THE IMPACT OF OIL PRICE VOLATILITY IN THE INTERNATIONAL MARKET ON ECONOMIC GROWTH UNDER ALGERIA'S FISCAL POLICIES: A ECONOMETRIC STUDY FOR THE PERIOD 1970-2020

Boukherbache Haroune Erachid[1]

Rezki Wail[2]

[1]University of Batna1 Hadj Lakhdar (Algeria), harouneerachid.boukherbache@univ-batna.dz
[2]University of Batna1 Hadj Lakhdar (Algeria), wail.rezki@univ-batna.dz

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Abstract

This paper aims to highlight the impact of oil price fluctuations on economic growth in Algeria for the period 1970-2020 in light of the fiscal policy pursued, using the ARDL model, and based on the analysis of the model results, it was found that there is a long-term equilibrium relationship between oil prices and economic growth in Algeria with an estimated elasticity of 9.93% and this result corresponds to the specificity of the Algerian economy being a rentier country dependent on oil revenues, which helped provide the necessary funding for public investment supervised by the government in implementing its mega projects, which reflects positively on economic growth rates.

Thus, the emergence of empirical evidence confirming the sensitivity of economic growth to oil price volatility.

Keywords: Oil prices, economic growth, ARDL model.

1. Introduction

The impact of oil price volatility on economic grow th has been a topic of great interest and research for several decades, as the period from 1970 to 2020 witnessed sharp fluctuations in the prices of this vital substance, which plays a crucial role in driving economic activities and is a key input in various sectors, including transportation, manufacturing, and energy production.

The relationship between oil prices and economic growth is complex and multifaceted. On the one hand, high oil prices can stimulate investment and innovation in alternative energy sources, leading to long-term economic benefits and sustainable growth. On the other hand, sudden and large increases in oil prices can impose significant costs on businesses and households, which may lead to an economic slowdown or recession. Moreover, oil price fluctuations can have indirect effects outside the energy sector, as fluctuations in oil prices can affect the cost of production for various industries, affecting their profitability and their ability to execute.

Like other oil producing and exporting countries, Algeria's economy is heavily influenced by fluctuations in global oil prices, so understanding the impact of these price movements on Algeria's economic growth is critical for policymakers and analysts alike. Algeria is seen as one of the world's leading oil producers and exporters, with a large portion of its government revenues

and export earnings derived from oil exports, so changes in oil prices can have profound effects on economic performance and development in Algeria, The period between 1970 and 2020 witnessed significant shifts in global oil prices due to geopolitical events, changes in global supply and demand dynamics, and market volatility. During this period, Algeria experienced two periods of high and low oil prices, each with distinct impacts on its economy. The oil price shocks of the 1970s resulting from the Organization of Petroleum Exporting Countries (OPEC) oil embargo and subsequent events had far-reaching consequences for Algeria, while high oil prices initially brought economic gains, they also created challenges as inflation and high production costs affected economic stability, In subsequent decades, Algeria faced a combination of high and low oil prices.

The 1980s and 1990s witnessed sharp fluctuations in oil prices, especially in 1986, when oil prices fell to very low levels, driven by factors such as increased global oil production and market competition. This period posed economic challenges for Algeria, as low oil prices limited revenue generation and necessitated adjustments in economic policies and strategies. Conversely, the early 2000s saw a significant increase in oil prices, providing Algeria with opportunities for economic growth and development. Higher oil prices boosted government revenues, allowing for increased public spending and investment in infrastructure, education, and social programs, However, the subsequent global financial crisis in 2008 and the volatility of oil prices, especially in 2014 and 2020, posed challenges for the Algerian economy, highlighting the weakness and fragility of the economy due to its excessive dependence on oil exports, in addition to the failure to exploit and invest oil surpluses to achieve sustainable growth rates, which prompts us to ask the following main question: **What is the relationship between international oil prices and economic growth in Algeria during the period (1970-2020)?**

2. Literature review

The topic of volatility of oil prices and its impact on economic growth has been addressed in many exporting or producing countries, and thus we find that the results can vary from one country to another according to its economic and institutional structure, and we will rely in this study on the most important of them to highlight the previous effects as follows:

The researchers (Akinsola & Odhiambo, 2020) investigated the impact of oil prices on economic growth for seven countries (low-income oil-importing countries) in sub-Saharan Africa, namely: Ethiopia, Gambia, Mali, Mozambique, Senegal, Tanzania, and Uganda. Using a panel-ARDL model, the impact of oil price on economic growth in the short and long run was examined. The results showed that the oil price does not have a significant impact on economic growth in the short run for the group, but has a significant negative impact in the long run. However, the short-run country parameters show that the oil price has a significant but mixed effect on economic growth in all seven countries. The NARDL model was also used to capture the asymmetric impact of the oil price on economic growth by decomposing oil prices into negative and positive changes. The advantage of this model is that it examines both the long-run and short-run asymmetric effects of the real oil price on growth. A lower oil price is found to have a positive and significant impact on growth, while a higher oil price has a significant negative impact. Moreover, the error correction terms are negative and statistically significant for both PMG and five of the countries through the short-run country parameters. Thus, it will be important for policymakers to design and implement energy policies effectively, while providing advanced technologies to mitigate oil price risks, especially in the long run.

The reasons behind the volatility of gold and oil prices are essential for the economic growth of emerging and developed countries around the world. In this paper (Bildirici & Sonustun, 2018), the researchers set out to identify the asymmetric relationship between gold and oil prices that is closely related to the macroeconomic dynamics and business cycle structure of countries' economies. Secondly, they tried to examine its effects on the economic growth of oil-exporting countries as a selected sample consisting of: (Canada, China, Kuwait, Kuwait, Mexico, Saudi Arabia, United Arab Emirates, United Kingdom, United States of America) Using MSVAR models. These models are used to test the impact of gold and oil price fluctuations on each other, to identify business cycle structures and to provide conclusions about the effectiveness of economic policy for the selected sample of countries.

Regime switching probabilities emphasized the asymmetric behavior of business cycles. The results also revealed the importance of gold and oil price fluctuations on economic growth, and oil prices had the most effective role in determining the business cycle in the sample of selected countries.

Study: (Nusair, 2016), this paper investigates the effects of oil price shocks on the real GDP of GCC countries. Using NARDL where short-term and long-term non-linear relationship is presented. The results indicate that there is evidence of significant positive oil price changes in all cases with the expected positive sign, which means that higher oil prices lead to an increase in real GDP. On the other hand, negative changes in oil prices are only limited to Kuwait and Qatar on the one hand, and on the other hand, the additional analysis carried out using Panel data shows that positive changes in oil prices increase real GDP and negative changes lead to a decrease in real GDP. Overall, the results indicate that positive changes in oil prices have a much larger impact on real GDP than negative changes.

(Gokmenoglu, Azin, & Taspinar, 2015) After the 1973 oil shock, the number of studies on the causal relationship between oil prices and macroeconomic variables has increased significantly. Therefore, this paper investigates the relationship between oil prices, inflation, GDP, and industrial production for the period 1961 to 2012 in the case of Turkey. The data for the study was taken from the World Bank and OPEC Development Indicators Database, and three main tests were used in the econometric side: Unit root, co-integration and causality tests to verify the relationship between the variables.

The results of the unit root PP test indicated that all variables under study are integrated at the first degree, which confirmed the existence of co-integration and after applying Johansen's methodology, the latter revealed the existence of a long-term relationship between these variables, also the results of Granger causality test revealed a unidirectional relationship from oil price to industrial production.

(Cavalcanti & Jalles, 2013) examines the macroeconomic effects of oil price shocks in Brazil and the United States. This paper examines the effects of oil price shocks in the past 30 years on Brazilian and U.S. inflation and the effects on economic activity. The authors find that the volatility of output growth in the United States is decreasing over time and so is the contribution of oil price shocks to such volatility, despite increasing dependence on oil imports. Inflation volatility is also decreasing but oil price shocks account for a larger portion of this volatility in the U.S. In Brazil, such shocks do not appear to have a clear impact on output growth and are responsible for a very small fraction of Brazilian inflation and output growth volatility.

The researchers used some experiments to analyze how real production growth in the U.S. would fluctuate if the share of net oil imports in the U.S. were distributed similarly to that of

Brazil, and found that the level of production would be about the same, with some fluctuations of less than 10% if the U.S. had the share of oil imports that Brazil actually has, and they found that the level of production would be about the same, with some fluctuations of less than 10%.

(Emami & Adibpour, 2012) This paper examined the relationship between oil revenue shocks and output growth in Iran using the SVAR model for the period 1959-2008, where the results revealed that positive and negative shocks in oil revenues significantly affect output growth negatively and positively respectively and these effects are unequal, while negative shocks in oil revenues negatively affect economic growth, thus the resource curse hinders the expected positive effects of positive oil shocks. In order to mitigate these effects on the Iranian economy, the authors argue that oil stabilization, saving money, diversifying the economy, separating government spending from oil revenues, and introducing fiscal rules in the general budget are critical to improving the performance of the Iranian economy.

The topic of the impact of oil price shocks on the macroeconomy has received a great deal of attention since the 1970s due to the many empirical evidence that established the relationship between oil shocks and the GDP variable and other economic variables governing the overall macroeconomy, but recently, many empirical studies contradicting the previous relationship have reported that there is no relationship between oil price shocks and macroeconomic variables, and this at the level of developed oil importing countries as well as at the level of oil-exporting countries, (Iwayemi & Fowowe, 2011) conducted an empirical analysis of the effects of oil price shocks on an oil exporting developing country like Nigeria using multiple econometric techniques, and the results showed that oil price shocks have no significant effect on most macroeconomic variables in Nigeria. The results of Granger causality tests, impulse response function analysis, and analysis of variance showed that different measures of linear and positive oil shocks did not cause output volume, government spending, inflation, and the real exchange rate. The tests support the existence of asymmetric effects of oil price shocks because we find that negative oil shocks significantly cause the size of output and the real exchange rate.

Study: (Du, Yanan, & Wei, 2010) Their study investigates the relationship between the global oil price and China's macroeconomy based on a monthly time series from 1995 month one to 2008 month twelve, using the multivariate vector autoregressive (VAR) method. The results showed that the world oil price affects economic growth and inflation in China significantly, but in terms of the reverse effect, Chinese economic activity translated into overall economic growth failed to affect the world oil price, which means that the world oil price is still an exogenous variable with respect to China's macroeconomy in terms of time series, and until that period, China did not have the power to price oil in the world.

Study: (Rafiq, Salim, & Bloch, 2009), where this paper examines the impact of oil price volatility on key macroeconomic indicators in Thailand, the quarterly oil price volatility is measured using actual real volatility, thus the impact of oil price volatility was investigated using a vector autoregressive (VAR) model, the results of Granger causality test, impulse response functions and analysis of variance show that oil price volatility has a significant impact on macroeconomic indicators, such as unemployment and investment, during the period from 1993Q1- to 2006Q4, the results show that the impact of oil price volatility is transmitted to the budget deficit, thus the floating exchange rate regime introduced after the crisis may be the factor The results also show that the effect of oil price volatility is transmitted to the budget deficit, thus the floating exchange rate regime introduced after the crisis may be the main factor in the transmission channel of the new effect.

Study: (Cunado & Perez de Gracia, 2005) where this paper investigated the relationship between oil prices and macroeconomics by studying the impact of oil price shocks on both economic activity and consumer price indices for six Asian countries during the period 1975-Q1-2002-Q2. The researchers found that oil prices have a significant impact on both economic activity and the general price level index, although the impact is limited to the short run and is more significant when oil price shocks are determined in local currencies. Moreover, evidence of asymmetry in the macroeconomic relationship of oil prices was found for some Asian countries.

This study aims to understand the impact of oil price volatility on economic growth in Algeria from 1970 to 2020. The Algerian economy relies heavily on oil, and previous studies have shown that positive volatility in oil prices positively affects economic growth. However, a more detailed study is needed to understand the relationship between oil price fluctuations and economic growth rates in light of local and international challenges such as the COVID-19 pandemic and the collapse of oil prices in 2020. The study utilizes a sample of 51 observations, which makes it relatively larger than previous studies, leaving us with a time-dependent research gap, which increases the relevance of the study

3. Data and model used

This study focuses on the Algerian economy using annual data covering the period 1970-2020, in order to answer the question of the previous study, which indicates the possibility of a relationship between oil price volatility and economic growth, where we will rely on the economic measurement methodology, and specifically we will introduce the ARDL approach and give the mathematical and standard form of the model in its linear form as follows:

$$GROWTH_t = \alpha + \beta LOP_t + \emptyset BB_t + \gamma EXCH_t + \delta INF + \varphi GM2 + \varepsilon_t$$

Where it is:

GROWTH: The growth rate of real GDP.

LOP: The logarithm of the price of a barrel of oil.

BB: The balance of the public budget.

EXCH: Official exchange rate (local currency against the U.S. dollar for the average period).

INF: Inflation rate.

GM2: Money supply growth rate.

With: **α:** The constant in the equation, **β, Ø, γ, δ, φ** are the model parameters, and $\boldsymbol{\varepsilon_t}$is the error term.

The empirical (standard) analysis uses the above variables mainly taken from the World Bank, BP, National Bureau of Statistics, Ministry of Finance website, and the Arab Monetary Fund website. The table below illustrates and describes the above:

Table (1) Study variables and their source

Variables	Symbol	Data source
Real GDP growth rate	GROWTH	World Bank Database
The logarithm of the price of a barrel of oil	LOP	British Petroleum Data
Public Budget Balance	BB	National Bureau of Statistics, Ministry of Finance website, Arab Monetary Fund website

Official exchange rate (local currency to US dollar for the average period)	EXCH	World Bank Database
Inflation rate	INF	World Bank Database
Money supply growth rate	GM2	World Bank Database

Source: Prepared by researchers

4. Discussion of results.

4.1 .Test the stability of the time series:

To detect the stationarity of the time series included in the study, we use the ADF and PP test as shown in the following table:

Table 2: ADF and PP test results

Variables	***ADF test***				**I**
	At level		**At first difference**		
	$t_{\emptyset_1} + t_c$	$t_{\emptyset_1} + t_c + t_b$	$t_{\emptyset_1} + t_c$	$t_{\emptyset_1} + t_c + t_b$	
GROWTH	-8.54 (-2.92)*	-9.21 (-3.502)*	- -	- -	**I(0)**
LOP	-2.97 (-2.92)*	-2.51 (-3.502)*	-6.13 (-2.92)*	-6.405 (-3.504)*	**I(1)**
BB	-1.73 (-2.92)*	-2.52 (-3.502)*	-6.68 (-2.92)*	-6.65 (-3.504)*	**I(1)**
GM2	-5.34 (-2.92)*	-6.15 (-3.502)*	-6.61 (-2.92)*	-6.601 (-3.508)*	**I(1)**
INF	-2.12 (-2.92)*	-2.32 (-3.502)*	-6.61 (-2.92)*	-6.606 (-3.504)*	**I(1)**
EXCH	0.84 (-2.92)*	-3.68 (-3.51)*	-4.51 (-2.92)*	-4.84 (-3.504)*	**I(1)**

Variables	***PP test***				**I**
	At level		**At first difference**		
	$t_{\emptyset_1} + t_c$	$t_{\emptyset_1} + t_c + t_b$	$t_{\emptyset_1} + t_c$	$t_{\emptyset_1} + t_c + t_b$	
GROWTH	-8.42 (-2.92)*	-8.96 (-3.502)*			**I(0)**
LOP	-3.002 (-2.92)*	-2.53 (-3.502)*	-6.13 (-2.92)*	-6.38 (-3.504)*	**I (1)**
BB	-1.73 (-2.92)*	-2.61 (-3.502)*	-6.69 (-2.92)*	-6.66 (-3.504)*	**I (1)**
GM2	-5.403 (-2.92)*	-6.15 (-3.502)*	-23.66 (-2.92)*	-36.44 (-3.504)*	**I (1)**

INF	-2.22 (-2.92)*	-2.407 (-3.502)*	-6.62 (-2.92)*	-6.606 (-3.504)*	**I (1)**
EXCH	0.98 (-2.92)*	-1.78 (-3.502)*	-4.508 (-2.92)*	-4.85 (-3.502)*	**I (1)**

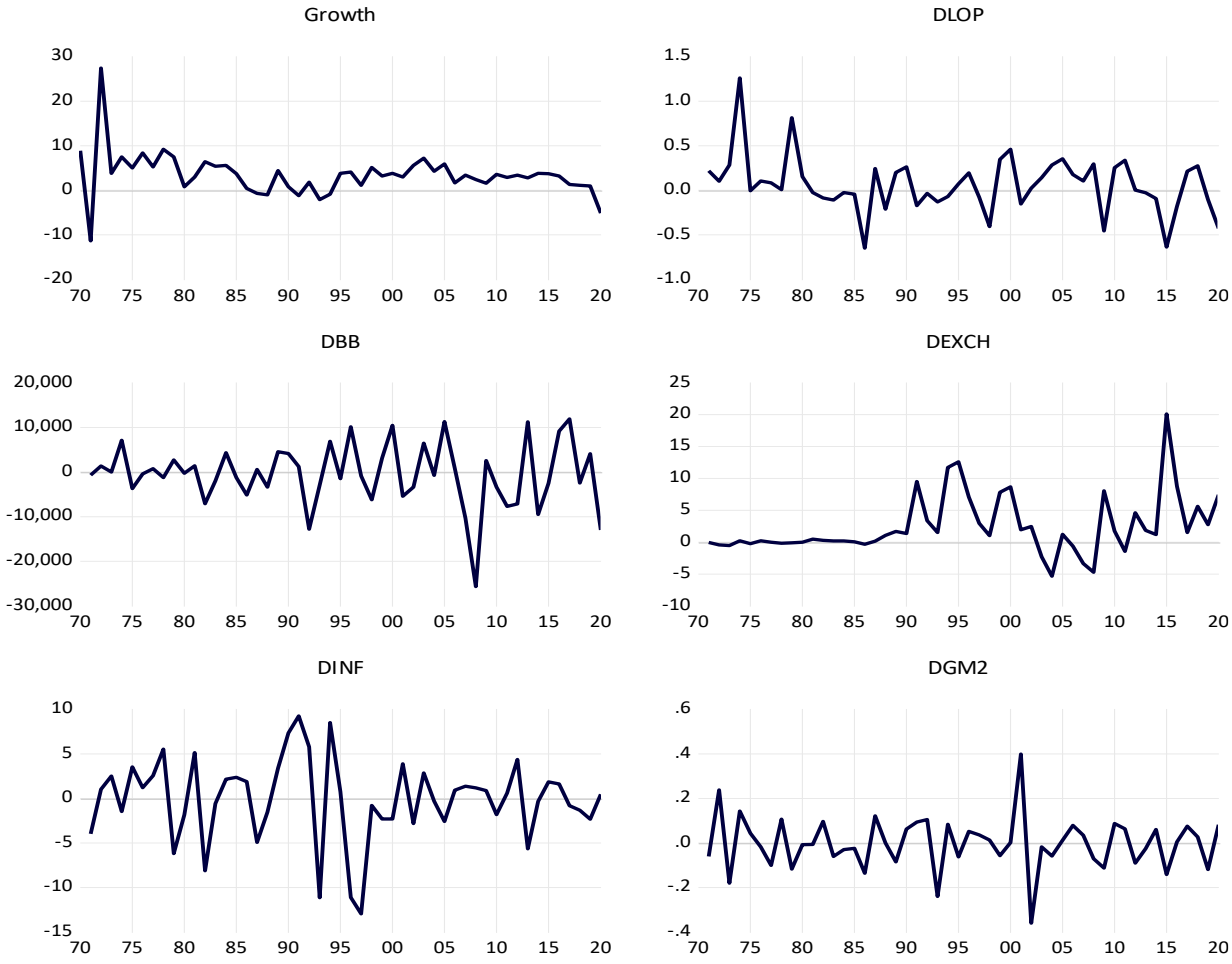
* :Values in parentheses are the probability value (P-value), , $t_{\emptyset_1} + t_c$:With constant ،$t_{\emptyset_1} + t_c + t_b$:A constant and a trend.

Source: Prepared by researchers

It is clear from the results presented above that all series are unstable in their original levels at the 5% significance level, but using the first difference, most of the series became stable and integrated of the first order, except for the GROWTH series, which leads us to perform the ARDL test.

Thus, the previous series take the following forms expressing their stability after performing the ADF and PP tests

Figure 1: Stationary Study Series



Source: Prepared by the authors based on EVIEWS 12 outputs.

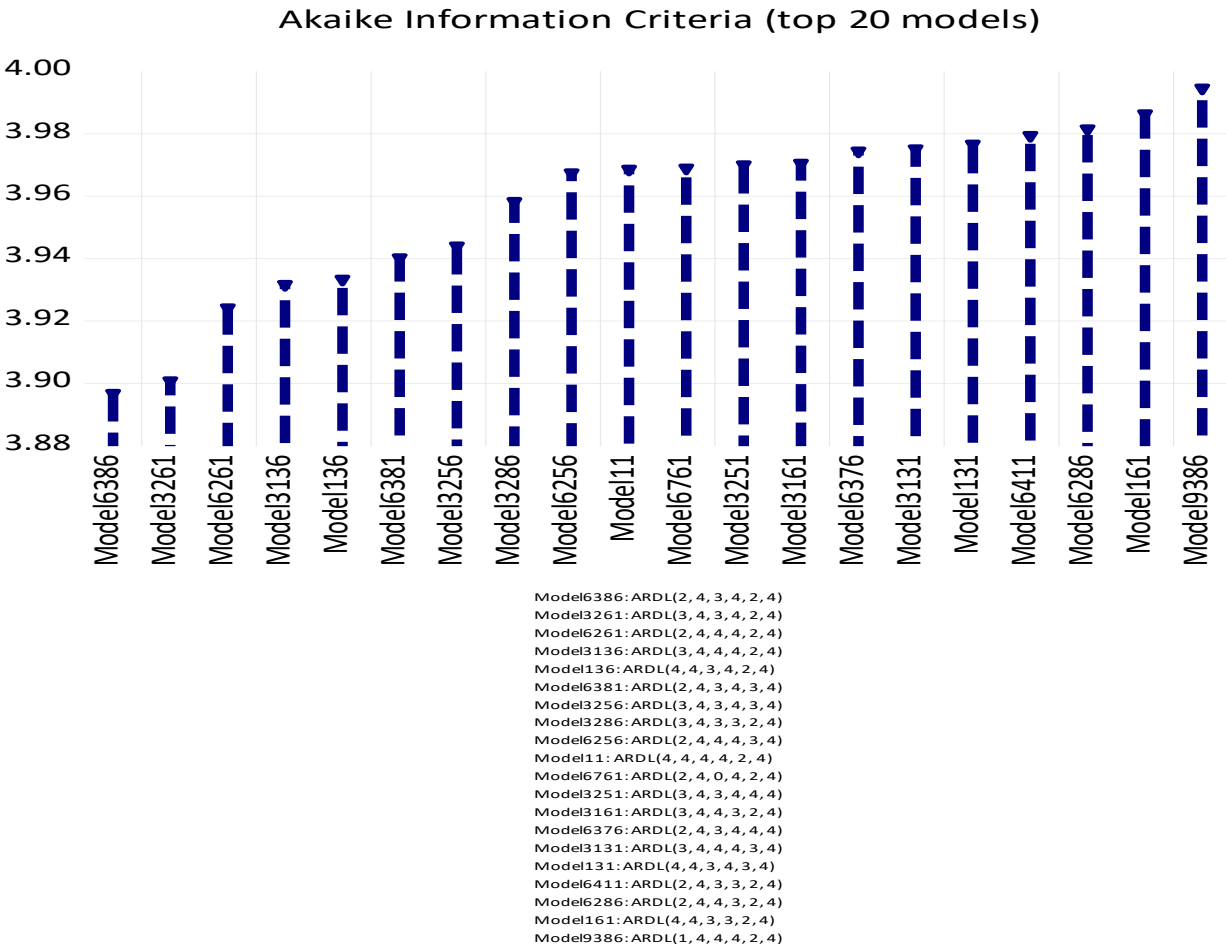
4.2. Estimating the ARDL model

To do this, we follow the following steps:

Step one: Determine the optimal lag scores using the Akaike's Information Criteria (AIC), and the model that achieves the lowest value of these criteria is selected, and 12,500 models were

differentiated to show that the best model is (2,4,3,4,4,2,4) ARDL, which means that the lag score in each variable should be as shown in the figure below:

Figure 2: Output of the best number of lags for the variables included in the model



Source: EVIEWS 12 output.

The results obtained from the previous figure for the ARDL model (2, 4, 3, 4, 2, 4) can be translated into the following mathematical equation:

$$dGROWTH_t = c + c(1)GROWTH_{t-1} + c(2)\ lOP_{t-1} + c(3)\ BB_{t-1} + c(4)\ EXCH_{t-1} + c(5)\ INF_{t-1} + c(5)\ GM2_{t-1} + \sum_{v=1}^{2} c_i * dGROWTH_{t-1} + \sum_{v=1}^{4} c_i * dlOP_{t-1} + \sum_{v=1}^{3} c_i * dBB_{t-1} + \sum_{v=1}^{4} c_i * dEXCH_{t-1} + \sum_{v=1}^{2} c_i * dINF_{t-1} + \sum_{v=1}^{4} c_i * dGM2_{t-1} + \varepsilon_t$$

Second Step: Bounds Test

To test the possibility of a long-term balanced relationship between the dependent variable and the explanatory variables, we use the bounds test, and the test showed that the calculated Fisher's value (6.59) is greater than the upper limit of the critical value I(1) which is estimated at 3.38 at the 5% significance level, as shown below:

Table 3: Bounds Test

F-Bounds Test	Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	6.597940	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Source: EVIEWS 12 output.

The boundary test result confirms the existence of a cointegrating relationship between economic growth and oil prices in Algeria. Accordingly, the ECM error correction model will be used in the ARDL space.

Step three: Estimating the model parameters for the long and short term

We estimate the short-term model parameters and then move on to estimating the long-term equilibrium relationship.

Short-term equation estimation: In order to determine the significance of the error correction beam model, we must first check the sign and significance of the error correction coefficient of the cointegrating beam, and to determine the significance of this parameter, we must estimate the short-term relationship, and by estimating using Eviews12, we obtain the following results:

Table 4: Short-term parameters of the study model

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GROWTH(-1))	0.266459	0.106595	2.499734	0.0208
D(DLOP)	0.716210	0.797747	0.897791	0.3795
D(DLOP(-1))	-8.148892	1.116308	-7.299858	0.0000
D(DLOP(-2))	-6.319121	0.996645	-6.340390	0.0000
D(DLOP(-3))	-4.051305	0.757966	-5.344973	0.0000
D(DBB)	0.000158	3.26E-05	4.830058	0.0001
D(DBB(-1))	1.90E-05	4.26E-05	0.447065	0.6594
D(DBB(-2))	9.23E-05	3.71E-05	2.487708	0.0213
D(DEXCH)	-0.286519	0.058389	-4.907074	0.0001
D(DEXCH(-1))	0.156074	0.064062	2.436286	0.0238
D(DEXCH(-2))	-0.079019	0.061118	-1.292896	0.2101
D(DEXCH(-3))	0.144477	0.057295	2.521615	0.0198
D(DINF)	0.000822	0.046000	0.017875	0.9859
D(DINF(-1))	0.218454	0.043639	5.005905	0.0001
D(DGM2)	-0.036688	2.268226	-0.016175	0.9872
D(DGM2(-1))	-14.65612	3.933115	-3.726340	0.0012
D(DGM2(-2))	-10.05416	3.510507	-2.864021	0.0093
D(DGM2(-3))	-8.970081	2.183845	-4.107472	0.0005
CointEq(-1)*	**-0.873190**	**0.113314**	**-7.705937**	**0.0000**
R-squared	**0.865881**	Mean dependent var		-0.273803
Adjusted R-squared	**0.776469**	S.D. dependent var		2.722017
S.E. of regression	1.286945	Akaike info criterion		3.635702
Sum squared resid	44.71815	Schwarz criterion		4.391010

Log likelihood	-64.62115	Hannan-Quinn criter.	3.918645
Durbin-Watson stat	2.541172		

Source: EVIEWS 12 output.

The results of estimating the short-term relationship show that the error correction coefficient is negative (-0.87) and statistically significant because the value of Prob<0.05. This result can be commented that the error that appears in the short term returns to its equilibrium level in the long term with an adjustment speed of: 1/0.858=1.14 years, so the short-term relationship is statistically acceptable, and the results of this model explain how errors are corrected to return to equilibrium.

Estimating the long-run equation: We estimate the long-run equilibrium relationship to find out the interactions between the variables in the long run, and after the estimation process, we get the following outputs:

Table 5 shows the long-run parameters related to the study model

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOP	**9.931925**	2.694705	3.685719	**0.0014**
DBB	0.000164	0.000121	1.352538	0.1906
DEXCH	-0.187631	0.151819	-1.235883	0.2301
DINF	-0.285276	0.133477	-2.137276	0.0445
DGM2	22.88221	18.36043	1.246279	0.2264
C	3.061060	0.600249	5.099647	0.0000
EC = GROWTH - (9.9319*DLOP + 0.0002*DBB -0.1876*DEXCH -0.2853*DINF + 22.8822*DGM2 + 3.0611)				

Source: EVIEWS 12 output.

The outputs of the estimation of the long-run equilibrium relationship show that the nature of the relationship between the explanatory variable of the logarithm of the price of oil (DLOP) and the dependent variable economic growth (GROWTH) is direct as well as statistically significant, as a one-point increase in the logarithm of the price of oil will lead to an increase in economic growth by 9%. 93 This result is consistent with the theoretical proposition that any increase in oil prices will lead to a steady increase in economic growth rates in countries with a rentier nature, as it is known that Algeria is a rentier country, as its economy depends heavily on revenues resulting from oil exports, and the country has rich natural resources, and the oil industry is a vital sector that contributes significantly to the economic growth of the country, and the period 1970-2020 witnessed sharp fluctuations in oil prices, and the last two crises can be mentioned the price collapse crisis in 2014 where the price per barrel fell from 104.7 dollars in January 2014 to 59.5 dollars per barrel in December.

As the Corona pandemic cast its black shadow on the oil markets, as oil prices witnessed a dramatic decline that was unprecedented, and prices reached negative levels, as the US oil price reached a value of -37 dollars per barrel during the period from 20 to 22 April 2020, and the public treasury was strengthened throughout the study period, especially during periods of high oil prices with significant financial amounts, which led to an increase in public investments, financing government projects and improving the standard of living of citizens, which enhanced growth in those periods.

This study shares with the study of (Bouchaour & Al-Zeaud, 2012), which found a positive impact on the long run of oil prices and economic growth.

In addition to the direct relationship between the logarithm of oil prices and economic growth rates in Algeria, there are other elasticities of the variables included in the model ranging between positive and negative elasticities, which we will try to explain in the following points:

- For the budget balance variable (DBB): The results show that there is a direct relationship between economic growth and the general budget balance, that is, if the budget balance variable rises by one unit, it will lead to an increase in economic growth rates at a very marginal and modest level that is close to zero and amounts to 0.000164%, and the positive relationship agrees with the theoretical proposition, but it is statistically insignificant, as confirmed by the Studnett statistic, which is estimated at (0.1906).
- For the official exchange rate variable (DEXCH): The results show that there is an inverse relationship between economic growth and the official exchange rate, which is inconsistent with economic theory and can be attributed to the stagnation of prices and the lack of a flexible production system that keeps pace with the decreases in the value of the currency, but it is statistically insignificant, as confirmed by Studnett's statistic of (0.2301).
- For the inflation variable (DINF): The results show that there is an inverse relationship between economic growth and inflation, which is consistent with the theoretical proposition that when the inflation rate rises, the state raises interest rates to absorb the monetary surplus, which leads to curbing investment, which leads to a decrease in domestic output and then economic growth rates, as the results show that the rise in inflation by one unit leads to a decrease in growth rates by -0.28%, in addition to this result being consistent with economic theory, it is statistically significant.
- For the variable of the growth rate of the monetary mass (DGM2): The results show that there is a direct relationship between economic growth and the monetary mass expressed by its growth rate, which is consistent with economic theory, but it is statistically insignificant, as confirmed by the estimated Studnett's statistic (0.2264).

Step four: Evaluating the model statistically and statistically significant ROBUSTNESS TESTS

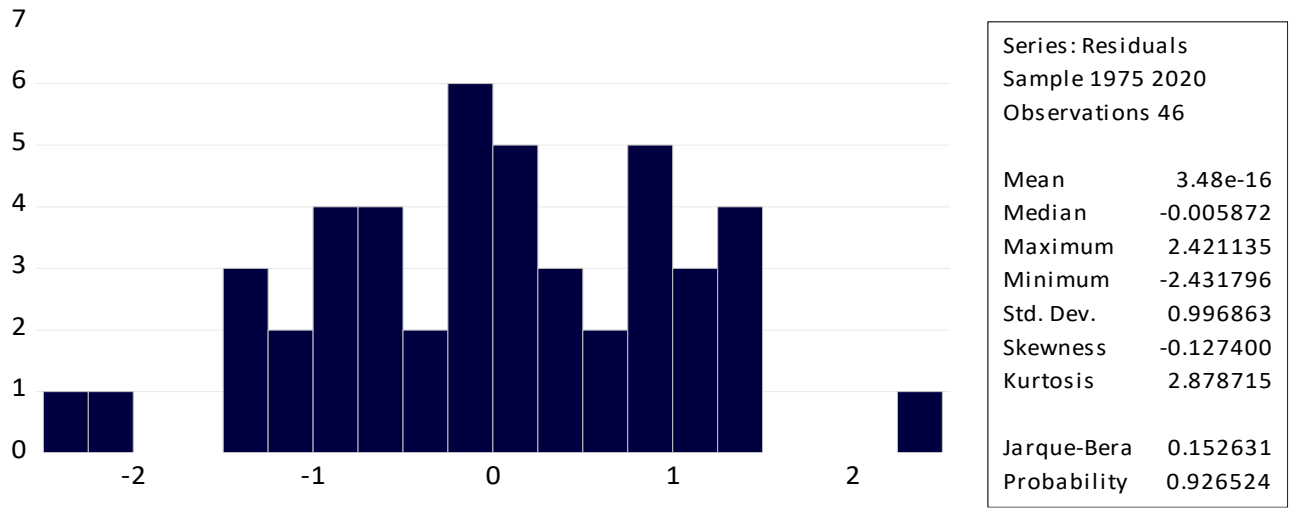
The model shows that there is an explanatory power indicating that changes in economic growth expressed by the GROWTH variable are explained by 86.58% in terms of the explanatory variables.

On the other hand, the quality tests of the model mainly consist of: LM serial correlation test, normal distribution test, variance invariance test, as well as the test of the stability of the model parameters. The tests were conducted and the results are shown in the table below:

Table 6: Model Quality

Diagnostic Test		
Serial Correlation	2.25	(0.13)**
Normality	0.15	(0.92)**
Heteroscedasticity	0.96	(0.54)**

P-value :**

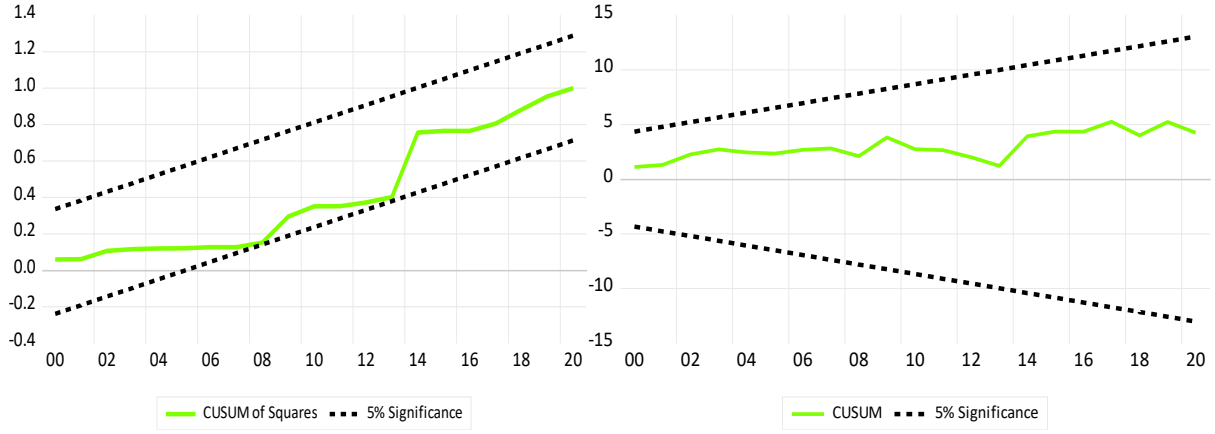


Source: EVIEWS 12 output.

From the table, the Lagrange Multiplier (LM) test indicates that there is no serial correlation, i.e. this test supports the hypothesis that there is no autocorrelation between the errors, on the other hand, the results of the Jarque-Bera test indicate that the residual errors are normally distributed, and the variance invariance test indicates that the model has variance invariance.

For testing the stability of the parameters, we rely on two tests, the cumulative sum of the residuals (CUSUM) test and the CUSUM SQ test is the cumulative sum of the squares of the residuals test, and it appears that the errors through the graph below move within a specific range at 5% significance level, which means that the estimated model parameters are stable and constant over time, and therefore there is no more than one equation to study.

Figure 3: CUSUM test and CUSUM SQ test



Source: EVIEWS 12 output.

5. Conclusion

This study shows that oil price volatility has a significant impact on economic growth in Algeria. Despite their positive impact at times, they can cause economic challenges when they are highly volatile. Thus, decision makers in Algeria should pay attention to diversifying sources of income and promoting economic sustainability to reduce oil dependency as well as developing and strengthening other sectors such as manufacturing, agriculture, services, and renewable energy, which requires stimulating investment, creating a favorable business environment, and promoting technology and innovation.

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