Theoretical and Applied Economics
Volume XXXI (2024), No. 3(640), Autumn, pp. 15-36

Analyzing the impact of oil price fluctuations on economic growth in Algeria: an empirical study

Youssouf HADJI
University of Ahmed Draia – Adrar, Algeria
hadji.youcef@univ-adrar.edu.dz
Abdessamed BEN ABDERRAHMANE
University of Ahmed Draia – Adrar, Algeria
abdessamed.benabderrahmane@univ-adrar.edu.dz

Abstract. *This study examines the effect of oil price fluctuations on economic growth in Algeria from 1973 to 2023. Using the Autoregressive Distributed Lag (ARDL) model and the Zivot-Andrews (ZA) structural break test for unit roots, the results confirm a long-run relationship between the variables. A 1% increase in oil prices is associated with a significant 1.05% rise in economic growth. However, the model also reveals a delayed negative impact from lagged oil price changes, indicating that price volatility can lead to economic instability. These findings underscore the critical importance of oil price stability for sustainable economic development in Algeria.*

Keywords: Oil Prices, Economic Growth, Zivot-Andrews Test, ARDL Cointegration, Algeria.

JEL Classification: Q43, O13, F43.

1. Introduction

The impact of oil price fluctuations on economic growth has been a topic of extensive study, as oil is a critical input for modern economies. The relationship between oil prices and economic growth is complex and multifaceted, encompassing various theories and empirical observations. This narrative will delve into the theoretical frameworks, channels of influence, the distinction between oil-exporting and oil-importing countries, and a comprehensive literature review that synthesizes findings from numerous significant studies. The study of oil price fluctuations and their impact on economic growth is grounded in several theoretical frameworks. One prominent theory is the supply-side economics perspective, which posits that changes in oil prices directly affect production costs. According to this view, an increase in oil prices raises the cost of production, leading to higher prices for goods and services, and ultimately dampening economic growth. Contrarily, a decrease in oil prices can lower production costs, stimulate economic activity, and boost growth (Agboola, Chowdhury and Yang, 2024). Another foundational theory is the demand-side perspective, which focuses on how oil price changes influence consumer and investment demand. Higher oil prices can reduce disposable income and increase the cost of energy and transportation, thereby lowering consumption and investment (Gadea, Gómez-Loscos, and Montañés, 2016; Akinsola and Odhiambo, 2020).

Oil price fluctuations can affect economic growth through various channels. One such channel is the production cost channel, where changes in oil prices influence the cost structure of firms, particularly those heavily reliant on energy inputs. This, in turn, affects their output, pricing strategies, and profitability (Taghizadeh-Hesary and Yoshino, 2015). Inflation is another critical channel, as oil price increases can lead to higher overall price levels, affecting purchasing power and consumption patterns. Additionally, oil price volatility can lead to uncertainty and affect investment decisions, with businesses potentially delaying or canceling planned investments due to unpredictable future costs. Furthermore, oil price changes can impact government budgets, particularly in oil-exporting countries where oil revenues constitute a significant portion of public revenue. Fluctuations in these revenues can lead to fiscal instability and affect public investment and spending (Idrisov, Kazakova and Polbin, 2015). The distinction between oil-exporting and oil-importing countries is crucial in understanding the differential impact of oil price fluctuations. In oil-exporting countries, higher oil prices typically boost economic growth by increasing export revenues and improving trade balances. These revenues can be used to fund public spending and investment, further stimulating the economy. Conversely, oil-importing countries often experience a negative impact from rising oil prices, as these increase import bills and can lead to trade deficits (Akinsola and Odhiambo, 2020; Deyshappriya, Rukshan, and Padmakanthi, 2023). The differential impact underscores the importance of considering the specific economic context of each country when analyzing the effects of oil price changes.

The literature on the relationship between oil prices and economic growth is extensive and diverse. The seminal work by Hamilton (1983) was one of the first to document the significant impact of oil price shocks on the US economy, highlighting that oil price increases were followed by recessions (Charfeddine, Klein and Walther, 2020b). This study

laid the groundwork for numerous subsequent analyses. For instance, the work of Barsky and Kilian (2004) explored the historical role of oil price shocks in economic fluctuations, concluding that such shocks had significant macroeconomic consequences. Similarly, Blanchard and Gali (2007) examined the changing impact of oil price shocks over time, noting that while the impact had diminished in recent decades, it remained non-trivial (Akinsola and Odhiambo, 2020).

Empirical analyses have further elucidated the nuanced effects of oil price changes. Studies like those by Lee, Ni, and Ratti (1995) and Bernanke, Gertler, and Watson (1997) have quantified the effects of oil price volatility on economic activity, finding that volatility often exacerbates the negative impacts of oil price increases (Deyshappriya, Rukshan and Padmakanthi, 2023). Research by Jimenez-Rodriguez and Sanchez (2005) compared the impact of oil price shocks on different countries, concluding that the effects varied significantly based on the structural characteristics of each economy. More recently, studies by Kilian and Park (2009) have incorporated advanced econometric techniques to distinguish between different types of oil price shocks and their distinct effects on economic growth. The asymmetric effects of oil price changes have also been a focus of many studies. Mork (1989) was among the first to suggest that oil price increases and decreases might have different impacts on economic growth (Jiménez-Rodríguez and Sánchez, 2005). This hypothesis has been supported by subsequent research, such as the work of Lardic and Mignon (2006), which found evidence of asymmetry in the oil price-growth relationship in both developed and developing countries (Abdelsalam, 2023). Furthermore, studies by Hamilton (2003) and Kilian (2008) have refined our understanding of the dynamics at play, suggesting that the response of economies to oil price shocks depends on various factors, including the underlying cause of the price change.

The impact of oil price fluctuations is also mediated by the institutional and policy environment. Research by Ramey and Shapiro (1998) indicated that the strategic responses of firms and policymakers could mitigate or amplify the effects of oil price changes (Abdelsalam, 2023). For instance, countries with strong monetary policy frameworks and flexible exchange rates may be better equipped to absorb oil price shocks without severe economic disruption. Additionally, the presence of energy subsidies, as examined by Coady et al. (2017), can alter the transmission mechanism of oil price changes, particularly in developing countries. The role of financial markets in transmitting the effects of oil price changes has been explored by studies like those of Sadorsky (1999) and Hamilton and Herrera (2004). These works found that oil price fluctuations could significantly affect stock and bond markets, influencing wealth and investment decisions. Moreover, recent research by Basher and Sadorsky (2006) has highlighted the spillover effects of oil price shocks on emerging markets, illustrating the global interconnectedness of financial and commodity markets. The impact of oil price fluctuations on inflation and monetary policy has also been extensively analyzed. Studies by Hooker (2002) and Blanchard and Gali (2010) have shown that oil price shocks can influence inflation expectations, complicating the task of central banks. The work by Bjørnland (2009) and others has further demonstrated that the monetary policy response to oil price shocks can significantly influence their ultimate impact on economic growth.

The heterogeneity of the impact across different sectors of the economy has been another area of interest. Kilian and Murphy (2014) found that while some industries, such as transportation and manufacturing, are highly sensitive to oil price changes, others like the service sector are less affected. This sectoral variation suggests that the overall economic impact of oil price fluctuations depends on the structural composition of the economy (Farhad Taghizadeh-Hesary, 2016). The relationship between oil prices and economic growth has also been explored from a geopolitical perspective. Studies by Berument, Ceylan, and Dogan (2010) examined how geopolitical events that affect oil supply can lead to price spikes and economic disruptions. The work of Baumeister and Peersman (2013) further highlighted the role of geopolitical tensions in driving oil market volatility and its economic consequences. More recently, the focus has shifted towards understanding the long-term implications of oil price fluctuations. Studies by Aastveit, Bjørnland, and Thorsrud (2015) have suggested that sustained high oil prices can lead to structural adjustments in the economy, such as increased investment in energy efficiency and alternative energy sources. This perspective aligns with the findings of Van de Ven and Fouquet (2017), who argued that prolonged periods of high oil prices could accelerate the transition towards a more sustainable energy system (Gadea, Gómez-Loscos and Montañés, 2016).

In conclusion, the extensive body of literature on the impact of oil price fluctuations on economic growth underscores the complexity of this relationship. While the theoretical frameworks provide a foundation for understanding the various channels of influence, empirical studies highlight the nuanced and context-dependent nature of these effects. The differential impact on oil-exporting and oil-importing countries, the asymmetric effects of price changes, and the role of institutional and policy environments are all critical factors that shape this relationship.

In the context of the Algerian economy, the impact of oil price fluctuations on economic growth is pivotal due to the country’s heavy reliance on hydrocarbon revenues. Algeria's economy is predominantly driven by its oil and gas sector, historically constituting about 60% of government revenues and 95% of export earnings (World Bank, 2023). From 1970 to 2023, the hydrocarbons sector contributed an average of 30% to the country's GDP, underscoring its significant role in shaping macroeconomic indicators (OPEC, 2022). Throughout this period, Algeria has navigated through various oil price cycles, each leaving a profound impact on its economic trajectory. The oil boom of the 1970s, characterized by prices rising to approximately $12-25 per barrel, fueled substantial economic expansion and ambitious public investment programs (IEA, 2021). Conversely, the 1986 oil price collapse, with prices plummeting below $10 per barrel, triggered severe fiscal deficits and economic contraction, highlighting the vulnerability of Algeria’s economy to external shocks. Another surge in oil prices during the 2000s significantly bolstered Algeria's fiscal position, leading to the accumulation of substantial foreign reserves, which peaked at $194 billion in 2013 (IMF, 2013). However, the subsequent downturn in oil prices after 2014, dropping to around $30 per barrel, exposed structural weaknesses, resulting in a slowdown in GDP growth from 4.0% in 2014 to 1.4% in 2019 (World Bank, 2019). This period also witnessed increased inflation rates and rising unemployment, particularly among the youth, reaching 29.5% by 2019 (ILO, 2019). Despite efforts at economic diversification, Algeria's

economy remains vulnerable to oil price volatility. The COVID-19 pandemic in 2020 exacerbated these challenges as global oil demand plummeted, causing Algerian oil revenues to decline by approximately 30% (OPEC, 2020), and GDP contracted by 5.5%, highlighting the profound impact of global oil market dynamics on national economic performance (World Bank, 2021).

The nexus between oil price fluctuations and economic growth in Algeria has been extensively examined through a multitude of econometric approaches, consistently revealing the profound influence of petroleum market dynamics on the country's macroeconomic performance. A preponderance of studies employs Vector Autoregressive (VAR) models to elucidate this relationship, with Benbouziane et al. (2022) and Benramdane (2017) demonstrating Algeria's acute susceptibility to global oil price volatility. Benramdane's findings are particularly salient, suggesting that the deleterious growth effects of oil price volatility have effectively neutralized the putative benefits of the oil boom, thereby elucidating the "resource curse" paradox in the Algerian context. This vulnerability is further corroborated by Bensafta (2022), who, through a more granular analysis, delineates the asymmetric impact of oil price shocks on various sectors of the Algerian economy. The study's revelation of the hydrocarbon sector's rapid response to price shocks (within 1-2 quarters) juxtaposed against the lagged effect on other sectors (5-7 quarters) underscores the pervasive influence of oil price fluctuations throughout the economic fabric of Algeria. Complementing these findings, Guechari (2018) and Dahmani et al. (2022) employ non-linear models to capture the nuanced, asymmetric nature of oil price effects. Their research collectively suggests that while the direct impact of oil price shocks on macroeconomic variables may be relatively constrained, the economy exhibits a heightened sensitivity to positive oil shocks, manifesting in both short-term volatility and long-term growth patterns.

The long-term ramifications of oil price fluctuations on Algeria's economic trajectory are further elucidated through cointegration analyses and global comparative studies. Laourari and Gasmi (2016), utilizing the Johansen multivariate cointegration approach, uncover a negative long-run impact of unexpected oil revenue shifts on Algeria's economic and industrial growth. This finding is contextualized within a broader regional framework by Olayungbo and Umechukwu (2022), whose global vector autoregression model highlights the asymmetric effects of oil price shocks across oil-exporting African nations, with Algeria exhibiting particularly pronounced sensitivity to positive price shocks. The heterogeneity of responses among oil-exporting economies is further emphasized by Monesa and Qazi (2013) and Berument and Ceylan (2010), whose comparative analyses underscore the idiosyncratic nature of Algeria's oil price-growth dynamics within the MENA and OPEC contexts. Abdelsalam's (2023) panel quantile regression approach offers additional granularity, delineating the dichotomous effects of oil price changes and volatility on oil-exporting versus oil-importing MENA countries, with Algeria's growth positively correlating with price increases but negatively impacted by volatility.

The literature also provides insights into the transmission mechanisms and policy implications of oil price fluctuations in Algeria. Amroun and Smaali (2022) and Lacheheb and Sirag (2019) examine the inflationary consequences of oil price shocks, revealing

asymmetric pass-through effects that necessitate nuanced policy responses. Chelghoum, Boumimez, and Alsamara (2023) elucidate the role of money demand as a conduit for oil price shocks, highlighting the imperative for monetary policy calibration in light of asymmetric oil price-money demand dynamics. Sadeghi (2017) and Rotimi and Ngalawa (2017) underscore the significance of fiscal policy and government size in modulating the economy's response to oil price shocks, while Bouchaour and Al-Zeaud (2012) provide a long-term perspective on the multifaceted impacts of oil price distortions on various macroeconomic indicators. Collectively, these studies underscore the critical need for economic diversification, as articulated by Moawad Ahmed (2016), to mitigate Algeria's vulnerability to oil price volatility and achieve sustainable economic growth. The consensus emerging from this corpus of research is clear: Algeria's heavy reliance on hydrocarbon revenues engenders significant macroeconomic instability, necessitating a comprehensive strategy of economic diversification and judicious fiscal and monetary policies to navigate the vicissitudes of global oil markets.

From a historical perspective, studies have shown that fluctuations in oil prices between 1970-2023 were linked to significant disruptions in Algeria's GDP growth rate, highlighting the strong correlation between the country’s economic performance and global energy markets. This historical sensitivity to oil price volatility continues to be relevant, as indicated by recent economic data and future projections. The World Bank's Spring 2024 Algeria Economic Update reported a robust 4.1% GDP growth in 2023, driven by strong performances across both hydrocarbon and non-hydrocarbon sectors, with record-high natural gas production mitigating the impact of declining crude oil production due to voluntary OPEC quota reductions (World Bank Group, 2024). However, despite this positive performance, Fitch Solutions has projected a slowdown in economic growth from 2.9% in 2023 to 1.8% in 2024, primarily due to anticipated reductions in hydrocarbon production resulting from OPEC+ quotas, aging oil fields, and insufficient investment in new capacity (Fitch Solutions, 2024). This contrast between recent growth and future projections underscores a key challenge for Algeria: while the country has demonstrated resilience and growth, particularly within its hydrocarbon sector, it remains highly vulnerable to external factors, particularly fluctuations in global oil prices. This ongoing vulnerability accentuates the urgent need for economic diversification and structural reforms to ensure sustainable growth amidst the volatility of global energy markets.

Collectively, these studies present a multifaceted view of how oil price volatility affects Algeria's economic landscape. The incorporation of both historical and contemporary analyses offers a comprehensive understanding of the complex interdependencies between oil prices and economic growth in Algeria, underscoring the necessity for strategic economic diversification and robust fiscal policies to cushion against global oil market fluctuations. The remainder of this paper is structured as follows: Section 2 elaborates on the research methodology, while Section 3 presents the empirical results accompanied by a thorough discussion.

2. Research Methodology

2.1. Model Specification

For this study, an econometric model has been developed to examine the impact of oil price fluctuations on economic growth in Algeria. The model employs the logarithm of GDP per capita (LNGDPPC) as the dependent variable, reflecting economic growth. The independent variables include the logarithm of nominal oil prices (LNOP), Broad Money to GDP Ratio (LNM2), inflation rate (LNIR), nominal exchange rate of the Algerian dinar against the US dollar (LNER), and trade openness (LNTO). The model is specified as follows:

$$LNGDPPC_t = \beta_0 + \beta_1 LNOP_t + \beta_2 LNM2_t + \beta_3 LNIR_t + \beta_4 LNER_t + \beta_5 LNTO_t + \varepsilon_t$$

where: $LNGDPPC$ is the natural logarithm of GDP per capita at time \(t), $LNOP_t$ is the natural logarithm of oil prices at time (t), $LNM2_t$ is the natural logarithm of money supply at time \(t), $LNIR_t$ is the natural logarithm of the inflation rate at time (t), $LNER_t$ is the natural logarithm of the exchange rate at time \(t), $LNTO_t$ is the natural logarithm of trade openness at time \(t), β_0 is the intercept term, β_1, \$\beta_2$, β_3, \$\beta_4$, \$\beta_5$ are the coefficients of the independent variables, ε_t represents the error term.

2.2. Data

The study utilizes annual time series data spanning from 1970 to 2023. The data for all variables, except oil prices, have been sourced from the World Bank database. The data on oil prices has been obtained from the OPEC database. The use of a comprehensive dataset over an extended period facilitates a robust analysis of long-term trends and relationships.

2.3. Estimation Technique

The Autoregressive Distributed Lag (ARDL) bounds testing approach will be employed to examine the cointegration relationship among the variables. This method is suitable given the mixed order of integration of the variables (I(0) and I(1)). The ARDL model specification will allow for the assessment of both short-term dynamics and long-term equilibrium relationships.

2.4. Unit Root Test

To ensure the reliability of our econometric analysis, we begin by examining the stationarity of the time series data using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. These tests are crucial for identifying the presence of a unit root in the series, which indicates non-stationarity. The ADF test, an extension of the Dickey-Fuller test, accounts for higher-order autocorrelation by adding lagged difference terms of the dependent variable, thereby stabilizing the error term. Complementing this, the PP test addresses serial correlation and heteroskedasticity in the error terms by employing a non-parametric correction, making it robust to a broader range of issues encountered in real-world data. Both tests are applied to the series in levels and first differences to determine whether the series are integrated of order zero, I(0), or one, I(1). The outcomes of these tests form the foundation for further analysis, guiding us toward appropriate modeling techniques.

While the ADF and PP tests provide initial insights into the stationarity properties of the data, they may be limited in their ability to detect structural breaks, which are common in macroeconomic time series due to events like oil price shocks or policy changes. To address this, we incorporate the Zivot-Andrews test, which allows for an endogenous determination of a single structural break in the series. This test enhances the robustness of our analysis by acknowledging potential shifts in the underlying data-generating process. By integrating the Zivot-Andrews test, we ensure a more comprehensive understanding of the stationarity characteristics of our time series, thereby refining the econometric modeling of the relationship between oil price fluctuations and economic growth in Algeria.

2.5. ARDL Approach

The Autoregressive Distributed Lag (ARDL) model, introduced by Pesaran and Shin (1997) and later expanded by Pesaran, Shin, and Smith (2001), has been widely employed in econometric analyses to explore both short and long-run dynamics among variables irrespective of whether the underlying variables are I(0), I(1), or fractionally integrated (Narayan, 2005). This flexibility makes the ARDL model particularly suitable for our study on the impact of oil price fluctuations on economic growth in Algeria. In our research, the dependent variable is the natural log of GDP per capita (LNGDPPC). The independent variables include oil prices along with several control variables. These comprise the natural logarithms of oil prices (LNOP), money supply (LNM2 - proxied as M2), inflation rates (LNIR), nominal exchange rates (LNER), and trade openness (LNTO). These variables are selected based on their theoretical and empirical relevance to economic growth, particularly in an oil-dependent economy such as Algeria. The functional form of the ARDL model can be expressed as:

$$\begin{aligned}\Delta LNGDPPC_t = {} & \alpha_0 + \sum_{i=1}^{p} \alpha_i LNGDPPC_{t-i} + \sum_{j=0}^{Q_1} \beta_j \Delta LNOP_{t-j} + \sum_{k=0}^{Q_2} \gamma_k \Delta LNM2_{t-k} \\ & + \sum_{n=0}^{Q_3} \delta_n \Delta LNIR_{t-n} + \sum_{m=0}^{Q_4} \vartheta_m \Delta LNER_{t-m} + \sum_{\rho=0}^{Q_5} \theta_w \Delta LNTO_{t-\rho} \\ & + \varphi_1 LNGDPPC_{t-1} + \varphi_2 OP + \varphi_3 LNM2_{t-1} + \varphi_4 LNIR_{t-1} + \varphi_5 LNER_t \\ & + \varphi_6 LNTO_t + \varepsilon_t\end{aligned}$$

where Δ denotes the first difference operator, and \(p, Q_1, Q_2, Q_3, Q_4, Q_5\) are the optimal lag lengths determined by information criteria such as AIC or BIC.

The ARDL bounds testing approach encompasses several key steps: First, the unrestricted error correction model (UECM) is estimated using ordinary least squares (OLS). Next, a bound test for cointegration is conducted using an F-test to determine the joint significance of the lagged level variables (i.e.,Q_1, Q_2, Q_3, Q_4, Q_5).The null hypothesis (H_0: $Q_1 = Q_2 = Q_3 = Q_4 = Q_5 = 0$) of no long-run relationship is tested against the alternative hypothesis (H_1: $Q_1 \neq Q_2 \neq Q_3 \neq Q_4 \neq Q_5 \neq 0$). The computed F-statistic is then compared with critical value bounds provided by Pesaran et al. (2001) to determine the presence of a cointegrating relationship. If the F-statistic exceeds the upper bound, we reject the null hypothesis, confirming the presence of a cointegrating relationship (Narayan, 2004). If it

falls below the lower bound, we fail to reject the null hypothesis. If it lies between the bounds, the test is inconclusive. If cointegration is established, the analysis proceeds in two key steps. First, the long-run equation is derived by extracting the long-run coefficients from the specified ARDL model, normalizing on LNGDPPC (the natural log of GDP per capita). This equation reveals the long-term relationships between the dependent variable and the independent variables. Second, the short-run dynamics are examined, which are captured by the coefficients of the first-differenced variables in the ARDL model. Crucially, this short-run model includes an error correction term (ECT), which represents the speed at which the system adjusts to restore long-run equilibrium following a short-term shock. The ECT coefficient indicates how quickly deviations from the long-run equilibrium are corrected, providing insight into the stability and adjustment process of the economic system under study.

The ARDL model's strength lies in its ability to handle variables integrated of different orders (I(0) and I(1)), thereby avoiding the pre-testing problems associated with traditional cointegration techniques. This ensures the robustness and reliability of the inferred relationships between oil prices, monetary variables, interest rates, exchange rates, trade openness, and economic growth. On the other hand, the ARDL approach provides a comprehensive framework to analyze the dynamic interactions between oil price fluctuations and economic growth in Algeria, capturing both short-term adjustments and long-term equilibrium relationships, thereby enhancing the empirical robustness of our study.

2.6. Diagnostic Tests

For ensuring the robustness of the econometric model, several diagnostic tests will be conducted, including tests for serial correlation (Breusch-Godfrey Serial Correlation LM Test), heteroskedasticity (Breusch-Pagan test), and normality of residuals (Jarque-Bera test). Additionally, the stability of the long-run coefficients will be tested using the CUSUM and CUSUMSQ tests as outlined in Pesaran et al. (2001).

3. Empirical results and discussion

Table 1. *Descriptive Statistics of Study Variables*

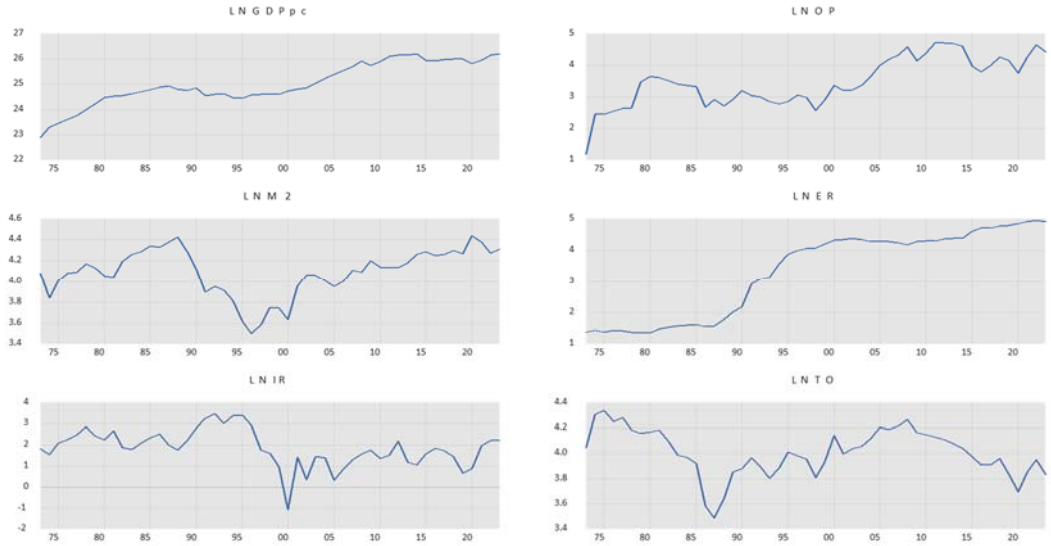
	LNGDPPC	LNOP	LNM2	LNER	LNIR	LNTO
Mean	25.01038	3.471777	4.089401	3.308472	1.859691	4.007527
Median	24.80779	3.359264	4.123436	4.073103	1.820159	3.998745
Maximum	26.20349	4.726680	4.441142	4.955792	3.455359	4.339309
Minimum	22.88749	1.190888	3.496684	1.344808	-1.081274	3.486904
Std. Dev.	0.840611	0.769083	0.224925	1.374080	0.859680	0.184357
Skewness	-0.292769	-0.199840	-0.778561	-0.421154	-0.580137	-0.542707
Kurtosis	2.482512	2.876144	3.088871	1.416740	4.414350	3.227400
Jarque-Bera	1.297629	0.372056	5.169125	6.834410	7.111566	2.613395
Observations	51	51	51	51	51	51

Source: Authors' Calculation.

Analyzing the statistical data on oil price fluctuations and economic growth in Algeria reveals that the Algerian economy experiences significant volatility due to its heavy reliance on oil revenues. The data indicates that oil prices vary greatly, with a range between 1.190888 and 4.726680, reflecting drastic fluctuations driven by geopolitical

tensions and global economic changes. Concurrently, the GDP growth rate per capita ranges between 22.88749 and 26.20349, suggesting that while economic growth in Algeria is notably influenced by these fluctuations, it demonstrates some resilience. A crucial measure in understanding this volatility is the standard deviation, which quantifies the extent of dispersion in the data. High standard deviation in oil prices signifies substantial volatility, and this directly impacts the overall economic stability. For instance, the standard deviation of oil prices and GDP growth rates highlights the irregularity and unpredictability in these metrics, underscoring the economic vulnerability tied to oil dependency.

Figure 1. *Annual Trends of Study Variables*



Source: Authors' Calculation.

Furthermore, Table 2 presents the correlation matrix, which delineates the nature and strength of the relationships between the variables under investigation, as detailed in the subsequent table.

Table 2. *Correlation Matrix of Economic Variables*

	LNGDPPC	LNOP	LNM2	LNER	LNIR	LNTO
LNGDPPC	1					
LNOP	0.9109	1				
LNM2	0.4194	0.3483	1			
LNER	0.7709	0.6405	-0.0922	1		
LNIR	-0.3268	-0.3254	-0.0479	-0.4340	1	
LNTO	-0.2102	0.1317	-0.3148	-0.0886	-0.1630	1

Source: Authors' Calculation.

The correlation analysis reveals crucial dynamics affecting economic growth (LNGDPPC) in Algeria. A strong positive correlation (0.91) between oil prices (LNOP) and per capita GDP highlights the essential role of oil revenues in driving economic performance. Additionally, a moderate positive correlation (0.77) with the money supply to GDP ratio (LNM2) underscores the importance of liquidity in supporting growth. Conversely, the

negative correlation with the nominal exchange rate (LNER) (-0.33) suggests that a stronger dinar may impede competitiveness, while the negative relationship with the inflation rate (LNIR) (-0.21) points to the adverse effects of rising inflation on economic stability. Lastly, a weak negative correlation with total trade to GDP ratio (LNTO) (-0.16) indicates potential vulnerabilities linked to external trade reliance. Collectively, these insights emphasize the intricate relationships between oil prices, monetary policy, exchange rates, and inflation, underscoring the need for targeted policy interventions to promote sustainable economic growth in Algeria.

Table 3. *ADF and PP Unit Root Tests*

	Augmented Dickey-Fuller (ADF) Test			Phillips-Perron (PP) test			
Variable	M(5)	M(6)	M(4)	M(5)	M(6)	M(4)	Conclusion
LNGDPPC	0.0714	0.2370	0.9997	0.1544	0.2013	0.9961	Nanstationary
D (LNGDPPC)	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000	Stationary
LNOP	0.0459	0.0534	0.8743	0.0463	0.0397	0.8850	Stationary
D (LNOP)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-
LNM2	0.5076	0.7524	0.7483	0.5076	0.7524	0.7480	Nanstationary
D (LNM2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Stationary
LNER	0.7757	0.4900	0.9605	0.7994	0.8485	0.9743	Nanstationary
D (LNER)	0.0000	0.0046	0.0977	0.0004	0.0029	0.0002	Stationary
LNIR	0.0386	0.0755	0.2359	0.0375	0.0687	0.2359	Stationary
D (LNIR)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-
LNTO	0.2882	0.5481	0.5477	0.2548	0.4520	0.5387	Nanstationary
D (LNTO)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Stationary

Note M(6): refers to the model with a constant and trend; **M(5)**: refers to the model with a constant; **M(4)**: refers to the model without a constant and trend; **D** denotes the first difference.
Source: Authors' Calculation.

The results of both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests for unit roots indicate that the variables LNOP and LNIR are stationary at level (I(0)), while the remaining variables, namely LNRGDPPC, LNM2, LNIER, and LNTO, become stationary after differencing, suggesting they are integrated of order one (I(1)). This consistent finding across both tests highlights that further analysis, such as cointegration tests, is necessary to understand the long-term relationships between these variables. Given these results, employing the Autoregressive Distributed Lag (ARDL) methodology would be appropriate to analyze the impact of oil price fluctuations on economic growth in Algeria and to capture the short and long-term relationships between the model variables.

Table 4. *Zivot-Andrews Test for Unit Roots with One Structural Break*

Variable	Break Year	Test Statistic	5% Critical Value	p-Value	Lags (k)	Stationarity
lnGDPPC	2003	-4.352	-4.93	0.0003	4	Stable with structural break
lnOP	2004	-5.014	-5.08	0.001	3	Trend-stationary
lnM2	1990	-5.019	-4.93	0.0009	2	Trend-stationary
lnER	1991	-5.217	-4.93	0.0002	1	Trend-stationary
lnIR	1997	-5.966	-5.08	0.0005	3	Trend-stationary
lnTO	1999	-2.535	-5.08	0.058189	2	Non-stationar

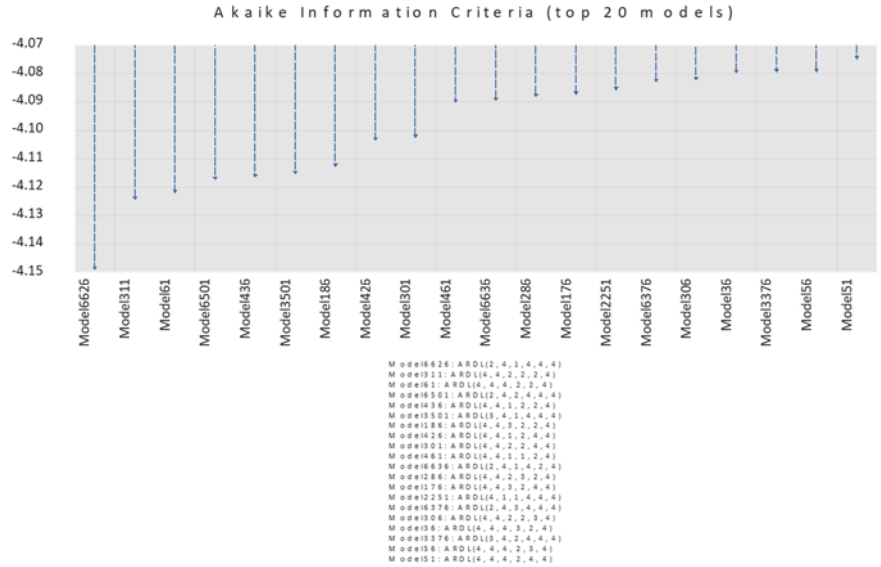
Source: Authors' Calculation.

The Zivot-Andrews tests for Algeria's economic indicators reveal varying degrees of stability. The log per capita GDP shows stability with a structural break in 2003, while the log oil price series (LNOP) is trend-stationary with a break in 2004. The log money supply (LNM2) is trend-stationary with a structural break in 1990, and the nominal exchange rate

(LNER) against the USD is trend-stationary with a break in 1991. The inflation rate (LNIR) is also trend-stationary with a structural break in 1997. However, the trade openness index (LNTO) fails to reject the null hypothesis of a unit root with a structural break in 1999, indicating non-stationarity.

The Zivot-Andrews test results for various economic indicators of Algeria reveal important structural breaks that align with significant economic and political events. The test identifies a structural break in Algeria's log per capita GDP in 2003, likely due to major economic reforms, increased oil revenues, and macroeconomic policies focused on infrastructure and diversification. For the log oil price series (LNOP), a structural break in 2004 corresponds to substantial oil market fluctuations and geopolitical events, alongside government efforts to better manage oil revenues. The log money supply (LNM2) shows a structural break in 1990, reflecting critical economic adjustments and policy shifts during Algeria's transition towards a market economy amidst high inflation. The nominal exchange rate (LNER) against the USD breaks structurally in 1991, in response to the liberalization of exchange rates and significant political changes. The Zivot-Andrews test for Algeria's inflation rate (LNIR) indicates a structural break in 1997, associated with important policy changes and economic events impacting inflation dynamics. Lastly, the 1999 break in trade openness suggests changes in trade policies linked to the rise in oil prices and oil exports, highlighting the significance of the oil sector in the national economy and its impact on governmental trade policies. This notable shift in trade openness in 1999 indicates a reevaluation of the country's official trade policies during that period. The government responded to the substantial impact of high oil prices and exports by revising its trade policies to enhance Algeria's benefits from these economic strengths. However, the series remains non-stationary, indicating persistent effects from external shocks.

Figure 2. *Results of the Optimal ARDL Model Selection*



Source: Authors' Calculation.

The model selection criteria table reveals that the ARDL(2, 4, 1, 4, 4, 4) model stands out as the best fit for the LNGDPPC data from 1973 to 2023, evidenced by its lowest AIC (-4.148410) and BIC (-3.164289) values. This indicates that this model strikes the optimal balance between goodness-of-fit and complexity, outperforming other tested models. The significantly lower AIC and BIC values suggest superior predictive performance and suitability for capturing the underlying economic dynamics in the given dataset. Consequently, Model (ARDL(2, 4, 1, 4, 4, 4)) is identified as the most effective model for capturing the relationship between oil price fluctuations and economic growth in Algeria, ensuring reliability and precision in the analysis.

Table 5. *Bounds test results*

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significance	Lower bound value	Upper bound value
F-statistic	14.70086	10%	2.08	3
		5%	2.39	3.38
k	5	2.5%	2.7	3.73
		1%	3.06	4.15

Source: Authors' Calculation.

Additionally, the ARDL bound test for cointegration among these variables is conducted. The results of the F-Bounds Test indicate a strong evidence of a long-run relationship among the variables under consideration. The computed F-statistic is 14.70086, which significantly exceeds the upper critical value of 3.38 at the 5% significance level and also exceeds the critical values at the 1% level (4.15).

Table 6. *Estimated Long-Run Coefficients of ARDL (2, 4, 1, 4, 4, 4) Model*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNOP	1.046863	0.115607	9.055392	0.0000
LNM2	-1.086112	0.522436	-2.078937	0.0495
LNER	-0.081623	0.090524	-0.901665	0.3770
LNIR	-0.048831	0.091616	-0.532998	0.5994
LNTO	-1.472959	0.334445	-4.404186	0.0002
C	32.94698	3.344128	9.852189	0.0000

Source: Authors' Calculation.

The long-term estimation results of the ARDL model reveal significant interactions between various economic determinants and the economic growth (LNGDPPC) in Algeria. The findings indicate that oil prices (LNOP) exhibit a robust positive correlation with economic growth, evidenced by a coefficient of 1.0469. This observation is congruent with established research, including seminal works by Hamilton (1983) and Kilian (2009). Such alignment underscores the considerable influence of oil price fluctuations on the Algerian economy, which is predominantly oil-dependent. Conversely, the coefficient for money supply (LNM2), recorded at -1.0861, suggests a strong negative relationship, implying that expansions in money supply may adversely impact economic growth. This may reflect the challenges inherent in the Algerian monetary policy framework and its efficacy in fostering economic growth. Additionally, trade openness (LNTO) demonstrates a significant negative correlation with economic growth, with a coefficient of -1.4730. This negative association points to underlying structural weaknesses within the Algerian trade sector that hinder growth prospects. Moreover, the analysis indicates that inflation rates (LNIR) and

the exchange rate (LNER) do not exhibit statistical significance, implying a negligible or non-existent direct impact on economic growth. These outcomes are consistent with the broader economic literature, which emphasizes the high sensitivity of economies heavily reliant on oil exports to fluctuations in oil prices.

In summary, the ARDL model's long-term estimates elucidate the pivotal role of oil prices in shaping Algeria's economic trajectory, while also highlighting the complex dynamics between monetary supply, trade openness, and economic growth.

Table 7. *Estimated Short-Run Coefficients of ARDL (2, 4, 1, 4, 4, 4) Model*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Δ(LNGDPPC(-1))	-0.267487	0.105045	-2.546405	0.0184
Δ(LNOP)	0.236561	0.022980	10.29428	0.0000
Δ(LNOP(-1))	-0.014030	0.029400	-0.477224	0.6379
Δ(LNOP(-2))	-0.053155	0.021686	-2.451131	0.0227
Δ(LNOP(-3))	-0.070588	0.019223	-3.672127	0.0013
Δ(LNM2)	-0.381936	0.059179	-6.453941	0.0000
Δ(LNER)	-0.727783	0.050147	-14.51303	0.0000
Δ(LNER(-1))	-0.228073	0.090245	-2.527271	0.0192
Δ(LNER(-2))	-0.024668	0.039423	-0.625738	0.5379
Δ(LNER(-3))	-0.109026	0.036850	-2.958647	0.0073
Δ(LNIR)	0.033323	0.005623	5.926661	0.0000
Δ(LNIR(-1))	0.033272	0.008083	4.116127	0.0005
Δ(LNIR(-2))	0.012887	0.007542	1.708613	0.1016
Δ(LNIR(-3))	0.015414	0.006446	2.391233	0.0258
Δ(LNTO)	-0.192595	0.074872	-2.572322	0.0174
Δ(LNTO(-1))	0.272932	0.078284	3.486415	0.0021
Δ(LNTO(-2))	0.050989	0.068966	0.739331	0.4675
Δ(LNTO(-3))	0.342712	0.063103	5.431005	0.0000
ECT	-0.180137	0.015740	-11.44427	0.0000
R^2	0.979328	Mean dependent var		0.055427
Adj. R^2	0.966039	S.D. dependent var		0.125580
Std.Error	0.023142	Akaike info criterion		-4.403730
Sum squared resid	0.014996	Schwarz criterion		-3.655798
Log likelihood	122.4876	Hannan-Quinn criter.		-4.122278
Durbin-Watson stat	2.149484			

Note: ECT refers to the Error Correction Term, and Δ denotes the first difference
Source: Authors' Calculation.

The analysis of the ARDL Error Correction Model (ECM) reveals the intricate dynamics between oil price fluctuations and economic growth in Algeria. The immediate positive impact of oil price increases on GDP per capita growth is evident from the statistically significant coefficient of the contemporaneous change in oil prices (D(LNOP)). This positive effect underscores Algeria's heavy reliance on hydrocarbon exports as an economic driver. However, the model also uncovers a more nuanced, delayed negative impact from lagged oil price changes. Specifically, the negative coefficients for the second and third lags of oil price changes (D(LNOP(-2)) and D(LNOP(-3))) suggest that price volatility leads to economic instability in subsequent periods. This phenomenon can be attributed to the uncertainty and investment hesitancy caused by fluctuating oil revenues, which aligns with the findings of Cashin et al. (2014) and Ghalayini (2011), who have documented similar delayed adverse effects in other oil-exporting nations.

The ARDL Error Correction Model (ECM) thoroughly elucidates the short-term dynamics of oil price fluctuations on Algeria's economic growth, with GDP per capita as the dependent variable. The significant positive coefficient for contemporaneous oil price changes (D(LNOP)) corroborates the immediate stimulative effect of rising oil prices on growth, reflecting Algeria's acute reliance on hydrocarbon exports. This finding is consistent with the resource-based growth hypothesis posited by Auty (1993) and Sachs and Warner (1997), who have established the critical role of natural resources in propelling economic expansion in resource-rich nations. However, the observed negative coefficients for the two- and three-period lags of oil price changes (D(LNOP(-2)) and D(LNOP(-3))) illustrate the adverse lagged effects of oil price volatility, highlighting an inherent economic instability. This is in line with Hamilton (2003) and Kilian (2008), who have documented similar delayed negative impacts of oil price shocks on macroeconomic performance due to the resultant uncertainty and reduced investment.

Moreover, the model reveals significant negative impacts from other macroeconomic variables such as money supply (D(LNM2)) and exchange rates (D(LNER) and D(LNER(-1))). The negative relationship between money supply increases and GDP per capita growth suggests potential inflationary pressures or inefficient capital allocation within the economy. Concurrently, the adverse effects of exchange rate depreciation on economic growth resonate with the broader literature on the Dutch disease phenomenon, as highlighted by studies from economists like Sachs and Warner (1995). The model's findings are consistent with the theoretical underpinnings of resource-dependent economies, illustrating how short-term gains from oil price increases can be offset by longer-term economic vulnerabilities. These results highlight the critical need for Algeria to diversify its economic base and stabilize macroeconomic policies to mitigate the adverse impacts of oil price volatility.

Additionally, the model provides insights into the roles of inflation (D(LNIR)) and trade openness (D(LNTO)) in affecting economic growth. The positive and highly significant coefficients for both current and lagged inflation rates (D(LNIR) and D(LNIR(-1))) suggest that moderate inflation can stimulate economic growth by enhancing short-term consumer spending, a phenomenon supported by Barro (1995). In contrast, the effects of trade openness are mixed; the immediate negative impact (D(LNTO)) indicates that an initial increase in trade openness might induce competitive pressures that harm domestic industries, which is a short-term adjustment cost. Over time, however, the positive significance of lagged trade openness variables (D(LNTO(-1)) and D(LNTO(-3))) underscores the long-term benefits of global market integration, leading to enhanced efficiency and sustained growth, aligning with Frankel and Romer (1999).

The significantly negative coefficient of the error correction term (-0.180137) indicates a robust adjustment mechanism, ensuring that short-term deviations from equilibrium are corrected over time. indicating a significant speed of adjustment towards long-term equilibrium at a rate of approximately 18% per period, which is both statistically significant and indicative of a relatively swift correction mechanism in the face of disequilibrium. These results resonate with Sachs and Warner's (1995) findings on the complexities of

resource-dependent economies, emphasizing the intricate balance required in policy-making to mitigate short-term volatilities while fostering sustainable long-term growth.

Table 8. *Breusch-Godfrey Serial Correlation LM Test*

Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.959901	Prob. F(2,20)	0.3999
Obs*R-squared	4.116401	Prob. Chi-Square(2)	0.1277

Source: Authors' Calculation.

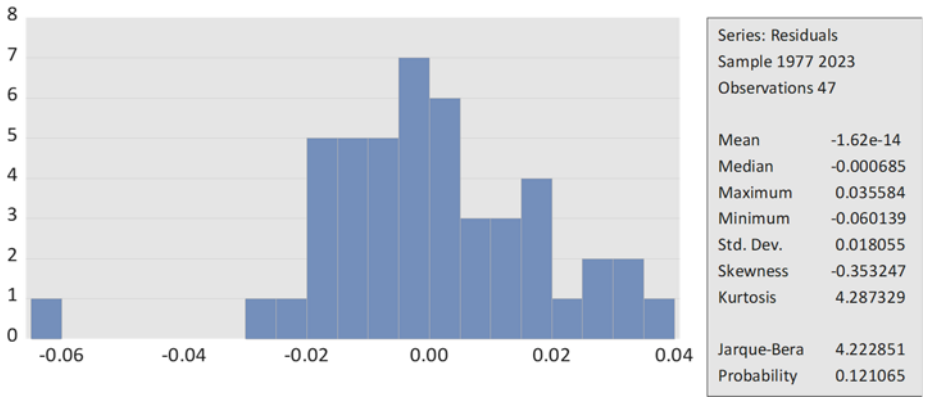
Table 9. *Heteroskedasticity Test: Breusch-Pagan-Godfrey*

Null hypothesis: Homoskedasticity			
F-statistic	0.836956	Prob. F(24,22)	0.6657
Obs*R-squared	22.43181	Prob. Chi-Square(24)	0.5535
Scaled explained SS	8.078432	Prob. Chi-Square(24)	0.9990

Source: Authors' Calculation.

The diagnostic tests for the ARDL model analyzing the impact of oil price fluctuations on Algeria's economic growth indicate a robust framework free from econometric issues. The absence of serial correlation, confirmed by the Breusch-Godfrey test, alongside the validation of homoskedasticity and normality of residuals through the Breusch-Pagan and Jarque-Bera tests, underscores the model's reliability. These findings affirm the model's suitability for accurately capturing the complex relationships at play, thereby providing a solid foundation for informed policy decisions.

Figure 3. *Histogram for Normality*



Source: Authors' Calculation.

The results of the Jarque-Bera test confirm the normality of the residuals in the ARDL model used to analyze the impact of oil price fluctuations on Algeria's economic growth. The test statistic was found to be insignificant, indicating that the residuals closely follow a normal distribution and, thus, validating one of the key assumptions underlying the model. These results are consistent with the findings of Jarque and Bera (1980), who emphasized the importance of normality in econometric modeling to maintain the integrity of hypothesis testing and confidence intervals.

The analysis of cumulative sums of recursive residuals (CUSUM) and CUSUM Squared provides a comprehensive assessment of the stability of the ARDL model examining the impact of oil price fluctuations on Algeria's economic growth.

Figure 4. *Cumulative sum of recursive residual (CUSUM) model*

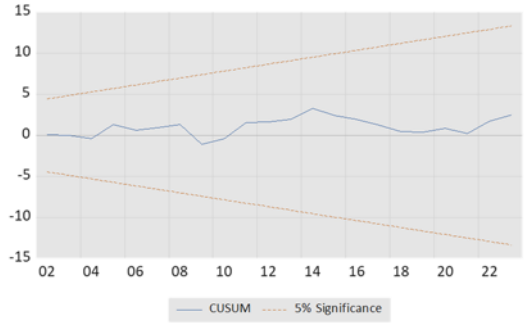
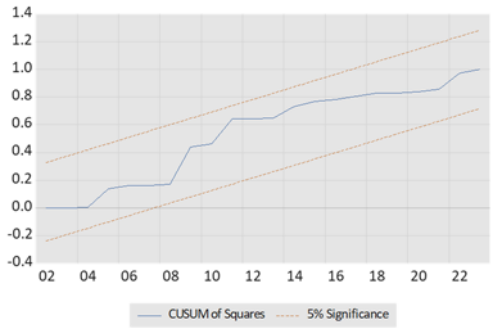


Figure 5. *Cumulative sum of recursive residual (CUSUM) of squares model*



Source: Authors' Calculation.

The application of the CUSUM and CUSUM of Squares tests confirms the stability of the autoregressive distributed lag (ARDL) model utilized to assess the short-term impact of oil price fluctuations on Algeria's economic growth. The results indicate that the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) statistics remain within the critical bounds throughout the sample period, thus validating the robustness and reliability of the model parameters over time. This empirical evidence suggests that there are no structural breaks or significant deviations, affirming the constancy of the relationship between the independent variables and economic growth. Such findings are crucial, as they underscore the model's capacity to provide consistent and accurate insights, aligning with classical stability diagnostics recommended by Brown, Durbin, and Evans (1975). Consequently, policymakers can confidently rely on the model's projections to inform economic strategies and mitigate the adverse effects of oil price volatility, ensuring sustainable economic growth.

4. Conclusion

This study rigorously examines the impact of oil price fluctuations on Algeria's economic growth using the Autoregressive Distributed Lag (ARDL) bounds testing approach. Empirical evidence from the F-Bounds Test substantiates a significant long-run relationship among the key macroeconomic variables under examination. This provides a solid foundation for further analysis of the dynamic interactions at play. The long-term ARDL model estimation reveals a robust positive correlation between oil prices and Algeria's economic growth, corroborating the extensive body of research in this domain. This observation reinforces the pivotal role of the hydrocarbon sector as a primary driver of economic progress in Algeria. The ARDL Error Correction Model (ECM) elucidates complex interactions between oil prices and economic growth.

The ARDL Error Correction Model (ECM) elucidates complex interactions between oil prices and economic growth. While immediate oil price increases positively impact GDP per capita growth, the model also unveils a more nuanced, delayed negative impact from lagged oil price changes, suggesting that price volatility can lead to economic instability in subsequent periods. The error correction model's estimates reveal an intriguing adjustment mechanism, with a statistically significant speed of adjustment towards long-term equilibrium at a rate of approximately 18% per period. This relatively swift correction process underscores the economy's inherent resilience in the face of disequilibrium, as it strives to realign its trajectory in line with the long-run equilibrium.

Conclusively, this study enriches the understanding of the intricate relationship between oil price volatility and economic growth in resource-rich nations. The insights underscore the necessity for Algeria to diversify its economic base, mitigate dependency on hydrocarbon revenues, and enhance resilience against global oil price fluctuations. This research provides a foundational analysis critical for evaluating Algeria's economic strategies and addressing its dependency on hydrocarbon revenues, thereby contributing to the broader discourse on sustainable economic development.

References

Aastveit, K.A., Bjørnland, H.C. and Thorsrud, L.A., 2015. What drives oil prices? Emerging versus developed economies. *Journal of Applied Econometrics*, 30(7), pp. 1013-1028. Available at: <https://doi.org/10.1002/jae.2406>

Abdelsalam, M.A.M., 2023. Oil price fluctuations and economic growth: The case of MENA countries. *Review of Economics and Political Science*, 8(5), pp. 353-379. Available at: <https://doi.org/10.1108/reps-12-2019-0162>

Adeosun, O.A., Tabash, M.I. and Anagreh, S., 2022. Oil price and economic performance: Additional evidence from advanced economies. *Resources Policy*, 77, p. 102666. Available at: <https://doi.org/10.1016/j.resourpol.2022.102666>

Agboola, E., Chowdhury, R. and Yang, B., 2024. Oil price fluctuations and their impact on oil-exporting emerging economies. *Economic Modelling*, 106665, p. 106665. Available at: <https://doi.org/10.1016/j.econmod.2024.106665>

Akinsola, M.O. and Odhiambo, N.M., 2020. Oil price and economic growth of oil-importing countries: A review of international literature. *Applied Econometrics and International Development*, 20(1), pp. 129-140. Available at: <https://ideas.repec.org/a/eaa/aeinde/v20y2020i1_9.html>

Amroun, W. and Smaali, F., 2022. The impact of oil price fluctuations on inflation in Algeria during the period (1990-2021). *Finance and Business Economies Review*, 6(3), pp. 21-49. Available at: <https://doi.org/10.58205/fber.v6i3.289>

Auty, R. and Warhurst, A., 1993. Sustainable development in mineral exporting economies. *Resources Policy*, 19(1), pp. 14-29.

Barro, R.J., 1995. Inflation and economic growth. *NBER Working Paper Series*, No. 5326.

Barsky, R.B. and Kilian, L., 2004. Oil and the macroeconomy since the 1970s. *The Journal of Economic Perspectives*, 18(4), pp. 115-134. Available at: <https://doi.org/10.1257/0895330042632708>

Basher, S.A. and Sadorsky, P., 2006. Oil price risk and emerging stock markets. *Global Finance Journal*, 17(2), pp. 224-251. Available at: <https://doi.org/10.1016/j.gfj.2006.04.001>

Baumeister, C. and Peersman, G., 2013. Time-varying effects of oil supply shocks on the US economy. *American Economic Journal: Macroeconomics*, 5(4), pp. 1-28. Available at: <https://doi.org/10.1257/mac.5.4.1>

Benbouziane, M., Benallal, B. and Bourdarche, C., 2021. The impact of oil price fluctuations on economic growth in Algeria: An empirical study. *The Empirical Economics Letters*, 20, pp. 63-82.

Benramdane, A., 2017. Oil price volatility and economic growth in Algeria. *Energy Sources Part B: Economics, Planning and Policy*, 12(4), pp. 338-343. Available at: <https://doi.org/10.1080/15567249.2015.1128015>

Bensafta, K.M., 2023. The impact of oil price shocks on economic growth in Algeria. *Economics and Policy of Energy and the Environment*, 2022(2), pp. 63-82. Available at: <https://doi.org/10.3280/EFE2022-002004>

Bernanke, B.S., Gertler, M., Watson, M., Sims, C.A. and Friedman, B.M., 1997. Systematic monetary policy and the effects of oil price shocks. *Brookings Papers on Economic Activity*, 1997(1), p. 91. Available at: <https://doi.org/10.2307/2534702>

Berument, M.H., Ceylan, N.B. and Dogan, N., 2010. The impact of oil price shocks on the economic growth of selected MENA countries. *Energy Journal*, 31(1), pp. 149-176. Available at: <https://doi.org/10.5547/issn0195-6574-ej-vol31-no1-7>

Bjørnland, H.C., 2009. Oil price shocks and stock market booms in an oil exporting country. *Scottish Journal of Political Economy*, 56(2), pp. 232-254. Available at: <https://doi.org/10.1111/j.1467-9485.2009.00482.x>

Blanchard, O. and Galí, J., 2010. The macroeconomic effects of oil price shocks: Why are the 2000s so different from the 1970s? In: *International Dimensions of Monetary Policy*. NBER, pp. 373-421.

Blanchard, O. and Galí, J., 2007. The macroeconomic effects of oil shocks: Why are the 2000s so different from the 1970s? Cambridge, MA: National Bureau of Economic Research.

Bouchaour, C. and Al-Zeaud, H.A., 2012. Oil price distortion and their impact on Algerian macroeconomics. *International Journal of Business and Management*, 7(18), pp. 24-36.

Brown, R.L., Durbin, J. and Evans, J.M., 1975. Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, 37(2), pp. 149-163. Available at: <https://doi.org/10.1111/j.2517-6161.1975.tb01532.x>

Cashin, P., Mohaddes, K., Raissi, M. and Raissi, M., 2014. The differential effects of oil demand and supply shocks on the global economy. *Energy Economics*, 44, pp. 113-134.

Charfeddine, L., Klein, T. and Walther, T., 2020. Reviewing the oil price – GDP growth relationship: A replication study. *Energy Economics*, 88(104786), p. 104786. Available at: <https://doi.org/10.1016/j.eneco.2020.104786>

Chelghoum, A., Boumimez, F. and Alsamara, M., 2023. Asymmetric effects of oil price shocks on the demand for money in Algeria. *The Quarterly Review of Economics and Finance*, 89, pp. 1-11. Available at: <https://doi.org/10.1016/j.qref.2023.02.009>

Coady, D., Parry, I., Sears, L. and Shang, B., 2017. How large are global fossil fuel subsidies? *World Development*, 91, pp. 11-27. Available at: <https://doi.org/10.1016/j.worlddev.2016.10.004>

Deyshappriya, N.P.R., Rukshan, I.A.D.D.W. and Padmakanthi, N.P.D., 2023. Impact of oil price on economic growth of OECD countries: A dynamic panel data analysis. *Sustainability*, 15(6), p. 4888. Available at: <https://doi.org/10.3390/su15064888>

Dickey, D.A. and Fuller, W.A., 1981. Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, 49(4), p. 1057. Available at: <https://doi.org/10.2307/1912517>

Fitch Solutions, 2024. Algeria set for significant economic slowdown in 2024. Available at: <https://www.fitchsolutions.com/bmi/country-risk/algeria-set-significant-economic-slowdown-2024-30-01-2024>

Frankel, J.A. and Romer, D.H., 1999. Does trade cause growth? *American Economic Review*, 89(3), pp. 379-399.

Gadea, M., Gómez-Loscos, A. and Montañés, A., 2016. Oil price and economic growth: A long story? *Econometrics*, 4(4), p. 41. Available at: <https://doi.org/10.3390/econometrics 4040041>

Ghalayini, L., 2011. The interaction between oil price and economic growth. *Middle Eastern Finance and Economics*, 13, pp. 127-141.

Guechari, Y., 2018. The effect of oil price shocks on the Algerian economy. *Revue des Sciences Humaines*, 47, pp. 7-32. Available at: <https://doi.org/10.37136/1003-000-047-048>

Hamilton, J.D. and Herrera, A.M., 2004. Comment: Oil shocks and aggregate macroeconomic behavior: The role of monetary policy. *Journal of Money, Credit, and Banking*, 36(2), pp. 265-286. Available at: <https://www.jstor.org/stable/3839020>

Hamilton, J.D., 1983. Oil and the macroeconomy since World War II. *The Journal of Political Economy*, 91(2), pp. 228–248. Available at: <https://www.jstor.org/stable/1832055>

Hamilton, J.D., 2003. What is an oil shock? *Journal of Econometrics*, 113(2), pp. 363-398. Available at: <https://doi.org/10.1016/s0304-4076(02)00207-5>

Hooker, M.A., 2002. Are oil shocks inflationary? Asymmetric and nonlinear specifications versus changes in regime. *Journal of Money, Credit, and Banking*, 34(2), pp. 540–561. Available at: <https://www.jstor.org/stable/3270701>

Idrisov, G., Kazakova, M. and Polbin, A., 2015. A theoretical interpretation of the oil prices impact on economic growth in contemporary Russia. *Russian Journal of Economics*, 1(3), pp. 257-272. Available at: <https://doi.org/10.1016/j.ruje.2015.12.004>

International Energy Agency (IEA), 2021. *World Energy Outlook 2021*. Available at: <https://www.iea.org/reports/world-energy-outlook-2021> [Accessed 5 August 2024].

International Labour Organization (ILO), 2019. *Global Employment Trends for Youth 2019*. Available at: <https://www.ilo.org/global/research/global-reports/youth/2019/lang--en/index.htm> [Accessed 5 August 2024].

International Monetary Fund (IMF), 2013. *Algeria: 2013 Article IV Consultation. IMF Country Report No. 13/47*. Available at: <https://www.imf.org/en/Publications/CR/Issues/2016/12/31/Algeria-2013-Article-IV-Consultation-40416> [Accessed 5 August 2024].

International Monetary Fund (IMF), 2000. The impact of higher oil prices on the economy. Available at: <https://www.imf.org/external/pubs/ft/oil/2000/> [Accessed 28 July 2024].

Jiménez-Rodríguez, R. and Sánchez, M., 2005. Oil price shocks and real GDP growth: Empirical evidence for some OECD countries. *Applied Economics*, 37(2), pp. 201-228. Available at: <https://doi.org/10.1080/0003684042000281561>

Kilian, L. and Murphy, D.P., 2014. The role of inventories and speculative trading in the global market for crude oil. *Journal of Applied Econometrics*, 29(3), pp. 454-478. Available at: <https://doi.org/10.1002/jae.2322>

Kilian, L. and Park, C., 2009. The impact of oil price shocks on the U.S. stock market. *International Economic Review*, 50(4), pp. 1267-1287. Available at: <https://doi.org/10.1111/j.1468-2354.2009.00568.x>

Kilian, L., 2008. The economic effects of energy price shocks. *Journal of Economic Literature*, 46(4), pp. 871-909. Available at: <https://doi.org/10.1257/jel.46.4.871>

Kolaczkowski, M. and White, A., 2022. Why do oil prices matter to the global economy? An expert explains. Available at: <https://www.weforum.org/agenda/2022/02/why-oil-prices-matter-to-global-economy-expert-explains/>

Lacheheb, M. and Sirag, A., 2019. Oil price and inflation in Algeria: A nonlinear ARDL approach. *The Quarterly Review of Economics and Finance*, 73, pp. 217-222. Available at: <https://doi.org/10.1016/j.qref.2018.12.003>

Laourari, I. and Gasmi, F., 2016. The impact of real oil revenues fluctuations on economic growth in Algeria: Evidence from 1960-2015 data. *Munich Personal RePEc Archive*. Available at: <https://mpra.ub.uni-muenchen.de/77590/>

Lardic, S. and Mignon, V., 2006. The impact of oil prices on GDP in European countries: An empirical investigation based on asymmetric cointegration. *Energy Policy*, 34(18), pp. 3910-3915. Available at: <https://doi.org/10.1016/j.enpol.2005.09.019>

Lee, K., Ni, S. and Ratti, R.A., 1995. Oil shocks and the macroeconomy: The role of price variability. *Energy Journal*, 16(4), pp. 39-56. Available at: <https://doi.org/10.5547/issn0195-6574-ej-vol16-no4-2>

Moawad Ahmed, S., 2016. The impact of oil prices on economic growth and development in the MENA countries. *Munich Personal RePEc Archive*.

Mork, K.A., 1989. Oil and the macroeconomy when prices go up and down: An extension of Hamilton's results. *The Journal of Political Economy*, 97(3), pp. 740-744. Available at: <https://doi.org/10.1086/261625>

Narayan, P.K., 2004. Reformulating critical values for the bounds F-statistics approach to cointegration: An application to the tourism demand model for Fiji. Australia: Department of Economics, Discussion Papers, No .02/04, Monash University, Victoria 3800.

Narayan, P.K., 2005. The saving and investment nexus for China: Evidence from cointegration tests. *Applied Economics*, 37(17), pp. 1979-1990.

Olayungbo, D.O. and Umechukwu, C**.,** 2022. Asymmetric oil price shocks and the economies of selected oil-exporting African countries: A global VAR approach. *Economic Change and Restructuring*, 55(4), pp. 2137-2170. Available at: <https://doi.org/10.1007/s10644-022-09382-8>

OPEC, 2020. *Annual Statistical Bulletin 2020*. Available at: <https://www.opec.org/opec_web/en/publications/2020.htm> [Accessed 5 August 2024].

OPEC, 2022. *Annual Statistical Bulletin 2022*. Available at: <https://www.opec.org/opec_web/en/publications/2022.htm> [Accessed 5 August 2024].

Pesaran, M.H., Shin, Y. and Smith, R.J., 2001. Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), pp. 289-326. Available at: <https://doi.org/10.1002/jae.616>

Phillips, P.C.B. and Perron, P., 1988. Testing for a unit root in time series regression. *Biometrika*, 75(2), p. 335. Available at: <https://doi.org/10.2307/2336182>

Qazi, L.T., 2013. The effects of oil price shocks on economic growth of oil exporting countries: A case of six OPEC economies. *Business & Economic Review*, 5(1), pp. 65-87.

Ramey, V.A. and Shapiro, M.D., 1998. Costly capital reallocation and the effects of government spending. *Carnegie-Rochester Conference Series on Public Policy*, 48, pp. 145-194. Available at: <https://doi.org/10.1016/s0167-2231(98)00020-7>

Rotimi, M.E. and Ngalawa, H., 2017. Oil price shocks and economic performance in Africa's oil exporting countries. *Acta Universitatis Danubius. OEconomica*, 13(5), pp. 169-188.

Sachs, J.D. and Warner, A.M., 1997. Fundamental sources of long-run growth. *The American Economic Review*, 87(2), pp. 184-188.

Sadeghi, A., 2017. Oil price shocks and economic growth in oil-exporting countries: Does the size of government matter? Washington, D.C., DC: International Monetary Fund.

Sadorsky, P., 1999. Oil price shocks and stock market activity. *Energy Economics*, 21(5), pp. 449-469. Available at: <https://doi.org/10.1016/s0140-9883(99)00020-1>

Taghizadeh-Hesary, F. and Yoshino, N., 2015. Macroeconomic effects of oil price fluctuations on emerging and developed economies in a model incorporating monetary variables. *Economics and Policy of Energy and the Environment*, (2), pp. 51-75. Available at: <https://doi.org/10.3280/efe2015-002005>

Van de Ven, D.J. and Fouquet, R., 2017. Historical energy price shocks and their changing effects on the economy. *Energy Economics*, 62, pp. 204-216. Available at: <https://doi.org/10.1016/j.eneco.2016.12.009>

World Bank Group, 2024. Algeria: Investing in data key for diversified growth. Available at: <https://www.worldbank.org/en/news/press-release/2024/05/22/algeria-investing-in-data-key-for-diversified-growth> [Accessed 29 July 2024].

World Bank, 2019. *Algeria Economic Update – April 2019*. Available at: <https://www.worldbank.org/en/country/algeria/publication/economic-update-april-2019> [Accessed 1 August 2024].

World Bank, 2021. *Algeria Economic Monitor – Spring 2021*. Available at: <https://www.worldbank.org/en/country/algeria/publication/economic-monitor-spring-2021> [Accessed 17 July 2024].

World Bank, 2023. *World Development Report 2023: Migrants, Refugees, and Societies*. Available at: <https://www.worldbank.org/en/publication/wdr2023> [Accessed 12 July 2024].

Zivot, E. and Andrews, D.W.K., 1992. Further evidence on the great crash, the oil price shock and the unit root hypothesis. *Journal of Business and Economic Statistics*, 10, pp. 251-270. 58205/fber.v6i3.289