economic growth in Algeria. Similarly, (Benachour, Abdelmalek , Tarhlissia, & Bouchelghoum, 2025)examined the impact of foreign trade on economic growth in Algeria over the period 1980-2023. The main objective is to analyze the influence of exports, imports, and the exchange rate on economic growth to understand better the country's trade dynamics and their implications for economic growth. The empirical results revealed contrasting effects. Imports positively impact economic growth in the medium term, fostering industrialization and improving local productive capacities through acquiring capital goods and technologies. In contrast, exports, primarily dominated by the hydrocarbon sector, show a limited and negative effect in the long term, highlighting the vulnerability of Algeria's economic model to commodity price volatility. The exchange rate has a favourable influence on growth, particularly by facilitating the importation of strategic goods and enhancing the country's attractiveness to foreign investors.

A second group of studies, situated within a broader spatial context, also demonstrates a consensus regarding the substantial impact of foreign trade on economic growth. For instance, the study of (Justyna, 2016), which examined the effect of foreign trade on Poland's economic growth during 2006–2015, revealed that the contribution of exports to GDP growth exceeds that of imports.

Similarly, the study by (Syzdykova & al, 2019), which investigated the impact of exports and imports on national income in Kazakhstan from Q1 2000 to Q4 2017, found that increases in both exports and imports positively influence GDP. This suggests that foreign trade plays a substantial role in supporting economic growth. The study further noted that while exports exert a stronger effect in the long run than in the short run, imports have a negative short-run effect but a positive long-run effect on economic growth.

Additionally, the income elasticity of imports was statistically significant and positive. Likewise, the study conducted by (Chibaya, 2020)on Malawi during the period 1961–2016 confirmed the existence of a cointegration relationship between exports, imports, and GDP, and established that both variables positively affect economic growth.

The Econometric Study

This section presents an econometric modelling of all variables relevant to the study, namely: the economic growth rate, exports, imports, trade openness, average oil prices, and the exchange rate over the period 1990–2023. The data were obtained from the World Bank.

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https://jisem-journal.com/

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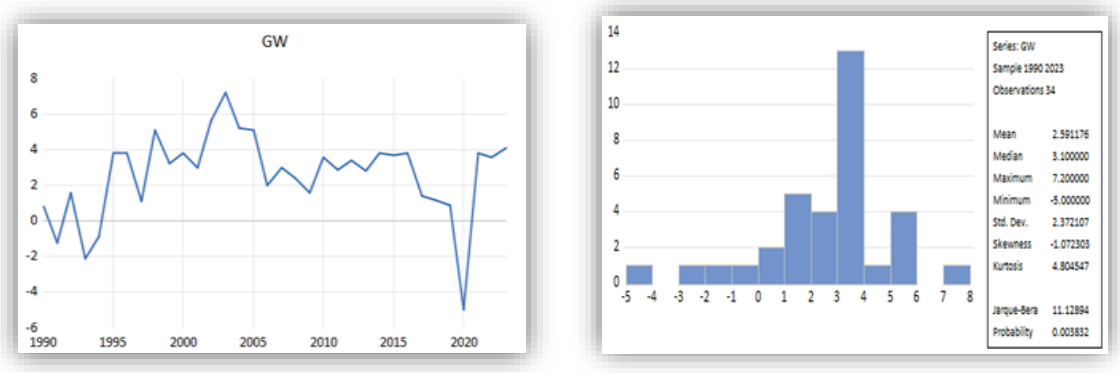
Descriptive Analysis of the Study Variables

We begin by conducting a descriptive analysis of the variables for the period 1990–2023. This analysis enables a clearer understanding of their evolution throughout the study period and provides insights into the distribution and variability of the data. Key descriptive statisticsincluding maximum and minimum values, mean values, and standard deviationsallow us to assess the homogeneity and dispersion of each variable before proceeding to the subsequent econometric stages.

1.1 Descriptive Analysis of the Economic Growth Series:

Figure (1): Graphical Representation and Descriptive Statistics of the Economic Growth Series (GW)

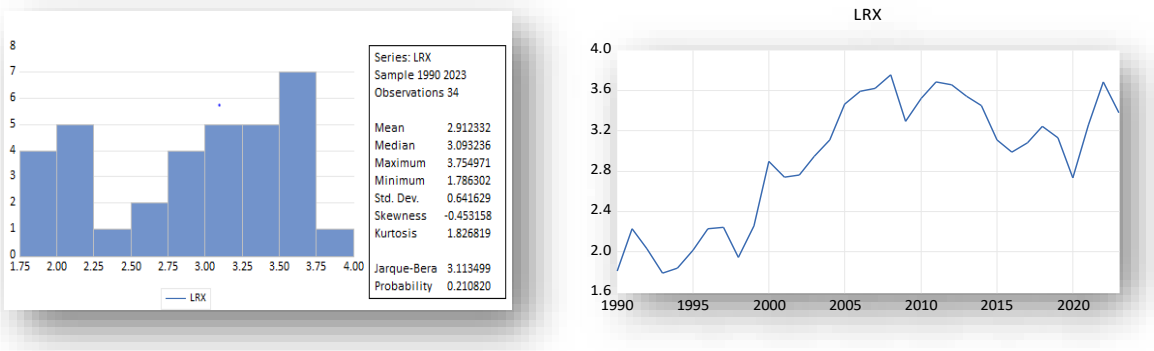


Source: Authors based on Eviews 12 outputs

We observe that the series during the study period is stationary, as the probability value is (Probability < 0.05), and it fluctuates around a constant arithmetic mean. The maximum economic growth value reached 7.20% in 2003, whereas the minimum value was –5.00% in 2020. The mean value of the series was 2.59, and the dispersion of the series measured by the standard deviation was 2.37.

1.2 Descriptive Analysis of the Export Series:

Figure (2): Graphical Representation and Descriptive Statistics of the Export Series (LRX)



Source:Authors based on Eviews 12 outputs

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2025, 10(63s)
e-ISSN: 2468-4376
https://jisem-journal.com/

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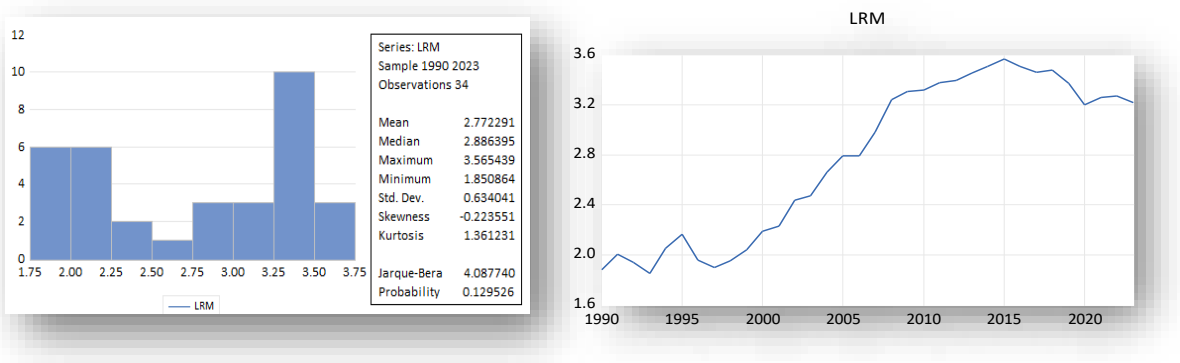
It is clearly apparent that the series during the study period is non-stationary, as the probability value is (Probability > 0.05). It does not fluctuate around a constant mean. The maximum export value reached 3.75% in 2008, whereas the minimum value was 1.78% in 1993. The mean value of the series was 2.91, and the dispersion measured by the standard deviation was 0.64.

1.3 Descriptive Analysis of the Import Series:

Figure (3): Graphical Representation and Descriptive Statistics of the Import Series (LRM)

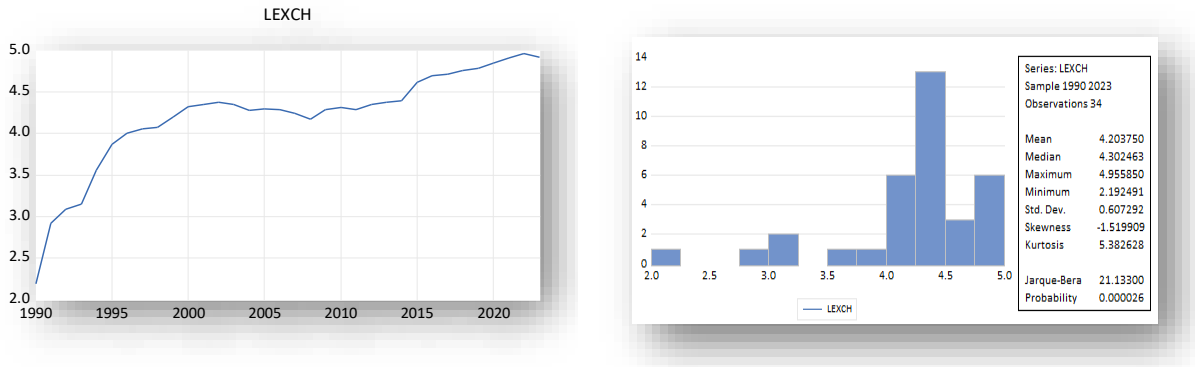


Source:Authors based on Eviews 12 outputs

The results indicate that the economic growth series is stationary over the study period, as reflected by a probability value lower than 0.05 (Probability < 0.05). The series fluctuates around a constant mean. The maximum growth rate reached 7.20% in 2003, while the minimum value recorded was –5.00% in 2020. The arithmetic mean of the series is 2.59, and the degree of dispersion, measured by the standard deviation, is 2.37.

1.4 Descriptive Analysis of the Export Series

Figure (4): Graphical Representation and Descriptive Statistics of the Exchange Rate Series (LEXCH)



Source: Authors based on Eviews 12 outputs

The exchange-rate series displays an upward trend, and the stationarity test confirms significance with a probability value below 0.05 (Probability < 0.05). The maximum value reached 4.95% in 2022,

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e-ISSN: 2468-4376
https://jisem-journal.com/

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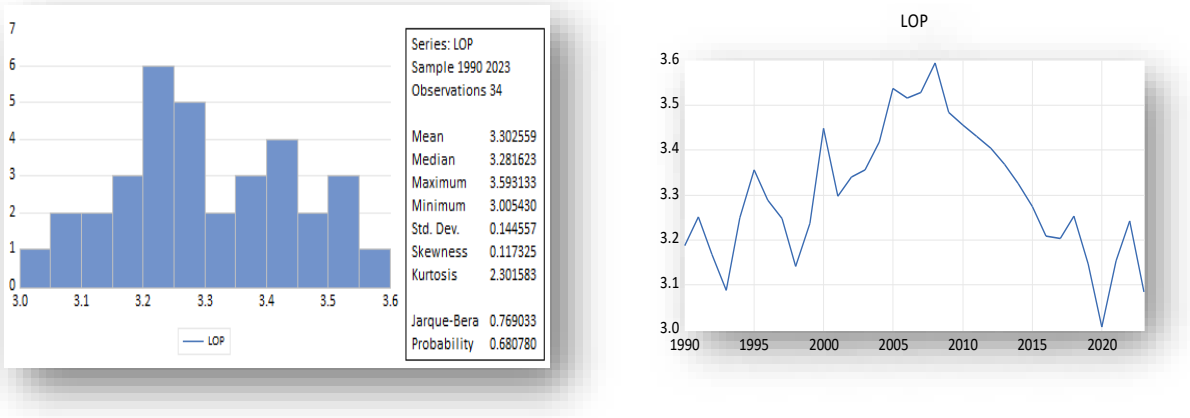
while the minimum recorded was 2.19% in 1990. The mean of the series is 4.20%, and the dispersion measured by the standard deviation is 0.60.

1.5Descriptive Analysis of the Trade Openness Series

Figure (5): Graphical Representation and Descriptive Statistics of the Trade Openness Series (LOP)

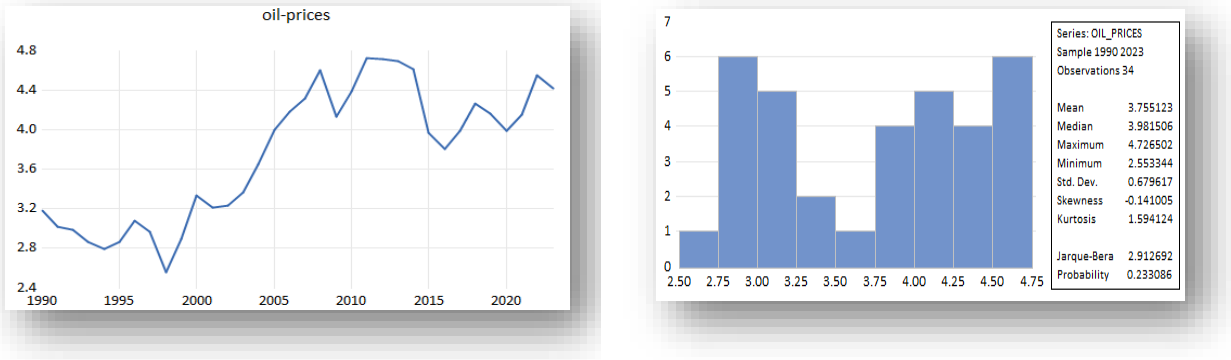


Source: Authors based on Eviews 12 outputs

The trade openness series is non-stationary, as indicated by a probability value exceeding 0.05 (Probability > 0.05). It does not fluctuate around a constant mean. The maximum value reached 3.59% in 2008, whereas the minimum value was 3.00% in 2020. The mean of the series is 3.30, with a standard deviation of 0.14, indicating limited dispersion.

1.6 Descriptive Analysis of the Average Oil Price Series

Figure (6): Graphical Representation and Descriptive Statistics of the Average Oil Price Series (LPOIL)



Source: Authors based on Eviews 12 outputs

The average oil price series is also non-stationary, given that the probability value exceeds 0.05 (Probability > 0.05). The maximum value recorded was 4.72 in 2011, while the minimum was 2.55 in 1998. The mean value is 3.75, and the dispersion measured by the standard deviation is 0.67.

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e-ISSN: 2468-4376
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Stationarity Tests

To mitigate issues related to heteroscedasticity in the error terms, logarithmic transformations were applied to most time series, with the exception of the economic growth series, which contains negative values and therefore cannot be log-transformed. Accordingly, the model is specified as follows:

$$GW_t = f(LRX_t, LRM_t, LEXCH_t, LOP_t, LPOIL_t) \quad \ldots.(1)$$

Stationarity testing constitutes a fundamental step in econometric analysis. These tests include first-generation unit root tests such as the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests, as well as second-generation tests such as the KPSS test, which accounts for potential structural breaks and seasonal effects in time series data.

Table (1): Results of Unit Root Tests

Unit Root Tests						
Augmented Dickey-Fuller Test						
Variables	**GW**	**LRX**	**LRM**	**LEXCH**	**LOP**	**LPOIL**
Levels	-3.7402 P=(0.0079)	-1.7517 P=(0.3969)	-1.2711 P=(0.6310)	-2.4827 P=(0.3332)	-0.8835 P=(0.9454)	-1.0086 P=(0.7386)
First difference		-6.0106 P=(0.0000)	-4.2682 P=(0.0021)	-6.4470 P=(0.0000)	-6.8293 P=(0.0000)	-5.0207 P=(0.0003)
Phillips-Perron Test						
Variables	**GW**	**LRX**	**LRM**	**LEXCH**	**LOP**	**LPOIL**
Levels	-3.7038 P=(0.3969)	-1.7007 P=(0.4216)	-1.2354 P=(0.6471)	-6.0660 P=(0.0001)	-1.7048 P=(0.4196)	-0.9544 P=(0.7576)
First difference		-5.6654 P=(0.0000)	-4.2379 P=(0.0023)	-6.4470 P=(0.0000)	-5.8019 P=(0.0000)	-4.9957 P=(0.0003)
KPSS Test						
Variables	**GW**	**LRX**	**LRM**	**LEXCH**	**LOP**	**LPOIL**
Levels	0.1500 P=H0*	0.1668 P=H1	0.1353 P=H1	0.1350 P=H1	0.1890 P=H1	0.5252 P=H1
First difference	--------	0.1860 P=H0	0.2769 P=H0	0.4237 P=H0	0.2793 P=H0	0.1086 P=H0

Source: Authors based on Eviews 12 outputs

**The null hypothesis indicates that the series is stationary.*

From the table above, it is evident that most of the time series become stationary after taking the first difference, with the exception of the economic growth series, which is stationary at level. Accordingly, the variables under study consist of a mixture of I(1) and I(0) processes.

Stationarity can also be verified through the graphical representations and the autocorrelation (ACF) and partial autocorrelation (PACF) functions shown in Appendix(1).

Model Estimation

At this stage, the appropriate model specification is determined based on the order of integration of the variables, as well as the existence of a cointegration relationship, as presented in Appendix (2).

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e-ISSN: 2468-4376
https://jisem-journal.com/

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Given that the series are integrated of orders I(1) and I(0), the suitable model for estimation is the Autoregressive Distributed Lag (ARDL) model.

The ARDL model can be expressed as follows:

$$\Delta GW_t = \alpha_0 + \sum_{i=0}^{n} \alpha_{1i}\Delta GW_{t-i} + \sum_{i=0}^{n} \alpha_{2i}\Delta LRX_{t-i} + \sum_{i=0}^{n} \alpha_{3i}\Delta LRM_{t-i} + \sum_{i=0}^{n} \alpha_{4i}\Delta LEXCH_{t-i} + \sum_{i=0}^{n} \alpha_{5i}\Delta LOP_{t-i} + \sum_{i=0}^{n} \alpha_{6i}\Delta LPOIL_{t-i} + \alpha_{7i}GW_{t-i} + \alpha_{8i}LRX_{t-i} + \alpha_{9i}LRM_{t-i} + \alpha_{10i}LEXCH_{t-i} + \alpha_{11i}LOP_{t-i} + \alpha_{12i}LPOIL_{t-i} + \alpha_{13i}ECM_{t-i} + \varepsilon_t \quad \dots (2.2)$$

Where:

- $\alpha_0 - \alpha_6$represent short-run coefficients.
- $\alpha_7 - \alpha_{13}$represent long-run coefficients.

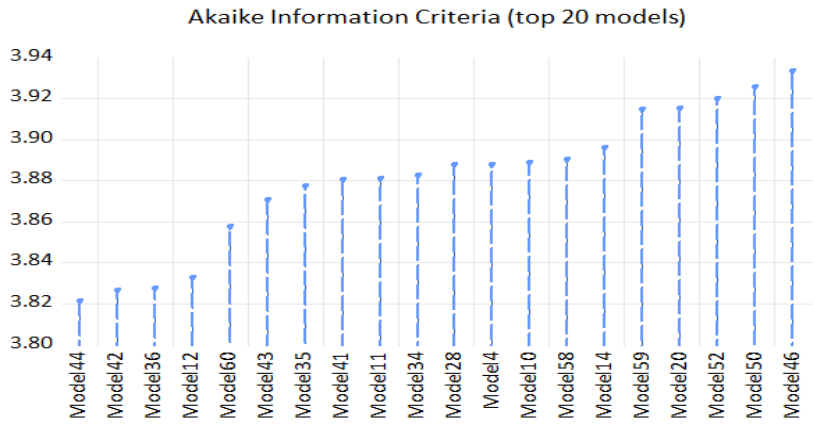
3.1Determining the Lag Length

According to standard econometric practice, annual data typically require the use of one lag to preserve degrees of freedom. The optimal lag order is presented in Appendix (2).

3.2 Optimal Model Selection

The optimal lag specification is selected based on the Akaike Information Criterion (AIC).

Figure (7): AIC Optimal Model Selection



Source: Authors based on Eviews 12 outputs

From the figure, the optimal ARDL model identified is: ARDL(1,0,1,0,1,0,0) which corresponds to the lowest AIC value.

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e-ISSN: 2468-4376
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3.3 Bounds Cointegration Test

The results of the Bounds Test, using (Narayan, 2005)[1]critical values for six explanatory variables, show that the calculated F-statistic (9.2923) exceeds both the lower and upper bounds at the 5% significance level.

Thus, we reject the null hypothesis of no long-run relationship and accept the alternative hypothesis, which confirms the existence of a long-run equilibrium relationship among the variables. The detailed results are presented in Appendix (4).

3.4 Results of the ARDL Model Estimation

Based on the short-run dynamic estimation results presented in Appendix (5), the following conclusions are drawn:

✓ There is a positive and statistically significant relationship between economic growth in period *t* and period *t–1*. This suggests that Algeria's growth is largely driven by recurrent financial inflows from oil rents. However, the persistence of growth also reflects the *absence of diversified productive sectors*, which prevents the economy from achieving structural transformation or dynamic productivity gains.

✓ Exports exert a positive and statistically significant effect on economic growth at the 5% level. Specifically, a 1% increase in exports leads to a 14.4799% increase in growth.

Given that approximately 97% of Algeria's exports are hydrocarbons, this result underscores:

- the rapid liquidity generated by oil exports,
- the vulnerability of the economy to global oil price fluctuations,
- and the persistent weakness in economic diversification.

The high export elasticity reflects the structural fragility of a rentier economy heavily dependent on a single commodity.

✓ The coefficient of imports is positive and statistically significant, contrary to the predictions of classical economic theory. A 1% increase in imports leads to a 12.1081% increase in growth.

This can be interpreted as follows:

- Algeria finances large volumes of imports using oil revenues.
- Imports function as a substitute for domestic production, reflecting the absence of strong manufacturing sectors.
- Around 80% of manufactured goods imported into Algeria could be produced locally under an effective industrial policy framework.

Thus, import-based growth reflects a consumption-driven model, not a productive or sustainable growth trajectory.

✓ The coefficient of trade openness is negative and insignificant, which can be explained by:

[1]Narayan (2005) provides critical values for the ARDL bounds test specifically for small sample sizes, which are often preferred over Pesaran et al. (2001) when the dataset is limited.

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- the unbalanced nature of openness (high imports vs. weak exports),
- the dominance of hydrocarbons in the export structure (97%),
- and the absence of competitive non-oil sectors capable of benefiting from global market integration.

Unstrategic openness transforms the Algerian economy into a consumer market rather than a productive economy.

✓ The Algerian dinar has experienced persistent depreciation, increasing the cost of imports. Because Algeria imports approximately 70% of its consumption and production needs, exchange-rate fluctuations have significant macroeconomic impacts.

Currency devaluationpromoted as a policy to support exportshas not generated measurable export gains. Instead, it has:

- contributed to inflation,
- increased the prices of essential goods,
- and led to a decline in real purchasing power, intensifying economic hardship for households.

✓The coefficient of oil prices is negative and highly significant, reflecting the Algerian economy's structural dependence on hydrocarbon revenues. Increases in oil prices may coincide with external shocks or fluctuations that adversely affect short-run economic growth. This outcome is linked to intensified reliance on oil rents and the persistent neglect of alternative productive sectors. The negative sign is therefore attributed to revenue mismanagement and the lack of meaningful economic diversification.

✓ The coefficient of import restrictions (dummy variable) appears weak and statistically insignificant. This indicates that import-restriction measures have not generated any significant effect on economic growth, largely due to the absence of viable domestic alternatives. Restrictive policies cannot yield positive outcomes in the absence of a comprehensive import-substitution strategy. The prevalence of the informal economy and the limited capacity of local industries further contribute to this insignificance.

3.5 Error Correction Model (ECM) Methodology

The estimation results of the Error Correction Equation (Appendix 6) show that the ECM term is statistically significant and carries a negative sign. This implies that 55.64% of deviations from the long-run equilibrium are corrected annually, indicating a relatively rapid adjustment process within the Algerian economy. Such a high adjustment speed reflects structural fragility rather than productive resilience. Rentier economies often exhibit rapid statistical correction due to dependence on external revenues, yet remain unable to achieve structural transformation or diversified growth. These findings are consistent with the resource-curse hypothesis.

4. Statistical Tests

This stage assesses whether the estimated model suffers from econometric problems. The principal diagnostic tests are summarized as follows:

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4.1 LM Test for Autocorrelation

The LM test results indicate that the probability value exceeds 0.05, confirming the absence of autocorrelation in the residuals. The null hypothesis of no serial correlation is therefore accepted.

Table (8): LM Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 1 lag

F-statistic	0.078538	Prob. F(1,21)	0.7820
Obs*R-squared	0.119231	Prob. Chi-Square(1)	0.7299

Source: Authors based on Eviews 12 outputs

4.2 ARCH Test for Heteroskedasticity

The ARCH test results show that the probability value is greater than conventional significance levels, indicating that the model does not suffer from heteroskedasticity.

Table (9): ARCH Test

Heteroskedasticity Test: ARCH

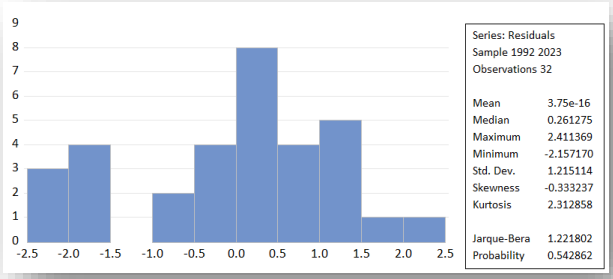
F-statistic	0.238881	Prob. F(1,29)	0.6287
Obs*R-squared	0.253269	Prob. Chi-Square(1)	0.6148

Source: Authors based on Eviews 12 outputs

4.3 Normality Test

The Jarque–Bera test confirms that the residuals follow a normal distribution, as the probability value exceeds 0.05. This also indicates the absence of heteroskedasticity.

Figure (10): Normality Test



Source: Authors based on Eviews 12 outputs

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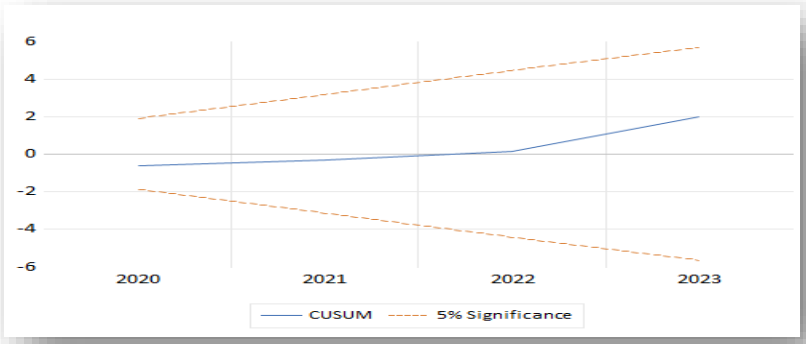
4.4 Model Stability Test

Model stability is evaluated using the **CUSUM test**, which detects structural breaks and assesses consistency between short-run and long-run parameters.

Figure (11): Model Stability Test Results



Source: Authors based on Eviews 12 outputs

the CUSUM stability testdemonstrates all recursive residuals remain within 5% significance bounds throughout 2010-2023, confirming parameter constancy(Brown & Evans, 1975). So, the result confirming the structural stability of the ARDL model.

Conclusion

The findings underline the rentier nature of economic growth in Algeria and its heavy dependence on hydrocarbon exportsan essential feature associated with the Dutch Disease. Growth persistence between consecutive periods reflects the influence of recurrent oil-based revenues, which sustain short-term economic expansion without generating genuine productive transformation. Consequently, growth remains highly vulnerable to global oil price fluctuations, a central symptom of the Dutch Disease.

The study reveals a positive and significant relationship between exports and economic growth. Since exports are predominantly composed of hydrocarbons, increases in export revenues lead to substantial but unstable improvements in growth, thereby deepening economic fragility.

The impact of imports appears positive yet inconsistent with theoretical expectations, reflecting dependence on consumer and intermediate imports as substitutes for domestic industrial production. This pattern stems from the weakening of tradable sectors due to rentier dynamics and from the increased reliance on imported goods, which undermines competitiveness and widens structural deficits.

Trade openness exhibits a negative and insignificant effect, highlighting an unbalanced trade environment characterized by import dominance and limited export diversification. Rising oil revenues and real exchange rate appreciation further reduce the competitiveness of local industries, preventing the economy from benefiting from potential gains associated with openness.

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The depreciation of the dinar has not succeeded in stimulating exports; instead, it has increased import costs and contributed to inflationary pressures. Higher oil prices also have a negative short-term effect on growth, owing to revenue mismanagement and continued dependence on oil rents. Import-restriction policies remain ineffective due to the lack of domestic productive alternatives and weak import-substitution strategies.

Overall, the findings demonstrate that foreign trade exerts a limited and unsustainable influence on economic growth in Algeria. Although oil rents generate short-term growth, the economy remains structurally fragile without a diversified productive base capable of absorbing shocks and supporting long-term development. Achieving sustainable economic growth requires addressing deep structural imbalances, establishing a competitive productive sector, and transforming foreign trade into a mechanism for diversification rather than a reflection of volatility in global oil markets.

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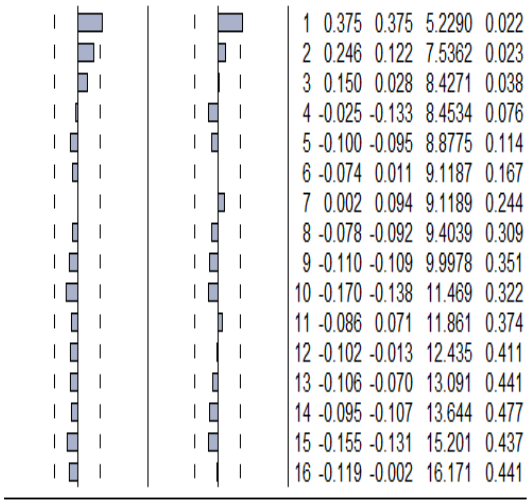
Appendices:

Appendix (1): Autocorrelation and Partial Autocorrelation Functions of the Study Variables

Series GW

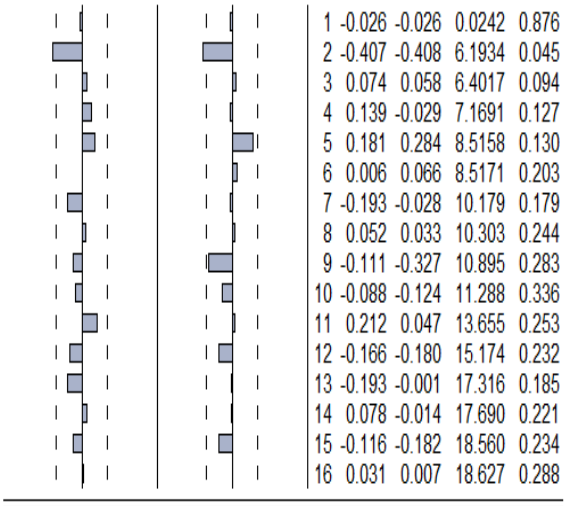
Date: 05/15/25 Time: 00:19
Sample: 1990 2023
Included observations: 34



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.375	0.375	5.2290	0.022
		2	0.246	0.122	7.5362	0.023
		3	0.150	0.028	8.4271	0.038
		4	-0.025	-0.133	8.4534	0.076
		5	-0.100	-0.095	8.8775	0.114
		6	-0.074	0.011	9.1187	0.167
		7	0.002	0.094	9.1189	0.244
		8	-0.078	-0.092	9.4039	0.309
		9	-0.110	-0.109	9.9978	0.351
		10	-0.170	-0.138	11.469	0.322
		11	-0.086	0.071	11.861	0.374
		12	-0.102	-0.013	12.435	0.411
		13	-0.106	-0.070	13.091	0.441
		14	-0.095	-0.107	13.644	0.477
		15	-0.155	-0.131	15.201	0.437
		16	-0.119	-0.002	16.171	0.441

Series LRX

Date: 05/14/25 Time: 23:57
Sample (adjusted): 1991 2023
Included observations: 33 after adjustments



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.026	-0.026	0.0242	0.876
		2	-0.407	-0.408	6.1934	0.045
		3	0.074	0.058	6.4017	0.094
		4	0.139	-0.029	7.1691	0.127
		5	0.181	0.284	8.5158	0.130
		6	0.006	0.066	8.5171	0.203
		7	-0.193	-0.028	10.179	0.179
		8	0.052	0.033	10.303	0.244
		9	-0.111	-0.327	10.895	0.283
		10	-0.088	-0.124	11.288	0.336
		11	0.212	0.047	13.655	0.253
		12	-0.166	-0.180	15.174	0.232
		13	-0.193	-0.001	17.316	0.185
		14	0.078	-0.014	17.690	0.221
		15	-0.116	-0.182	18.560	0.234
		16	0.031	0.007	18.627	0.288

Series LRM **Series LOP**

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e-ISSN: 2468-4376
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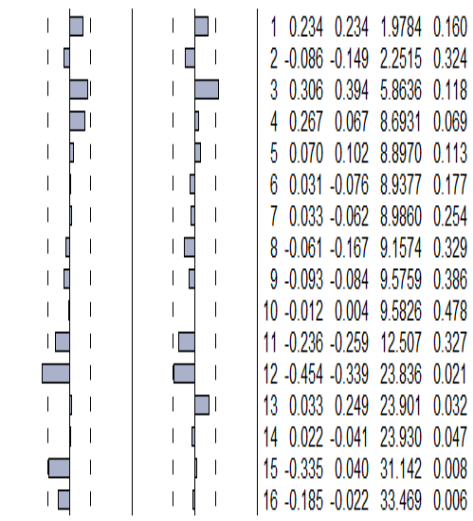
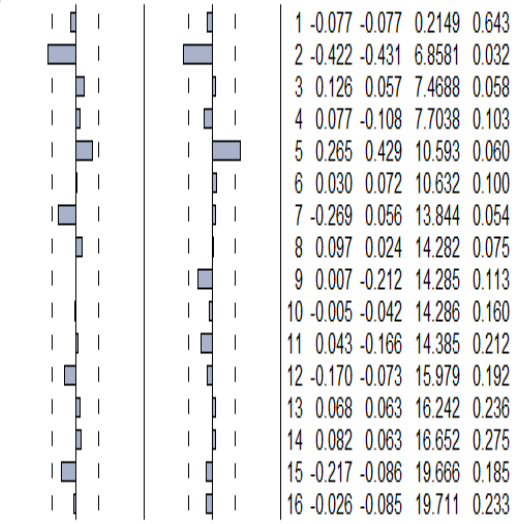
Date: 05/15/25 Time: 00:13
Sample (adjusted): 1991 2023
Included observations: 33 after adjustments



	Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
1			0.234	0.234	1.9784	0.160
2			-0.086	-0.149	2.2515	0.324
3			0.306	0.394	5.8636	0.118
4			0.267	0.067	8.6931	0.069
5			0.070	0.102	8.8970	0.113
6			0.031	-0.076	8.9377	0.177
7			0.033	-0.062	8.9860	0.254
8			-0.061	-0.167	9.1574	0.329
9			-0.093	-0.084	9.5759	0.386
10			-0.012	0.004	9.5826	0.478
11			-0.236	-0.259	12.507	0.327
12			-0.454	-0.339	23.836	0.021
13			0.033	0.249	23.901	0.032
14			0.022	-0.041	23.930	0.047
15			-0.335	0.040	31.142	0.008
16			-0.185	-0.022	33.469	0.006

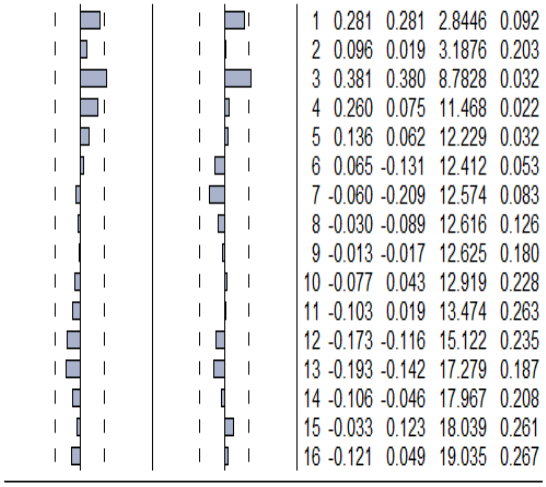
Date: 05/15/25 Time: 00:16
Sample (adjusted): 1991 2023
Included observations: 33 after adjustments



	Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
1			-0.077	-0.077	0.2149	0.643
2			-0.422	-0.431	6.8581	0.032
3			0.126	0.057	7.4688	0.058
4			0.077	-0.108	7.7038	0.103
5			0.265	0.429	10.593	0.060
6			0.030	0.072	10.632	0.100
7			-0.269	0.056	13.844	0.054
8			0.097	0.024	14.282	0.075
9			0.007	-0.212	14.285	0.113
10			-0.005	-0.042	14.286	0.160
11			0.043	-0.166	14.385	0.212
12			-0.170	-0.073	15.979	0.192
13			0.068	0.063	16.242	0.236
14			0.082	0.063	16.652	0.275
15			-0.217	-0.086	19.666	0.185
16			-0.026	-0.085	19.711	0.233

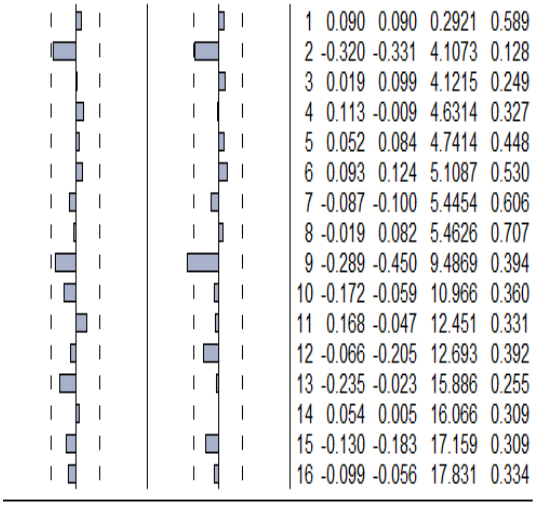
Series LEXCH **Series LPOIL**

Date: 05/15/25 Time: 00:14
Sample (adjusted): 1991 2023
Included observations: 33 after adjustments



	Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
1			0.281	0.281	2.8446	0.092
2			0.096	0.019	3.1876	0.203
3			0.381	0.380	8.7828	0.032
4			0.260	0.075	11.468	0.022
5			0.136	0.062	12.229	0.032
6			0.065	-0.131	12.412	0.053
7			-0.060	-0.209	12.574	0.083
8			-0.030	-0.089	12.616	0.126
9			-0.013	-0.017	12.625	0.180
10			-0.077	0.043	12.919	0.228
11			-0.103	0.019	13.474	0.263
12			-0.173	-0.116	15.122	0.235
13			-0.193	-0.142	17.279	0.187
14			-0.106	-0.046	17.967	0.208
15			-0.033	0.123	18.039	0.261
16			-0.121	0.049	19.035	0.267

Date: 05/22/25 Time: 01:52
Sample (adjusted): 1991 2023
Included observations: 33 after adjustments



	Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
1			0.090	0.090	0.2921	0.589
2			-0.320	-0.331	4.1073	0.128
3			0.019	0.099	4.1215	0.249
4			0.113	-0.009	4.6314	0.327
5			0.052	0.084	4.7414	0.448
6			0.093	0.124	5.1087	0.530
7			-0.087	-0.100	5.4454	0.606
8			-0.019	0.082	5.4626	0.707
9			-0.289	-0.450	9.4869	0.394
10			-0.172	-0.059	10.966	0.360
11			0.168	-0.047	12.451	0.331
12			-0.066	-0.205	12.693	0.392
13			-0.235	-0.023	15.886	0.255
14			0.054	0.005	16.066	0.309
15			-0.130	-0.183	17.159	0.309
16			-0.099	-0.056	17.831	0.334

Appendix (2): Determination of Lag Lengths Appendix (3): Cointegration Test

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VAR Lag Order Selection Criteria
Endogenous variables: GW DLRX DLRM DLPOIL DLOP DLEXCH DUM
Exogenous variables: C
Date: 05/18/25 Time: 12:40
Sample: 1990 2023
Included observations: 32

Lag	LogL	LR	FPE	AIC	SC	HQ
0	82.52644	NA	2.10e-11	-4.720403	-4.399773*	-4.614123
1	147.3068	97.17051*	8.46e-12*	-5.706674*	-3.141636	-4.856436*

* 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
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Date: 05/25/25 Time: 11:26
Sample (adjusted): 1993 2023
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: GW DLRX DLRM DLEXCH DLOP DLPOIL DUM
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.804040	161.5020	125.6154	0.0001
At most 1 *	0.684319	110.9768	95.75366	0.0030
At most 2 *	0.592861	75.23300	69.81889	0.0173
At most 3	0.553396	47.37637	47.85613	0.0554
At most 4	0.423531	22.38783	29.79707	0.2774
At most 5	0.150341	5.311980	15.49471	0.7748
At most 6	0.008398	0.261447	3.841465	0.6091

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Appendix (4): Bounds Test

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	9.292358	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99
Actual Sample Size	32	Finite Sample: n=35		
		10%	2.254	3.388
		5%	2.685	3.96
		1%	3.713	5.326
		Finite Sample: n=30		
		10%	2.334	3.515
		5%	2.794	4.148
		1%	3.976	5.691

Appendix (5): ARDL Model Estimation

Dependent Variable: GW
Method: ARDL
Date: 05/20/25 Time: 14:24
Sample (adjusted): 1992 2023
Included observations: 32 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): DLRX DLRM DLOP DLEXCH DLPOIL DUM
Fixed regressors: C
Number of models evaluated: 64
Selected Model: ARDL(1, 0, 1, 0, 1, 0, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GW(-1)	0.326249	0.166265	1.962220	0.0625
DLRX	14.47994	3.428993	4.222797	0.0004
DLRM	12.10819	5.359794	2.259077	0.0341
DLRM(-1)	4.638775	3.064801	1.513565	0.1444
DLOP	-12.58812	11.24053	-1.119887	0.2748
DLEXCH	-8.721975	5.144315	-1.695459	0.1041
DLEXCH(-1)	5.747881	2.582468	2.225732	0.0366
DLPOIL	-10.85654	2.499340	-4.343762	0.0003
DUM	0.346285	0.938453	0.368996	0.7157
C	1.139510	0.929529	1.225901	0.2332

R-squared	0.726136	Mean dependent var	2.765625
Adjusted R-squared	0.614100	S.D. dependent var	2.321930
S.E. of regression	1.442403	Akaike info criterion	3.820804
Sum squared resid	45.77156	Schwarz criterion	4.278847
Log likelihood	-51.13287	Hannan-Quinn criter.	3.972632
F-statistic	6.481302	Durbin-Watson stat	1.797177
Prob(F-statistic)	0.000171		

*Note: p-values and any subsequent tests do not account for model selection.

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Appendix (6): Error Correction Methodology ECM Test

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GW(-1))	-0.173094	0.087638	-1.975093	0.0699
D(LRX)	6.664312	2.414323	2.760323	0.0162
D(LRM)	9.919451	2.838889	3.494131	0.0040
D(LRM(-1))	13.20706	2.945872	4.483243	0.0006
D(LEXCH)	-4.029568	2.941921	-1.369706	0.1940
D(LEXCH(-1))	6.448812	1.804710	3.573323	0.0034
D(LOP)	-12.57992	5.660439	-2.222429	0.0446
D(LOP(-1))	-8.424657	2.964824	-2.841537	0.0139
D(LPOIL)	-3.635397	2.212690	-1.642976	0.1243
D(DUM)	-1.217521	1.143218	-1.064994	0.3063
D(DUM(-1))	-5.857639	1.376107	-4.256674	0.0009
CointEq(-1)*	-0.556430	0.077169	-7.210494	0.0000

R-squared	0.899016	Mean dependent var	0.165625
Adjusted R-squared	0.843475	S.D. dependent var	2.673479
S.E. of regression	1.057714	Akaike info criterion	3.230093
Sum squared resid	22.37516	Schwarz criterion	3.779744
Log likelihood	-39.68148	Hannan-Quinn criter.	3.412286
Durbin-Watson stat	1.794188		