The Impact of oil price fluctuations on Algerian government spending: Empirical study using ARDL self-regression model, during 1983-2020

أثر تقلبات أسعار النفط على الإنفاق العام في الجزائر: دراسة قياسية باستخدام نموذج الانحدار الذاتي للفجوات الزمنية الموزعةARDL ، خلال الفترة 1983- 2020

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Abstract:

This paper examines the impact of oil price fluctuations on government spending in Algeria, using the ARDL self-regression model from 1983 to 2020. It aims to examine the models of government spending, which include the following variables: oil prices, exchange rate, and GDP, through unit root tests, ARDL standard integration tests, and diagnostic tests. Results show a long-term relationship and a significant relationship between those variables.

K**eywords:** Oil prices, government spending, exchange rate, GDP, ARDL

Jel Classification Codes : C32, E17, E64, N17

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1. INTRODUCTION

Oil has been a major source of financing for Algeria since its independence. Due to the change in oil prices, Algeria tried to break out of the rental economy cycle. Even though oil prices recovered in the early 2000s, they collapsed from 2014 to the present, and many countries today suffer from the phenomenon of increasing public expenditures as a result of the phenomenon of rising oil prices, which has been a problem for many countries.

With its public spending closely tied to oil prices, Algeria has gone through several stages as a growing country. Expansionary spending policies are being pursued in light of the economic prosperity brought on by the rise in oil prices, and Algeria has suffered in recent years as a result of the decline in oil prices brought on by the contraction of the country's resources and incomes caused by the global economic recession. Algeria has changed its spending policy from one of expansion to one of austerity in the wake of the current global financial and economic crisis**.**

In this context, this paper tends to examine the following questions:

Is Algeria's government spending affected by oil prices between 1983 and 2020?

For the most accurate and well-known answer to the topic, further questions must be discussed:

- What is the impact of oil price fluctuations on government spending in Algeria in the short and long term?
- What is general maintenance and its reality in Algeria?
- Can a standard model be built to study the relationship between oil prices and government spending?

To better address the above questions, the following hypothesis will be tested:

Hypothesis 1: There is no long-term relationship Heading from interpreted variables towards

Dependent variable

Hypothesis 2: A standard model cannot be built to study the impact of oil price fluctuations on

Government spending

Hypothesis 3: This model cannot be relied upon to explain the impact of oil price fluctuations on government spending in Algeria

Algeria's economic growth is heavily dependent on the price of oil, which is the most crucial economic determinant. Therefore, this study aims to determine how oil price fluctuations affect Government spending, focusing on this determinant and how its volatility affects public spending.

Identifying the oil reality and determining its short- and long-term influence on government spending will be the first step in analyzing the link between oil price fluctuations and public spending. To analyze the relationship, a quantitative (experimental) approach is based on the ARDL model and uses the following variables oil prices, exchange rate, and GDP.

The paper is structured as follows:

Section 2 reviews a few studies examining the relationship between oil price swings and economic growth. An overview of the relationship between government spending and oil prices throughout time is included in Section 3. Section 4 discusses the empirical approach and the results of the ARDL model. Conclusion and recommendations are addressed in Section 5.

2. Related work:

In countries where the economy is heavily dependent on oil, it is necessary to be more research examining the relationship between oil prices and expenditures. Numerous studies on oil price changes have addressed some aspects of oil price fluctuations, including:

The study by Hammadi (2009) examined how the volatility of oil prices affected economic development funding in the Arab countries from 1986 to 2008. This research shows a direct relationship between the oil price and economic development funding, especially in Arab countries. In addition, the volatility of oil prices has affected development depending on the economy's dependence on this sector, and economic and social development is achieved in the Arab oil countries, unlike non-oil countries

The impact of oil price fluctuations on oil economies was examined in Jama (2011)'s study, and the following conclusions were drawn: oil economies have a positive impact on oil price fluctuations when prices are high and a negative impact when prices are low, causing imbalances in the calculations of various countries, the most important of which are oil, due to their inability to predict the efficiency of oil prices.

Mori (2015) was interested in analyzing how fluctuations in oil prices can affect economic development in Algeria? The findings show that the Algerian economy is closely linked to the hydrocarbon sector. Therefore, the fluctuations in oil prices significantly impact various economic balances as it is considered an engine and leader Change is either towards stability orimbalance in the economic indicator.

Qurnai (2019) tried to examine the impact of fluctuations in oil prices on public spending in Algeria. The study results show a causal relationship in the short-term one-way trend between oil prices towards public spending. As shown by the estimated results in the short term, there is a close correlation between oil prices and public spending in Algeria during the study period, but in the long run, there is a correlation between inflation and public spending in Algeria.

In addition, Bessissa and Bouafia (2020) found a short-term and direct relationship between the oil price and public spending and a positive impact of oil prices on the growth of the rate of public spending in Algeria from 1990 to 2017.

3. The concept of government spending and oil prices and their development in Algeria:

3.1 The concept and development of government spending in Algeria:

3.1.1. The concept of government spending:

Public spending is defined as a cash amount that comes out of the financial assets of a state or one of its organizations in order to satisfy public arguments, as can be said to be a cash amount that comes out of the financial disclosure of a public moral person in order to satisfy a general need(03 صفحة ،2010 ،تاتي).

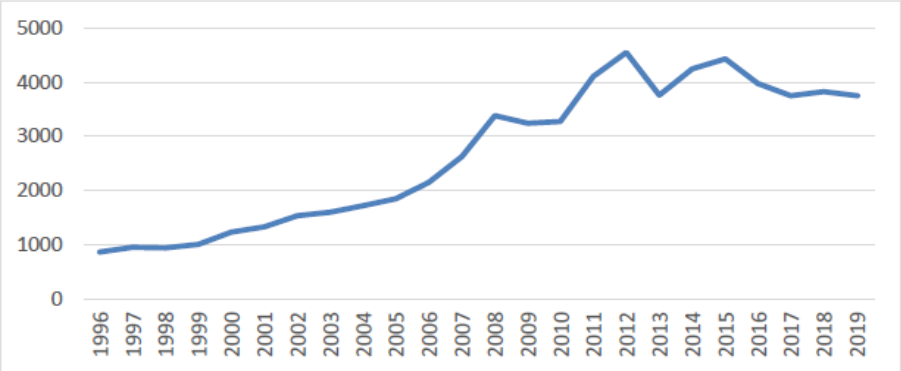
Public expenditure is a set of funds a public person spends to obtain the necessary resources to meet public needs as defined by the law governing these

bodies.(معلاش، 2011، صفحة 2).

3.1.2 Development of government spending:

The following figure summarizes the development of the Algerian government spending from 1996 to 2019.

Fig.1. The volume of public expenditures during 1996-2019



Source: سليم لعقون, 2021, 102

This figure shows that public expenditures in Algeria are increasing as a result of the population's growth and the rise in the cost of basic materials, as well as the allocation of public development programs. However, the growth rate in public expenditures fluctuates from year to year, between the rise and decline, according to the political and security conditions experienced by Algeria.(لعقون، 2021، صفحة 102).

3.2 The concept of oil prices and their development in Algeria:

3.2.1The concept of petroleum price:

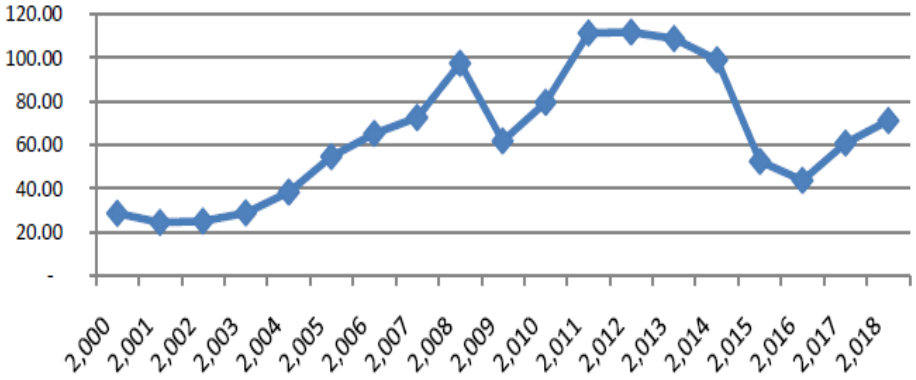
It is one of the most important economic prices, as it determines the prices of other energy resources and, therefore, affects the economic cycle, as expressed by the value of the material or petroleum commodity.(عجاج، 2019، صفحة 510). In this context, we can identify:

a. **Nominal price:** Is the monetary value in dollars given to one unit of oil (barrel) within a certain period and is determined by several factors, including demand and supply law.
b. **Real price:** The price is considered in fixed dollars as it reflects the development of the oil price over time, afterseveral developments on it, and the real price is attributed to the base year(حمادي، 2009، صفحة 52).

3.2.2 Oil price development:

As illustrated in the following figure, and according to the International Monetary Fund (IMF), global economic growth rose from 2.7% in 2000 to 6.5% in 2006. During this period, oil prices rose steadily, as shown. From one percent to three percentage points in 2002, then four percentage points in 2003, and finally five percentage points in 2004, the most significant level in thirty years.

Fig.2. Global Oil Precious Development 2000-2018



Source: قصابي شعبان، بلعباس رابح، 2020 ،ص333

The 2008 oil price speculation contributed to the crisis to a large extent. OPEC's oil price surged to an all-time high of $122/barrel that year before declining in 2009 to ease oil costs in 2010, but in 2014, global oil prices decreased by more than 50%. Even though producing countries confirmed production restriction agreements, oil prices surged to $83 per barrel in 2018.(قصابي و بلعباس ، 2020، صفحة 333).

4. Empirical approach:

Analyzing time-series data using the ARDL self-regression model will help determine the effect of oil price volatility on Algerian government spending.

4.1 Building the model:

For the purpose of this study, the model can be written as follows:

$$DP = f(OIL, GDP, EX)$$

$$\mathrm{GS}_t = \boldsymbol{\alpha_0} + \boldsymbol{\beta_1}\mathrm{OIL}_t + \boldsymbol{\beta_2}\mathrm{GDP}_t + \boldsymbol{\beta_3}\mathrm{EX}_t + \boldsymbol{\varepsilon_t}$$

where:
GS: Government spending;
OIL: Oil prices;
GDP: GDP;
EX: Exchange rate;
DM: pictorial variable
Δ represents the first difference in the variable
α0 represents the fixed limit
β1, β2, and β3 represent slope in the short term
λ1, λ2, and λ3 represent slope in the long term
t: Represents the study time from 1983 to 2020

4.2 Time series stability test (unit root test)

Using the Dickie Fuller extended test 1981, a unit root test (known as ADF) is used to examine the properties of time series for all economic and social variables. It also aims to verify their stillness and determine each variable's integration level on a scale. Where:

H0: the presence of the root of the unstable chain unit H0: Φ= 1
H1: lack of root of stable chain unit: H1Φ:# 1
The results are illustrated in the table below:

Table 1. Unit root test results of ADF

Level	Level			1st diff		
variables	Form01	Form02	Form03	Form04	Form05	Form06
GS	0.280942	-4.027319*	-2.240054	-2.273565 *	-2.310921	-2.152788
OIL	-0.718368	-1.457599	-1.780516	-5.238565 *	-5.159188 *	-5.085482 *
GDP	0.257661	-0.966049	-2.075297	-2.231141 *	-2.265845	-2.097593
EX	1.833106	0.360786	-4.776392 *	-3.206183 *	-4.183125 *	-4.161772 *
DM	-5.477226*	-6.616670 *	-6.503509*	-9.625334*	-9.502372*	-9.364787*
	Critical values at level			Critical values in the first differences		
Percentages	Form01	Form02	Form03	Form04	Form05	Form06
1%	-2.630762*	-3.689194*	-4.234972*	-2.630762*	-3.626784*	-4.234972*
5%	-1.950394**	-2.971853**	-3.540328**	-1.950394**	-2.945842**	-3.540328**
10%	-1.611202***	-2.625121***	-3.202445***	-1.611202***	-2.611531***	-3.202445***

Source: Authors' elaboration based on Eviews10 outputs

(*, **, ***) indicates acceptance of the alternative hypothesis (H1), which states that there is no unit root. The series is stable at significant levels (1%, 5%, and 10%).

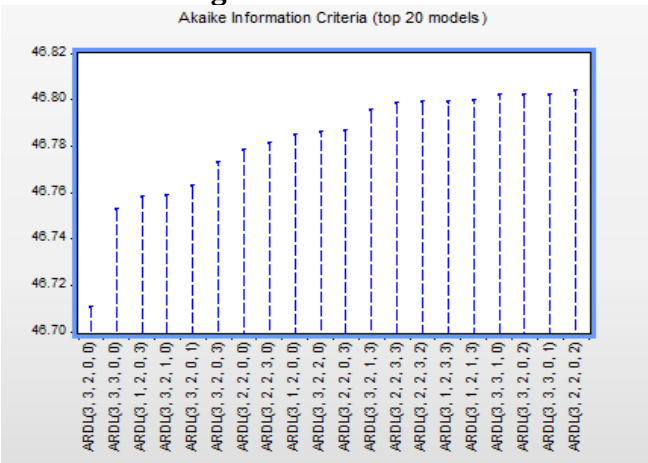
After testing the stability of the time series, we found that the time series oil prices and aesthetic GDP were stable at the first difference, while the time chains of both government spending, exchange rates, and the mock variable were stable at the level, and therefore we can rely on the self-regression model of ARDL.

4.3 Bounds test

This test is conducted to see if there is a long-term relationship between the study variables, but before that, the degree of slowness must be determined by relying on the Akaike Information Criteria standard.

4.3.1 Determine the degree of the slowness of the ARDL model

Fig.3.Determine the degree of the slowness of the ARDL model



Source: Eviews10 outputs

The figure above indicates that the best slowing down by Akaike Information Criteria was ARDL (3.3.2.0.0). Therefore, we can conduct the bounds test.

4.3.2 Bound Test of Co-integration

Through this test, we can see if there is a long-term relationship between the dependent variable and the interpreted variables by testing the validity of the H0 and H1 hypothesis

H0: there is no long-term relationship that goes from the interpreted variable to the dependent variable H0: Φ =1

H1: there is a long-term relationship that goes from interpreted variable to dependent variable H1: Φ #1

Table 2.Long run ARDL bounds tests Null Hypothesis:

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	6.205700	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Actual Sample Size	35	Finite Sample: n=35		
		10%	2.46	3.46
		5%	2.947	4.088
		1%	4.093	5.532

Source: Eviews10 outputs

The table shows that the statistic F-statistic = 6.205700calculated is greater than bound I1 = 3.49 at 5%. In this case, we reject hypothesis H0 and accept the alternative H1. Which shows a long-term relationship moving from the explained variables (petrol prices, gross

domestic product, exchange rate) to the dependent variable (public spending)

4.4Estimate the ARDL model

The government spending equation can be written as follows:

$$GS = C(1) * GS(-1) + C(2) * GS(-2) + C(3) * GS(-3) + C(4) * OIL + C(5) * OIL(-1) + C(6) * OIL(-2) + C(7) * OIL(-3) + C(8) * GDP + C(9) * GDP(-1) + C(10) * GDP(-2) + C(11) * EX + C(12) * DM + C(13)$$

Table 3.Estimate Results ARDL Modal

Dependent Variable: GS
Method: ARDL
Date: 09/15/22 Time: 18:27
Sample (adjusted): 1986 2020
Included observations: 35 after adjustments
Maximum dependent lags: 3 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic): OIL GDP EX DM
Fixed regressors: C
Number of models evalulated: 768
Selected Model: ARDL(3, 3, 2, 0, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GS(-1)	0.986510	0.167248	5.898501	0.0000
GS(-2)	-0.624510	0.227055	-2.750480	0.0117
GS(-3)	0.351490	0.141643	2.481515	0.0212
OIL	-78844608	59709743	-1.320465	0.2003
OIL(-1)	2.14E+08	65343530	3.272419	0.0035
OIL(-2)	-1.26E+08	61052652	-2.070973	0.0503
OIL(-3)	84496803	49408281	1.710175	0.1013
GDP	1.157717	0.197959	5.848261	0.0000
GDP(-1)	-1.575753	0.384275	-4.100592	0.0005
GDP(-2)	0.875558	0.307889	2.843744	0.0094
EX	-88977651	50740921	-1.753568	0.0934
DM	-1.74E+09	1.88E+09	-0.925439	0.3648
C	-2.43E+10	5.62E+09	-4.323053	0.0003

R-squared	0.998173	Mean dependent var	1.12E+11
Adjusted R-squared	0.997177	S.D. dependent var	5.51E+10
S.E. of regression	2.93E+09	Akaike info criterion	46.71031
Sum squared resid	1.88E+20	Schwarz criterion	47.28801
Log likelihood	-804.4303	Hannan-Quinn criter.	46.90973
F-statistic	1001.838	Durbin-Watson stat	2.233718
Prob(F-statistic)	0.000000		

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

Source: Eviews10 outputs

We note that the R-squared and the adjusted R-squared values are significant through the table results. This indicates a strong relationship between oil prices, GDP, exchange rate, and government spending. This is to say that dependent variables explain government spending by 99%.

The model is significant since the F value (1001.838) is greater than the F-table value (2.45). Therefore, we accept the GS government spending equation statistically.

4.5 ARDL Error Correction Regression

Table 4.ARDL Error Correction Regression

ARDL Error Correction Regression
Dependent Variable: D(GS)
Selected Model: ARDL(3, 3, 2, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 09/15/22 Time: 18:36
Sample: 1983 2020
Included observations: 35

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GS(-1))	0.273020	0.122105	2.235939	0.0358
D(GS(-2))	-0.351490	0.113047	-3.109225	0.0051
D(OIL)	-78844608	32805790	0.000000	0.0000
D(OIL(-1))	41941606	36536334	0.000000	0.0000
D(OIL(-2))	-84496803	38699931	0.000000	0.0000
D(GDP)	1.157717	0.148824	7.779123	0.0000
D(GDP(-1))	-0.875558	0.206848	-4.232856	0.0003
CointEq(-1)*	-0.286510	0.042384	-6.759920	0.0000

R-squared	0.885314	Mean dependent var	3.08E+09
Adjusted R-squared	0.855581	S.D. dependent var	6.95E+09
S.E. of regression	2.64E+09	Akaike info criterion	46.42459
Sum squared resid	1.88E+20	Schwarz criterion	46.78010
Log likelihood	-804.4303	Hannan-Quinn criter.	46.54731
Durbin-Watson stat	2.233718		

* p-value incompatible with t-Bounds distribution.

Source: Eviews10 outputs

We note that the error correction factor is negative, CointEq (-1) = -0.286510, with level

of significance under 5%.

4.6 LM Test:

H_0: lack of self-association of errors:H_0: $\Phi=1$

H_1: a subjective correlation of errors: H_1: $\Phi \neq 1$

Table 5. LM TEST

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.902532	Prob. F(2,20)	0.4214
Obs*R-squared	2.897364	Prob. Chi-Square(2)	0.2349

Source: Eviews10 outputs

We note from the table above that the probability is greater than 5%. Therefore, we accept the H0 and w say that there is no subjective association of errors.

4.7Heteroskedasticity Test:

There are a range of tests that can be performed, including breusch-Pagan-Godfrey and ARCH

4.7.1 Breusch-Pagan-Godfrey:

Table 6.Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.757765	Prob. F(12,22)	0.6844
Obs*R-squared	10.23573	Prob. Chi-Square(12)	0.5953
Scaled explained SS	3.016316	Prob. Chi-Square(12)	0.9954

Source: Eviews10 outputs

The results in table 6 indicate that the probability of testing homogeneity variance error variations (Prob.F (12,22) = 0.6844) and is greater than 5%, so we reject the hypothesis H1, and we retain the H0, which means that the estimated model is free of the problem of homogeneity variance errors.

4.7.2 Heteroskedasticity Test: ARCH

4.7.3

Table 7.Heteroskedasticity Test: ARCH

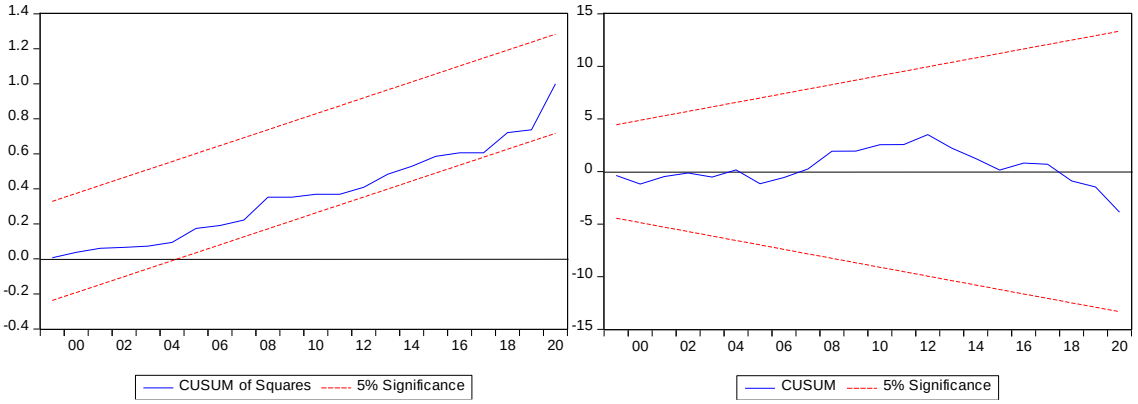
Heteroskedasticity Test: ARCH			
F-statistic	0.198479	Prob. F(1,32)	0.6590
Obs*R-squared	0.209584	Prob. Chi-Square(1)	0.6471

Source: Eviews10 outputs

The contrast instability test indicates that Fisher's probability is 0.6590, which is greater than 5%, which means acceptingthe hypothesis of nothingness is that the random error limit in the estimated model is consistent.

4.8 Structural stability test for model

Fig.4.stability test results

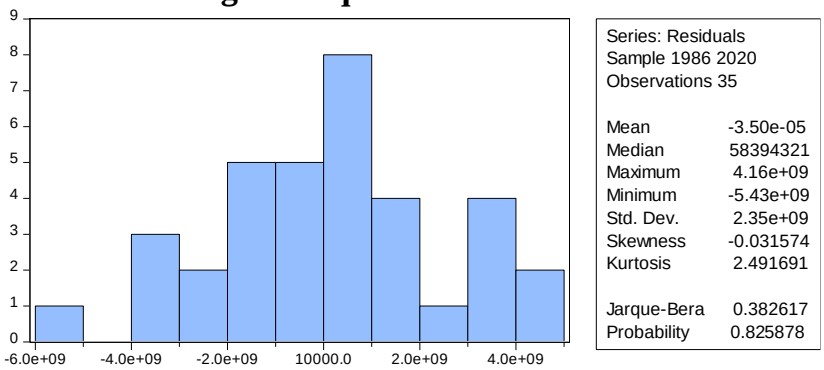


Source: Eviews10 outputs

It is clear from both forms that the estimated transactions of the ARDL model used are stable, as we note that both the total of cusum (Cumulative Sum of Recursive Residual) and cusum of squares (Cumulative Sum of Square Recursive Residual) are located between critical lines at a significance level of 5%. This confirms a stability between the study variables and a harmony in the model between the short- and long-term error correction results.

4.9 normality test for residuals of the ARDL model

Fig.5. Jarque-Bera test results



Source: Eviews10 outputs

Figure 4 shows that the probability is greater than the significance level (5%); therefore, we accept the H0. This means that all the residuals follow a normal distribution. So, we can rely on this model to explain the impact of oil price fluctuations on government spending in Algeria.

5. Conclusion and Recommendation

This study analyzed the impact of oil price fluctuations on government spending, considering the self-regression model of ARDL for the 1983-2020 period. According to the empirical results through the World Bank and OPAC, government spending is one of the most important political and financial instruments Algeria uses to achieve its desired goals, and it is constantly changing as oil prices change on global markets. Therefore, we can say that the

Algerian economy depends widely on this sector.

5.1Results:

As a result, we can say that:
- The Algerian economy is closely linked to the hydrocarbon sector; therefore, fluctuations in oil prices significantly impact various economic balances.
- There is A Long-Term Relationship Move from the variables (Oil Precious, Gross Domestic Product, Exchange Rate) to The Independent Variable (government spending),which means that oil prices have a long-term impact on public spending, which makes public spending subject to fluctuations in oil prices in Algeria.
- Government spending is explained by previous observations and late values of oil prices, GDP, and exchange rate
- There is no subjective correlation of errors, and the estimated model is free of the problem of heterogeneity errors
- The residuals follow the natural distribution. Therefore, we can rely on this model to explain oil price fluctuations' impact on Algeria's government spending.
- A standard model can be built to study the impact of fluctuations in oil prices and government spending

5.2 Recommendations

- Algeria has enormous potential to end dependence on oil as its sole source and to an economy dependent on economic diversification and the recovery of other parts;
- Government spending must be redirected by raising the productive capacities of various sectors, especially the industrial and agricultural sector.
- The need to take advantage of the experiences of successful states to emerge from the rentier economy, which depends on oil revenues;
- Promoting investment, opening up towards foreign investment, employing oil revenues to support scientific research in order to find solutions and exploit modern technologies in the fields of production and get rid of oil dependency,

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7.Appendices

Appendix 1:

Augmented Dickey-Fuller Unit Root Test on GS

Null Hypothesis: GS has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.280942	0.7618
Test critical values:	1% level	-2.630762	
	5% level	-1.950394	
	10% level	-1.611202	

*MacKinnon (1996) one-sided p-values.

Appendix 2:

Augmented Dickey-Fuller Unit Root Test on GS

Null Hypothesis: GS has a unit root
Exogenous: Constant
Lag Length: 6 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.027319	0.0040
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

Appendix 3:

Augmented Dickey-Fuller Unit Root Test on GS

Null Hypothesis: GS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.240054	0.4543
Test critical values:	1% level	-4.234972	
	5% level	-3.540328	
	10% level	-3.202445	

*MacKinnon (1996) one-sided p-values.

Appendix 4:

Augmented Dickey-Fuller Unit Root Test on D(GS)

Null Hypothesis: D(GS) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.273565	0.0241
Test critical values:	1% level	-2.630762	
	5% level	-1.950394	
	10% level	-1.611202	

*MacKinnon (1996) one-sided p-values.

Appendix 5:

Augmented Dickey-Fuller Unit Root Test on D(GS)

Null Hypothesis: D(GS) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.310921	0.1741
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Appendix 6:

Augmented Dickey-Fuller Unit Root Test on D(GS)

Null Hypothesis: D(GS) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.152788	0.5003
Test critical values:	1% level	-4.234972	
	5% level	-3.540328	
	10% level	-3.202445	

*MacKinnon (1996) one-sided p-values.

Appendix 7:

Augmented Dickey-Fuller Unit Root Test on OIL

Null Hypothesis: OIL has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.718368	0.3986
Test critical values:	1% level	-2.628961	
	5% level	-1.950117	
	10% level	-1.611339	

*MacKinnon (1996) one-sided p-values.

Appendix 8:

Augmented Dickey-Fuller Unit Root Test on OIL

Null Hypothesis: OIL has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.457599	0.5436
Test critical values:	1% level	-3.621023	
	5% level	-2.943427	
	10% level	-2.610263	

*MacKinnon (1996) one-sided p-values.

Appendix 9:

Augmented Dickey-Fuller Unit Root Test on OIL

Null Hypothesis: OIL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.780516	0.6938
Test critical values:	1% level	-4.226815	
	5% level	-3.536601	
	10% level	-3.200320	

*MacKinnon (1996) one-sided p-values.

Appendix 10:

View | Proc | Object | Properties | Print | Name | Freeze | Sample | Genr | Sheet | Graph

Augmented Dickey-Fuller Unit Root Test on D(OIL)

Null Hypothesis: D(OIL) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.238565	0.0000
Test critical values:	1% level	-2.630762	
	5% level	-1.950394	
	10% level	-1.611202	

*MacKinnon (1996) one-sided p-values.

Appendix 11:

Augmented Dickey-Fuller Unit Root Test on D(OIL)

Null Hypothesis: D(OIL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.159188	0.0001
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Appendix 12:

Augmented Dickey-Fuller Unit Root Test on D(OIL)

Null Hypothesis: D(OIL) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.085482	0.0011
Test critical values:	1% level	-4.234972	
	5% level	-3.540328	
	10% level	-3.202445	

*MacKinnon (1996) one-sided p-values.

Appendix 13:

Augmented Dickey-Fuller Unit Root Test on GDP

Null Hypothesis: GDP has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.257661	0.7553
Test critical values:	1% level	-2.630762	
	5% level	-1.950394	
	10% level	-1.611202	

*MacKinnon (1996) one-sided p-values.

Appendix 14:

Augmented Dickey-Fuller Unit Root Test on GDP

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.966049	0.7548
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Appendix 15:

Augmented Dickey-Fuller Unit Root Test on GDP

Null Hypothesis: GDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.075297	0.5416
Test critical values:	1% level	-4.234972	
	5% level	-3.540328	
	10% level	-3.202445	

*MacKinnon (1996) one-sided p-values.

Appendix 16:

Augmented Dickey-Fuller Unit Root Test on D(GDP)

Null Hypothesis: D(GDP) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.231141	0.0266
Test critical values:	1% level	-2.630762	
	5% level	-1.950394	
	10% level	-1.611202	

*MacKinnon (1996) one-sided p-values.

Appendix 17:

Augmented Dickey-Fuller Unit Root Test on D(GDP)

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.265845	0.1881
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Appendix 18:

Augmented Dickey-Fuller Unit Root Test on D(GDP)

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.097593	0.5297
Test critical values:	1% level	-4.234972	
	5% level	-3.540328	
	10% level	-3.202445	

*MacKinnon (1996) one-sided p-values.

Appendix 19:

Augmented Dickey-Fuller Unit Root Test on EX

Null Hypothesis: EX has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.833106	0.9820
Test critical values:	1% level	-2.630762	
	5% level	-1.950394	
	10% level	-1.611202	

*MacKinnon (1996) one-sided p-values.

Appendix 20:

Augmented Dickey-Fuller Unit Root Test on EX

Null Hypothesis: EX has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.360786	0.9784
Test critical values:	1% level	-3.621023	
	5% level	-2.943427	
	10% level	-2.610263	

*MacKinnon (1996) one-sided p-values.

Appendix 21:

Augmented Dickey-Fuller Unit Root Test on EX

Null Hypothesis: EX has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 6 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.776392	0.0030
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Appendix 22:

Augmented Dickey-Fuller Unit Root Test on D(EX)

Null Hypothesis: D(EX) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.206183	0.0021
Test critical values:	1% level	-2.630762	
	5% level	-1.950394	
	10% level	-1.611202	

*MacKinnon (1996) one-sided p-values.

Appendix 23:

Augmented Dickey-Fuller Unit Root Test on D(EX)

Null Hypothesis: D(EX) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.183125	0.0023
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Appendix 24:

Augmented Dickey-Fuller Unit Root Test on D(EX)

Null Hypothesis: D(EX) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.161772	0.0120
Test critical values:	1% level	-4.234972	
	5% level	-3.540328	
	10% level	-3.202445	

*MacKinnon (1996) one-sided p-values.

Appendix 25:

Augmented Dickey-Fuller Unit Root Test on DM

Null Hypothesis: DM has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.477226	0.0000
Test critical values:	1% level	-2.628961	
	5% level	-1.950117	
	10% level	-1.611339	

*MacKinnon (1996) one-sided p-values.

Appendix 26:

Augmented Dickey-Fuller Unit Root Test on DM

Null Hypothesis: DM has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.616670	0.0000
Test critical values:	1% level	-3.621023	
	5% level	-2.943427	
	10% level	-2.610263	

*MacKinnon (1996) one-sided p-values.

Appendix 27:

Augmented Dickey-Fuller Unit Root Test on DM

Null Hypothesis: DM has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.503509	0.0000
Test critical values:	1% level	-4.226815	
	5% level	-3.536601	
	10% level	-3.200320	

*MacKinnon (1996) one-sided p-values.

Appendix 28:

Augmented Dickey-Fuller Unit Root Test on D(DM)

Null Hypothesis: D(DM) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.625334	0.0000
Test critical values:	1% level	-2.630762	
	5% level	-1.950394	
	10% level	-1.611202	

*MacKinnon (1996) one-sided p-values.

Appendix 29:

Augmented Dickey-Fuller Unit Root Test on D(DM)

Null Hypothesis: D(DM) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.502372	0.0000
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Appendix 30:

Augmented Dickey-Fuller Unit Root Test on D(DM)

Null Hypothesis: D(DM) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.364787	0.0000
Test critical values:	1% level	-4.234972	
	5% level	-3.540328	
	10% level	-3.202445	

*MacKinnon (1996) one-sided p-values.