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The impact of oil price fluctuations on the Algerian economy during the period 1990-2020- an econometric study using the Autoregressive Distributed Deceleration (ARDL)

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Abstract :

This study aims to find out the extent of the impact of oil price fluctuations on the GDP in Algeria, through and using the autoregressive distributed lags (ARDL) model applied to annual time series for both GDP and oil prices from 1990 to 2022. Specifically, we found that there is a long-term equilibrium relationship between oil prices and the gross domestic product (GDP) , which means that the gross domestic product in Algeria is closely related to the changes in oil prices in the long run, and since this relationship is direct and significant, in the long run the volume of the gross domestic product increases. In Algeria, during periods when oil prices rise and vice versa in the case of decline, but in the short term there is a direct significant relationship between oil prices and GDP.

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JEL Codes: Q4-H3- E6- C5

1. Introduction

Oil is the main engine of the global economy, as it is one of the most important main criteria that have a global impact, whether economically or politically, and it is one of the pillars on which human civilization is based. Oil fluctuates up and down from time to time, due to linking the price of a barrel of oil to the forces of supply and demand and the free market mechanism.

The importance of oil in Algeria stems from its provision of significant financial returns necessary and important to finance economic and social development plans, and oil in Algeria played a major role in determining the course and nature of development since the early seventies of the last century until the present time.

Algeria is one of the countries whose economy depends on a major source of income represented in oil wealth, and in light of the sharp changes taking place in the global oil markets, these changes are reflected in the national economy, and in this context this study came to highlight the impact of oil price fluctuations on the Algerian economy during For the period 1990-2020, because of the great fluctuations in the oil market, and this prompts us to raise the following study problem:

What is the impact of oil price fluctuations on the Algerian economy during the period 1990-2020?

To answer the previous problem, we formulate the following hypotheses:

1- Oil prices have a positive impact on the gross domestic product in Algeria during the study period.

2- There is a long-term equilibrium relationship between oil prices and GDP in Algeria.

3- Literature review:

This interest of Oil price fluctuations can be very easily perceived when one considers the amount of scientific work devoted to assessing the macroeconomic effects of oil prices shocks for both importing and exporting countries . We found many previous studies that dealt with the issue of the impact of oil price changes on macroeconomic indicators such as economic growth, gross domestic product, inflation, and unemployment. Where the difference lies in the studies in terms of

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the approach used in the study, the methodology of analysis, and the variation in the results reached by the researchers. The most important of these studies are:

(ABDAT, 2021) This article analyzes the relationship between the variation of international oil prices and its effects on indicators of the Algerian economy from 2008 to 2017. To achieve this, They use secondary sources regarding the oil price average-considering just BRENT references- for each year, and other macroeconomic indicators. This information was analyzed through statistical models. First, they took Oil price as the main variable and they confronted each of the macroeconomic indicators collected to test whether they were independent from this main variable or not; second, they applied a Poisson regression to find if the citizen perception of the economy in these countries has a correlation with the booms and busts of oil prices. In the end, they found a divergence between the citizens' perception and the economy's positive or negative economic performance.

(Lacheheb & Sirag, 2016) This study examined the relationship between oil price changes and inflation rate in Algeria from 1970 – 2014. The study method that able to capture for asymmetries in the relationship between oil price and inflation known as nonlinear autoregressive distributed lags (NARDL). The estimated model revealed the existence of nonlinear effect of oil price on inflation. Specifically, they found a significant relation between oil price increases and inflation rate, whereas, a significant relation between oil price reduction and the inflation was absent.

(BENAMEUR, BELARBI, & TOUMACHE, 2020) This study analyze the dynamics of the GDP structure by subjecting its components to an exogenous shock using an SVAR model .they use quarterly data covering the period 1999 to 2019 to evaluate the response of national account aggregates (from both the production and demand sides) to oil price shocks. they also explore the similarities in their fluctuations with the ones observed in oil prices and foreign reserves; they consider the later as a damper that can absorb foreign shocks. their results show a strong and clear impact of international oil price fluctuations on GDP growth, hydrocarbon exports, and public spending.

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3.Methodology :

3.1 Autoregressive distributed time lag model (ARDL) :

Recently, economists have become increasingly interested in quantitative methods and using them to study economic relations, whether at the macro or micro level, because they can reach accurate results that serve as a basis for making appropriate decisions, using a modern methodology called the Autoregressive Lagging Distributed Time Lag (ARDL) methodology, which allows By separating the effects of the short term (causal relationship) from the long term (elasticities index). The (ARDL) model combines autoregressive (AR) and lagging time gaps (DL), developed by Basiran (2001), and this model is characterized by the fact that it does not require Equal degree of integration of the variables, and the Pasiran method has better characteristics in the case of using short time series compared to other methods in cointegration test.

3.2 Advantages of the ARDL methodology:

The commonly accepted cointegration tests require that the time series to be tested for the cointegration relationship between them be integrated to the same degree and at other than their original levels, and this explains the limited use of these tests. However, there is an alternative test as a co-integration approach represented in the Autoregressive Distributed Time Delay (ARDL) model of its two owners, Pesaran and Shin, which offers a number of advantages compared to other tests, which are embodied in :

- This method is relatively more robust in small samples containing between 30-80 observations.
- This method is used regardless of whether the regression is of order 0 i(0) or order 1 i(1) or in the case of a mixture of both, ARDL model is ineffective if one of the time series is integrated of order (2) I(2).
- The ARDL model applies a general-to-specific modeling framework by taking a sufficient number of latencies to obtain the data generation process. It estimates the number of (p + 1) k regressions in order to obtain the optimal delay period for each variable, where p is the maximum delay period that can be used and k is the number of variables included in the equation. The model is chosen on different statistical criteria such as

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Akaike and (AIC). Info Criterion (HQC) Hannan-Quinn or (SIC) Schwarz Info Criterion.

The ARDL model method can distinguish between dependent variables and explanatory variables and eliminate problems that may arise due to the presence of autocorrelation and endogenous growth. ARDL model can estimate the short-term and long-term relationship at the same time, and provides an unbiased and efficient estimate. The most appropriate use of the ARDL model is to be based on the one equation framework (Adriush, 2014).

3.3 Steps to apply ARDL autoregressive distributed time lag model: In time series models, there may be a certain, relatively long period in the
variables of economic decision-making and the final effect in the policy variable. In other words, the modification in the dependent variable y due to changes in the explanatory variable x is distributed over a wide range over time. If the interval between the response and the effect is long enough Relatively, the lagging explanatory variables must be included in this model, and one of the methods of building dynamic response models is by including the lagging variables of X as explanatory variables, i.e. the use of Distributed Lag models in this, as the basis for the lagging models is to include a series of explanatory deceleration variables To ensure the modification process according to the following simple form (MUHAMMAD , 2013):

$$\boldsymbol{Yt} = \boldsymbol{a0Xt} + \boldsymbol{a1Xt{-}1} + \boldsymbol{a2Xt{-}2} + \text{.....} + \boldsymbol{apXt{-}p} + \boldsymbol{\mu t}$$

The dynamic behavior can be expressed by relying on the previous value of the internal variable, *Y*t depends on the previous values (Y). It is represented by the autoregressive model

$$\mathbf{Yt} = \boldsymbol{\beta 1Yt{-}1} + \boldsymbol{\beta 2Yt{-}2} + \cdots \ldots \ldots + \boldsymbol{\beta pYt{-}p} + \boldsymbol{\varepsilon t}$$

In other words, the additional or alternative way to include the dynamic component in economic behavior is by including lagging endogenous variables in addition to explanatory exogenous variables. Whereas, in time series studies,

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dynamic regression models include both lagging endogenous and exogenous variables as explanatory variables. If there are k explanatory variables, it can be expressed in the following form:

$$\boldsymbol{Yt} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1 Y_{t-1}} + \boldsymbol{\beta_2 Y_{t-2}} + \cdots + \boldsymbol{\beta_p Y_{t-p}} + \boldsymbol{a_0 X_{t-1}} + \boldsymbol{a_1 X_{t-1}} + \boldsymbol{a2Xt{-}2} + \cdots + \boldsymbol{apXt{-}q} + \boldsymbol{\varepsilon t}$$

This equation expresses the basic form of the Autoregressive-Distributed Lag (ARDL) model where:

$\boldsymbol{\varepsilon t}$: random error term - white noise , the model is autoregressive, meaning that variable $\boldsymbol{Yt}$ is explained (partially) by decelerated values of the variable itself, and has distributed deceleration components, in the form of successive decelerations of the explanatory variable X and sometimes the value $\boldsymbol{Xt}$ itself is excluded from Structure of the distributed deceleration model Also,

: represents the constant term, p : the rank of the dependent variable Y, the number of periods of deceleration for the variable) $\boldsymbol{Xt}$

t: the time variable (time direction) and the equation can be expressed as ARDL(p,q) and this type of model is based on the estimation of the model Unrestricted Error Correction (UECM) (Ali Abd al-Zahra Hassan & Abd al-Latif Shoman, 2013).

The general form of the $\boldsymbol{A(p, q1, q2,\ldots, qk)}$ model is composed of a function variable Y and k of explanatory variables $\boldsymbol{X1}$, $\boldsymbol{X2}$ ……. . , as follows (Abed, 2007):

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + \sum_{i=0}^{n} \theta_i \Delta X_{t-i} + \lambda_1 Y_{t-1} + \lambda_2 X_{t-1} + \eta_t$$

whereas:

$\boldsymbol{a0}$: constant term, Δ: first-order differences, K: number of variables, m. lag time, Y: dependent variable, εt: random error term.

$\boldsymbol{\lambda}1\boldsymbol{\lambda}2$:represents the coefficients of the long-term relationship, $\beta\theta$represents the

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coefficients of the short-term relationship, while Δ represents the first difference of the variables, while m,n represents the time delay periods (it is not necessary that the time delay periods of the variables be in the level or number same m≠n)). The cointegration relationship is tested according to the ARDL model through two hypotheses:

H0 :The null hypothesis, that there is no cointegration (a long-term equilibrium relationship) between the variables, which are:

$a1 = a2 = a3 = a4 = a5 = a6 = 0$

$H1$: The alternative hypothesis, the existence of cointegration (a long-term equilibrium relationship) between the variables, which is represented in:

$a1 \neq a2 \neq a3 \neq a4 \neq a5 \neq a6 \neq 0$

Before the standard modeling the ARDL model, steps must be passed, namely (Giles, 2013):

- Ensuring that none of the variables is not a quadratic integral, I (2), as this invalidates the methodology of the ARDL model.
- Formulate an Unrestricted Error Correction Model (UECM) which is a special type of ARDL model.
- In the second step, determine the structure of sufficient deceleration for the model.
- Ensure that model errors are sequentially independent.
- Ensure that the model is dynamically stable.
- Bounds Test to see if there is evidence of a long-term relationship between variables.
- If the result is positive in Step 6, the long-term relationship "Model Levels" is estimated, as well as an Unrestricted Error Correction Model (UECM) separation.

Using the results of the estimated model in Step 7 to measure the dynamics of the effects of the short-term relationship and the long-term equilibrium relationship between the variables, and to apply the co-integration test using the ARDL model, four procedures are adopted where:

1. The first procedure is to choose the optimal slowing period for the first differences of the values of the variables in the UECM model, using a Vector

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Unresyricted Autoregressive Model, and this is done by using four different criteria to determine this period: Hannan and Quinn (HQ) criterion (1979) Akaike (1973), Schwarz (SC, 1978) criterion Final Prediction Error (FPE) proposed by Akaike (1969)

2. The second procedure is represented in estimating the UECM by means of the Ordinary Least Squares (OLS) method. To determine each of these models, the procedure of testing the model that goes from General to Specific is followed, which is to cancel the variable of the first differences for any variable that is the absolute values of the t statistic. is less than one, in succession.

3. The third procedure is to test the joint significance of the coefficients of the levels of the slowed variables for one period by using the Wald test (F test statistic).

4. The fourth procedure is to compare the value of the F statistic calculated for the coefficients of the independent variables slowed down for one period with the corresponding (tabular) critical F statistic calculated in Pesaran 2001. Since the F test has a nonnormative distribution, there are two critical values for the statistic of this test: the minimum value and assumes that All variables are static in their original values (or in their level), meaning that they are integral of zero order, i.e. I(0) the value of the upper bound, and it assumes that the variables are static in the first differences of their values, meaning that they are integrated of the order one true, i.e. I(1) the value of the upper bound, and it assumes That the variables are static in the first differences of their values, meaning that they are integrated of the order one true I (1), where:

- If the value of the calculated F statistic is greater than the value of the upper limit, the null hypothesis will be rejected, which says that there is cointegration between the variables regardless of the cointegration ranks of the variables, and this means that there is a cointegration relationship between the variables.
- If the value of the calculated F statistic is less than the minimum value, the null hypothesis that there is no cointegration between the variables cannot be rejected, which means that there is no long-term equilibrium relationship between the variables.
- If the calculated value of the F statistic falls between the values of the lower and upper limits, the results will be indeterminate, and a decision cannot be taken to determine whether or not there is cointegration between the variables.
- If all the variables are integral of order I(1), then the decision that is made to

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determine whether there is cointegration between the variables or not will be based on comparing the computed F statistic values with the critical value of the upper bound, similarly, if All variables are integrated from the order of zero (I0), then this decision is taken on the basis of a statistical comparison F calculated with the critical value of the minimum.

4.Results and discussion:

- **Estimating a model of the impact of oil price fluctuations on GDP in Algeria during the period 1990-2020:**

1 -Determining the variables and data sources: Our standard study relies on a time series for each of the oil prices and the gross domestic product in Algeria, through annual data during the period 1990-2022, where the data is taken from the statistics published by (the National Office of Statistics, ONS, and the World Bank). Using standard quantitative methods to identify the relationship between oil prices and GDP in Algeria, and building a standard model that shows the impact of oil prices on GDP in Algeria.

1. The dependent variable: Gross Domestic Product: (GDP).
2. The independent variable: oil prices (PP).

the study model as follows:
GDP = f(PP).....(1)
The mathematical form of the model is as follows:
GDP=a+bPP+ui……(2)

whereas:
PP: Petroleum Price.
GDP: Gross Domestic Product of Algeria.
Ui: The random variable.

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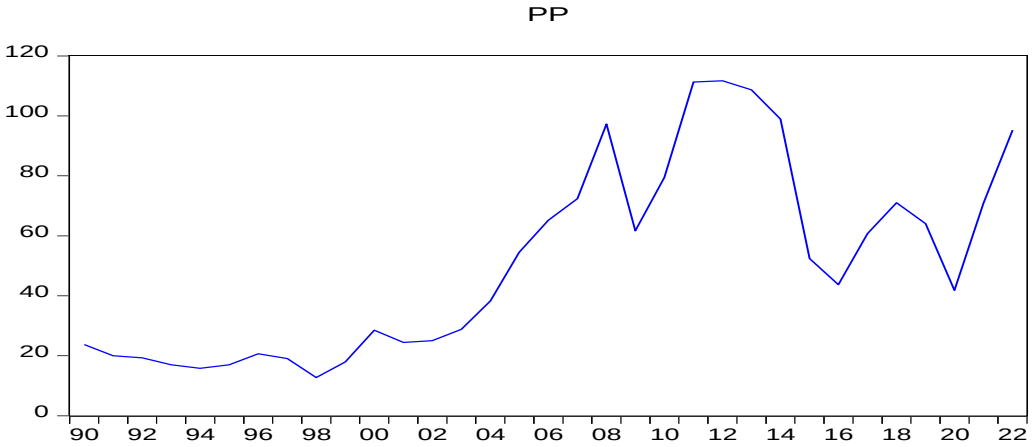
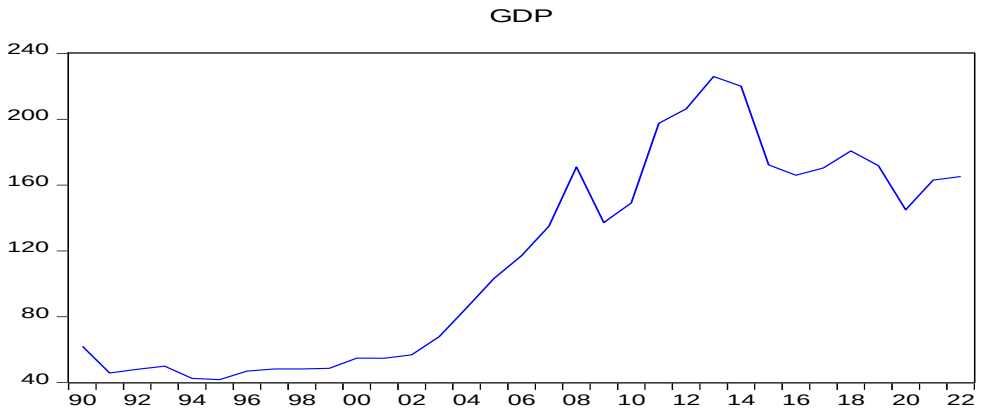
2 Descriptive Analysis of Time Series:

Figure No. (01): The evolution of the oil price in Sahara Bland in Algeria during the period 2001-2020



Source: Prepared by researchers based on EViews.10

Figure No. (02): The evolution of the gross domestic product in Algeria during the period 1990-2022



Source: Prepared by researchers based on EViews.10

Through the figure, we notice a development in the size of the gross domestic

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product during the period 1994-2013, and this coincides with the development of oil prices during the same period, which reflects the rise in oil prices in this period, given that the Algerian economy depends on more than 60% of oil revenues and also reflects the rise in domestic product The total went from 42.54 billion dollar to 225.93 billion dollar.

As for after 2014, we notice a decrease in the gross domestic product from 220.09 billion dollar in 2014 to 145.01 billion dollar in 2020, and this is due to the sharp drop in oil prices from 98.95 dollar per barrel to 43.73 dollar per barrel in 2016. We also notice that the curve of the gross domestic product and the curve of oil prices tend in two parallel directions during the study periods. At a time when oil prices rise, the volume of gross domestic product increases, and when oil prices decrease, the volume of gross domestic product decreases, and this does not contradict the content of the economic theory that states The positive relationship between resources represented in oil revenues and the gross domestic product of any country, that is, the higher the revenues, the greater the size of the gross domestic product.

3- Testing the stability of time series data:

The unit root test aims to examine the properties of the time series for all economic variables during the period (2001-2020), and to ensure their stability, and to determine the degree of integration of each variable separately, and to test the stability of the time series for the variables of the model under study, we will use the Dickey and Fuller test (ADF) The Extended Dickey Fuller (ADF) test is based on the following hypothesis test (J, 1998):

H0: The unit root is in the series, the time series is unstable.
H1: There is no unit root in the series, the time series is stable.

This test is performed for the original time series at the level, and if it does not settle at the level, the first differences are taken, then the second, and so on until it stabilizes, and the null hypothesis that there is a unit root problem is rejected, if the absolute value calculated for the (ADF) test is greater than the absolute values of the value Criticality at the level of significance of 5% and if the probability value is less than 5%, and it is indicated that the (ADF) test for the regression

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equation is done in three formulas (a fixed limit or a fixed limit and direction or without a fixed limit and direction) (Khaled Lafi Nayef & Hana Muhammad Al-Hunaiti, 2018). As shown in the following table:

Table No. (01): Stability tests using the ADF test at a significant level of 5%

variables	Model	The original series Level			First order difference series 1st difference		
		t-Statistic. 5%	ADF	Prob	t-Statistic .5%	ADF	Prob
GDP	None	-1.961409	0.704077	0.2674	-1.953858	-4.691723	0.0000
	trend and intercept	-3.580623	-2.049717	0.5500	-3.587527	-4.737057	0.0040
	intercept	-2.971853	-0.650177	0.8434	-2.976263	-4.863687	0.0006
PP	None	-1.953381	-0.230775	0.5941	-1.953858	-4.635156	0.0000
	trend and intercept	-3.580623	-1.966792	0.5934	-3.587527	-4.518397	0.0067
	intercept	-2.971853	-1.265691	0.6309	-2.976263	-4.606788	0.0011

Source: Prepared by researchers based on EViews.10

From the previous table, we found that the time series for each of the oil price (PP) and the total gross domestic product (GDP) are unstable in the original series (level)) because the ADF test statistic is not significant, and in this case we enter the differences of degree one, and after processing the series The original first-order differences method shows that the two series (DPP and DGDP) are stable in

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the first differences because they meet the stability condition, which is that the absolute values of the test statistics are greater than the corresponding critical values in the three models of the Dickie-Fullor extended tests, and this proves that the two series are GDP and the price of oil are complementary to the first degree, which means that they have the same degree of integration, which indicates the existence of a long-term relationship.

4 **- Determine the number of model delays:**

The period of time lag is measured by the period from which the effect of one variable appears on another variable. This period is determined by answering the following question: How long does it take for the effect of one variable to appear on another variable? The stage of choosing the number of slowing periods is one of the most important stages because it primarily affects the results of the estimate. This On the one hand, and on the other hand, it is desirable to limit the number of slowing periods to the lowest possible in the case of small samples such as our study (Kamal Allawi, Kazem Al-Fatlawi, & Hussein Latif Al-Zubaidi, 2014).

In order to determine the time delay periods, a standard will be used. Akaike information criterion AIC, Schwarz information criterion SC, HQ.Annan-Quinn criterion. Information criterion These indicators choose the period in which the lowest value of these indicators is, and the results of the number of delays test are shown in the following table:

Table No. (02): Testing the number of delays

VAR Lag Order Selection Criteria
Endogenous variables: GDP PP
Exogenous variables: C
Date: 02/25/23 Time: 19:01
Sample: 1990 2022
Included observations: 28

Lag	LogL	LR	FPE	AIC	SC	HQ

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0	-266.5428	NA	733758.5	19.18163	19.27679	19.21072
1	-211.7184	97.90077 *	19481.28 *	15.55131 *	15.83678 *	15.63858 *
2	-209.3704	3.857385	22055.14	15.66931	16.14510	15.81477
3	-207.1145	3.383878	25331.11	15.79389	16.45999	15.99753
4	-207.0065	0.146602	34316.42	16.07189	16.92831	16.33370
5	-201.6140	6.547944	32401.00	15.97243	17.01916	16.29243

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

Source: Prepared by researchers based on EViews.10

* : denotes the number of time lag periods chosen by the standard. And (0.1.2.3.4.5.) the number of delays, and the test results indicate that the number of delays that the model must include is the slowdown period No. (01), the effect appears in the first year, and this is given that the price of oil is a major resource in increasing the volume of domestic product Total

5 -Cointegration regression according to the ARDL model: We conduct a cointegration test to investigate the existence of an equilibrium relationship in the long term between oil prices (DPP) and gross domestic product (GDP), and the nature of the equilibrium relationship between variables in the long term, including that the relationship between them is complementary, as it is The two variables are complementary, that is, they move with time in a random upward manner. For the existence of cointegration, at least one complementary vector is required between the variables in the ARDL test. The Autoregressive Distributed Lag Model, ARDL, appeared as the best alternative because it does not require that the estimated variables have the same degree of integration, where the cointegration is tested using ARDL through The “Bound Test” method developed

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by Pesaran et Shin in 2001 combines the Autoregressive Model, AR(p) and Distributed Lag Model. In this methodology, the time series is a function of slowing down its values and the values of the current explanatory variables and slowing them down by one period or more. The ARDL method is distinguished from the traditional methods used to test cointegration with many advantages (PK, 2005).

- It can be applied regardless of whether the variables under study are integrated of order I (0) or integrated of order one integer (I) or integrated of different degrees, they can be applied when the order of integration is unknown or not uniform for all the variables under study .
- The practical results are good if the sample size (number of observations) is small, unlike most traditional cointegration tests that require a large sample size in order for the results to be more efficient.
- Its use helps to estimate the components (relationships) of the long and short terms together at the same time in one equation instead of two separate equations as shown in the following table:

Table No. (03): ARDL model estimation results

Dependent Variable: GDP
Method: ARDL
Date: 02/25/23 Time: 20:45
Sample (adjusted): 1992 2022
Included observations: 31 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): PP
Fixed regressors: C
Number of models evalulated: 20
Selected Model: ARDL(1, 2)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*

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GDP(-1)	0.744496	0.060359	12.33453	0.0000
PP	1.017271	0.077147	13.18613	0.0000
PP(-1)	-0.614434	0.123425	-4.978191	0.0000
PP(-2)	0.155829	0.094432	1.650170	0.1109
C	2.754673	2.667000	1.032873	0.3112
R-squared	0.989732	Mean dependent var		119.0454
Adjusted R-squared	0.988152	S.D. dependent var		62.34156
S.E. of regression	6.785673	Akaike info criterion		6.814194
Sum squared resid	1197.179	Schwarz criterion		7.045482
Log likelihood	-100.6200	Hannan-Quinn criter.		6.889588
F-statistic	626.5393	Durbin-Watson stat		1.644481
Prob(F-statistic)	0.000000			
*Note: p-values and any subsequent tests do not account for model selection.				

Source: Prepared by researchers based on EViews.10

The results of the statistical tests of the regression equation shown in the previous table indicate the high quality of the model estimated through the coefficient of determination (R2 = 0.98), and indicate that the model explains 98% of the changes in the GDP rate. The results also indicate that the relationship between the dependent variable and the explanatory variable is not false, as the significance of Prob(F-statistic) at the significance level is much less than 5%.

6 -Test Bound:

In this case, there are two hypotheses:

H0: Null hypothesis H0: which indicates that there is no long-term relationship moving from the explanatory variable to the dependent variable if the calculated F is less than I1 Bound.

H1: Alternative Hypothesis H1: indicates the existence of a long-term relationship moving from the explanatory variable to the dependent variable if the calculated F is greater than the term I1 Bound and we compare the calculated F-statistic with the I1 Bound.

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Table No. (04): The results of the test bound test

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.080021	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58

Source: Prepared by researchers based on EViews.10

Through the table, we note that the calculated = 7.080 F-statistic is greater than = 4.16 I1 Bound at the level of significance of 5%. In this case, we reject the null hypothesis and accept the alternative hypothesis, which means that there is a long-term relationship that goes from the explanatory variable (oil price PP) to the dependent variable (Gross Domestic Product). GDP).

7- The error correction coefficient method (error limit coefficient): What we are interested in is the folds of this estimate, represented in the error correction coefficient using the ARDL Cointegrating And Long Run Form. The results are shown in the following table:

Table No. (05): Estimation results of the error correction coefficient methodology

ARDL Error Correction Regression
Dependent Variable: D(GDP)
Selected Model: ARDL(1, 2)
Case 2: Restricted Constant and No Trend
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Sample: 1990 2022
Included observations: 31

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PP)	1.017271	0.071479	14.23169	0.0000
D(PP(-1))	-0.155829	0.090598	-1.720001	0.0973
CointEq(-1)*	-0.255504	0.053423	-4.782668	0.0001

R-squared	0.879393	Mean dependent var	3.854355
Adjusted R-squared	0.870778	S.D. dependent var	18.18999
S.E. of regression	6.538839	Akaike info criterion	6.685162
Sum squared resid	1197.179	Schwarz criterion	6.823935
Log likelihood	-100.6200	Hannan-Quinn criter.	6.730398
Durbin-Watson stat	1.644481		

* p-value incompatible with t-Bounds distribution.

Source: Prepared by researchers based on EViews.10

In this test, two conditions must be met, namely that CointEq(-1) has a negative and significant sign, as we note from the results of the table that CointEq(-1) has an error correction coefficient equal to (-0.2555), with a negative and significant sign because prob = 0.0001 is less than 0.05, and from it the fulfillment of the two conditions, The long-term co-integration equation represented by the dependent variable GDP and the explanatory variable the price of oil is as follows:

Table No. (06): Estimating the long-run cointegration equation

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.

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PP	2.186524	0.172000	12.71236	0.0000
C	10.78132	9.741220	1.106773	0.2785
EC = GDP - (2.1865*PP + 10.7813)				

Source: Prepared by researchers based on EViews.10

GDP =10 .78 +2.18 IPC+ ui……..03

With regard to the oil price parameter, it has a positive sign, and it corresponds to the economic theory, which means that the higher the oil price, the greater the size of the gross domestic product in Algeria, and this reflects the validity of the hypothesis. Likewise, prob, less than 0.05, means a statistically significant parameter or ability of the oil price, if there is a long-term equilibrium direct relationship between the oil price and the gross domestic product in Algeria, that is, the higher the oil price by one unit, the economic growth rate in Algeria will rise by 2.18 billion dollars. . This means that the GDP in Algeria is closely linked in the long run to the price of oil.

It is also noted that the value of the coefficient of determination is 0.98 R^2= this indicates that the variable explaining the inferential consumption number (IPC) explains 83% of the changes that occur in the dependent variable (GDP) and 17% is the amount of error or other variables that were not included in the model or inaccuracy of the statistical data.

- **Statistical tests of the ARDL model:**

1- Test the autocorrelation between errors using (LM Test):

Table No. (07): Autocorrelation test between errors using (LM Test).

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.079473	Prob. F(2,24)	0.9238
Obs*R-squared	0.203955	Prob. Chi-Square(2)	0.9030

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Source: Prepared by researchers based on EViews.10

Prob. F-statistic is very high, greater than 0.05, then we accept the null hypothesis and reject the alternative hypothesis, that is, there is no serial autocorrelation between errors (residuals).

2 -Breusch-Pagan-Godfrey test for homogeneity of variance:

Table No. (08): Estimation results of the stability of variance test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.783216	Prob. F(4,26)	0.1625
Obs*R-squared	6.673699	Prob. Chi-Square(4)	0.1542
Scaled explained SS	7.912682	Prob. Chi-Square(4)	0.0948

Source: Prepared by researchers based on EViews.10

Prob. F (4,26) is greater than 0.05 We reject the alternative hypothesis H1 and accept the null hypothesis, and this indicates that the model does not suffer from the problem of instability of the variances of the residuals, that is, the residuals have the same variance.

3 -Jarque-Bera normal distribution test for residuals of the estimated model:
The results of the normal distribution test for the residuals of this estimated model are shown in the following figure**:**

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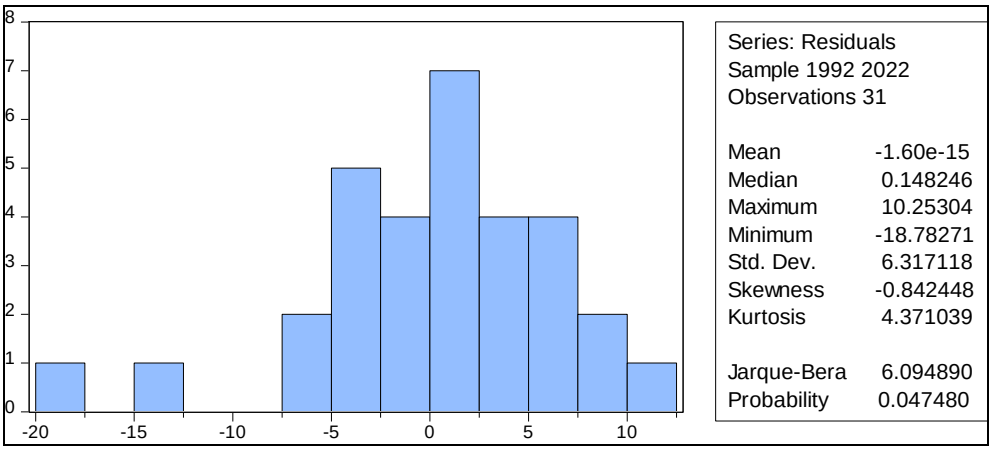
Figure No. (09): Testing the normal distribution of the estimated model residuals



Source: Prepared by researchers based on EViews.10

We can see from the figure the normal distribution test for the Jarque-Bera residuals of the estimated model that the probability value of the Jarque-Bera statistic (Prob = 0.04748) is greater than 0.05 (5%) if the residuals follow the normal distribution.

Since the model estimated for the impact of oil price fluctuations on the GDP in Algeria during the period 1990-2022 is acceptable from the economic, statistical and standard points of view, in this case this model can be considered valid for prediction.

5. Conclusion

The importance of oil at the international level emerges as a source of energy that is used in the most important economic sectors, and this is what made the industrialized countries, the first consumer of energy, strive to obtain oil supplies at reasonable prices, as they established an agency to use it as a tool to put pressure on the producing countries, and given that the fuel sector in Algeria is the engine The mainstay of the economy, as the revenues of this sector contribute to raising the rate of domestic product, including the increase in

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economic growth rates.

After estimating the model, the study reached the following results and recommendations:

Study Results: The results reached through this study were:

- There is a long-term equilibrium relationship between oil prices and GDP in Algeria, and this means that oil prices have a long-term impact on GDP and fiscal policy in Algeria, meaning that in the long run, GDP in Algeria is directly linked to fluctuations in oil prices.
- Oil prices are of great importance from an economic point of view, due to its close association with a large number of economic phenomena.
- After the emergence of OPEC, oil prices became characterized by a kind of flexibility, in view of the competition that has become imposed by the companies of the producing countries, due to their recovery of their wealth through nationalizations. Where oil prices were characterized by a kind of complexities in view of the monopoly imposed by the monopolistic big companies before the emergence of OPEC.
- The price of oil in the global (external) markets, despite being severely affected by shocks, has become dependent on it to calculate the revenues of the Algerian general budget at the internal level, meaning that the general budget is always affected by an external variable, and what is more, this variable (the price of points) is outside the control of the Algerian state, although it Owning the crude oil commodity is difficult in practice to overcome its practical effects.

Test Validity of hypotheses:

- Acceptance of the first hypothesis: Oil prices have a positive impact on the gross domestic product in Algeria during the study period.
- Acceptance of the second hypothesis: There is a long-term equilibrium relationship between oil prices and GDP in Algeria.

Study Recommendations: In light of the data, we propose some recommendations intended to diversify the sources of the Algerian GDP:

- Working on diversifying the sources of national income by paying attention to other sectors such as tourism, industry and agriculture.
- Raising the productive capacities of various sectors, encouraging investment, and focusing on increasing investment spending directed

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towards infrastructure projects.

- Employing oil revenues to support scientific research in the direction of devising and developing modern technologies in the fields of production.

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