



The impact of oil price fluctuations on operating expenses in Algeria during the period 1990-2022

<i>Akram laouar*</i>	<i>Ali Khenafar</i>	<i>Bothainamordjane</i>
<i>Green Economy and Renewable Energies Laboratory, Abbes LaghrourKhenchela - algeria</i>	<i>Green Economy and Renewable Energies Laboratory, Abbes LaghrourKhenchela - algeria</i>	<i>Abbes LaghrourKhenchela - algeria</i>
<i>Akram.laouar@univ-khenchela.dz</i>	<i>khenafar.ali@univ-khenchela.dz</i>	<i>Bothainamordjane@gmail.com</i>

Received : 22/09/2025

Accepted 24 / 11 /2025

Abstract

The study aims to determine the reality and prospects of oil in Algeria. Considering that the Algerian economy is largely dependent on oil, Algerian fiscal policy also depends heavily on oil revenues, which change continuously with the change in oil prices in global markets. The variable of oil price fluctuations was chosen due to their importance in oil taxation, which is considered revenue to cover the state's public expenditures.

The unconstrained VAR model was adopted between oil price fluctuations and operating expenses, with the aim of studying the causal relationship and commenting on the response functions as well as the analysis of the variance components. Through this standard relationship, we can obtain a specific and clear interpretation of the impact of oil price fluctuations on operating expenses. The study concluded that there is an impact between oil price fluctuations and operating expenses.

The study also recommends the necessity of adopting a strategy to rationalise oil supply in line with demand in Algeria, as the balance between these variables is considered the most important source of revenues that contribute to covering operating expenses.

Keywords::petroleum. Operating expenses.Overhead expenses.

* Corresponding author

1. Introduction

The significance of oil in Algeria arises from the generation of substantial financial returns, which are crucial for funding economic and social development initiatives, Oil in Algeria has significantly influenced the trajectory and character of development from the early 1970s to the present, The examined period saw an increase in government expenditure in Algeria, indicating an expansionary fiscal approach, Price fluctuations significantly influence the Algerian economy, a rentier economy primarily reliant on the hydrocarbon sector, particularly oil. These variations impact macroeconomic variables through various channels, notably the public spending channel, which serves as a tool of the state's fiscal policy. Public spending reflects the government's efficacy in economic activity, and oil revenues are a crucial source of funding for numerous countries, including Algeria, which relies on oil taxation to finance its development programs and public expenditures, Nonetheless, oil taxation is contingent upon the prices during its collection, The oil market is unpredictable and unstable, affecting the national budget by influencing governmental revenues and expenditures. Included in these expenditures are operating expenses, which are essential for the management of governmental facilities.

1.1 The main problem

Algeria has diligently endeavoured to address oil-related matters, including oil prices, by channelling investments in oil resources over time, as this sector is the primary source of state revenue, facilitating the coverage of public expenditures and the attainment of equilibrium in the national budget. Therefore, we can formulate the central question as follows: To what degree did variations in oil prices influence operating expenses in Algeria from 1990 to 2022?

1.2 Study hypotheses

In order to conduct a study that takes into account all of the problems presented above, the study hypothesis was formulated as follows:

- Null Hypothesis: There is no statistically significant effect between oil price fluctuations and operating expenses during the period 1990-2022.
- Alternative Hypothesis: There is a statistically significant effect between oil price fluctuations and operating expenses during the period 1990-2022.

1.3 Objectives of the study

Through this study, we aim to achieve a number of objectives, including:

- ✓ The purpose of this study is to understand and comprehend oil price fluctuations in global markets.
- ✓ The goal is to uncover the network of relationships between the variables of the system under study and determine the direction of causal relationships between them.
- ✓ The purpose of this study is to highlight the impact of oil price fluctuations on operating expenses.

1.4 The Methodology of the study



This study relied on the descriptive and analytical approaches by determining the reality of the impact of oil price fluctuations on operating expenses in Algeria. As for finding the connection between the study variables from 1990 to 2022, it was put through a number of statistical tests for the time series, and the results were gathered using the statistical program Eviews10.

2. General concepts about operating expenses

Operating expenses are considered an important part of public expenditures, used to ensure the smooth running of the state's public facilities.

2.1 Definition of operating expenses

These expenses relate to the financial appropriations allocated to ensure the operation of the public facilities of the state. So, Article 5 of Law 21-90, dated 24 Muharram 1411, which is August 15, 1990, about public accounting, along with its amendments and additions, said that they were "covering the normal burdens necessary to operate public interests whose appropriations are recorded in the general budget of the state." In this case, the most important thing about operating expenses is that they are necessary and ongoing. This is because they are linked to the state's daily and normal activities and allow it to run its public facilities to meet public needs.(djilali, 2023, p. 273) Operating expenses can also be defined as "general expenses that ensure the smooth running of public facilities and include public service expenses, employee salaries, and wages, which constitute the most important part of them, in addition to paying interest on public debts, as well as subsidies and transfer payments." (kasmyouri & khenchour, 2020, p. 254)

2.2 Composition of operating expenses

In the prior budgetary framework, operating expenses encompassed allocations for public service operations, debt repayment, and social expenditures:(djilali, 2023, pp. 273-274)

A- Public Service Operational appropriations are the predominant segment of operational expenditures, The state distributes these appropriations to facilitate the efficient functioning of several ministries, both central and decentralised departments, and public organizations, These allocations encompass, specifically, the following:

- User Appropriations: These funds are designated for all aspects concerning the remuneration of public service users, including salaries and associated benefits such as compensation, grants, and mission expenses, These appropriations represent the predominant portion of operating allocations and serve as a significant metric for assessing their magnitude.
- Means Appropriations: These funds are designated for all aspects concerning the means, tools, and equipment utilised in public service, including expenses for acquisition, maintenance, and renting of such resources, These appropriations encompass all expenditures unrelated to users, including the costs associated with court-awarded compensation.

B- Public debt repayment credits: These are funds designated for the settlement of public debts that are either due or that the government has opted to repay prematurely.

C- Social Expenditure Credits: These are credits in the form of grants and aid directed to groups in need of assistance and solidarity due to their special circumstances, as well as those allocated to subsidising the prices of widely consumed goods, These expenditures do not have a separate chapter in the general state budget but are incorporated into the operating expenses of various ministries with the aim of covering them according to each ministry's specialisation, as follows: for example:

- The Ministry of National Solidarity, Women, and Family Affairs incorporates grants and aid for the disabled into its operating budget.
- Grants directed to non-wage victims of terrorism: These are incorporated into the operating budget of the Ministry of the Interior, Local Authorities, and Territorial Planning, Aid directed in the event of disasters and catastrophes: These are also incorporated into the operating budget of the Ministry of the Interior, Local Authorities, and Territorial Planning.
- Credits to subsidise the prices of widely consumed goods: These are incorporated into the operating budget of the Ministry of Trade.

3. Presenting the study variables

We will identify and present the various variables in this study as the first step. As the second step, we will conduct a unit root test on these variables, as this is crucial in determining the appropriate model for conducting this study.

3.1 Dependent variables

The study focusses on a single variable, operating expenses. It has annual data (from 1990 to 2022) and is expressed in Algerian dinars. It was obtained from publications of the National Office of Statistics (1962–2011) and also from the General Directorate of Policies and Estimation of the Ministry of Finance. We gave it the following abbreviation: DNPSF, which we will rely on in the rest of this study.

3.2 Independent variables

The single variable under study is oil prices. They are annual averages of weekly oil prices for the updated OPEC basket (from 1990 to 2022), expressed in actual value (dollars per barrel), obtained from the official website of OPEC, representing the spot price (current) for the OPEC reference basket, and the following abbreviation was given to it, PPTt, which we will rely on in the rest of this study.

In this study, we relied on the use of the unrestricted VAR model between the oil price PPT and DNPSF with the aim of studying the causal relationship, commenting on the response functions, and analysing the variance components. Through this standard relationship, we can obtain a specific and clear interpretation of the impact of oil price fluctuations on operating expenses. As a starting point, we model the VAR between the two variables LPPT and DNPSF, with the aim of determining the optimal slowing degree, then studying the causal relationship between the two



variables and finally commenting on all the response functions and analysing the variance components, passing through the diagnostic tests of the model.

4. Estimating the VAR(p) model between the two variables LPPT and DNPSF

The results of the lag test for the VAR(p) model, as shown in the table below, showed that the optimal number of lags is $1p = 1$, Therefore, this study will rely on the VAR(1) model.

Table 1. Results of Optimal Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-46.44474	NA	0.109115	3.460338	3.555496	3.489429
1	20.73869	119.9704*	0.001198*	-1.052764*	-0.767291*	-0.965492*
2	21.51727	1.279087	0.001518	-0.822662	-0.346875	-0.677209
3	25.70459	6.280978	0.001518	-0.836042	-0.169940	-0.632408
4	27.34496	2.226219	0.001844	-0.667497	0.188920	-0.405682
5	28.00093	0.796530	0.002442	-0.428638	0.618095	-0.108641

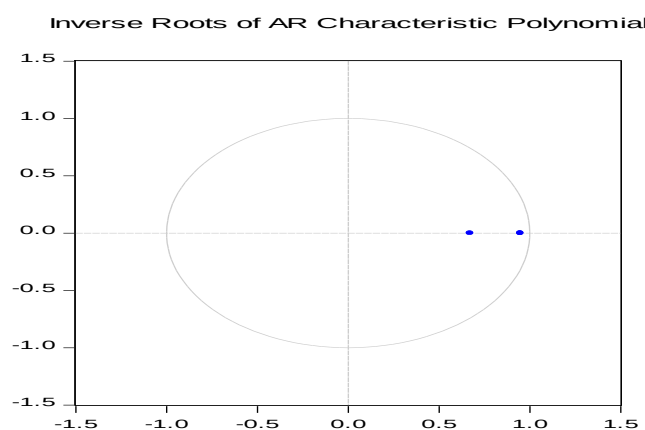
Source: Prepared by the researchers based on EVIEWS10.

After we have identified the ideal model, we now move on to the process of estimating the model parameters so that we can perform all the necessary statistical tests.

4.1 Testing the Quality of the VAR(3) Model

The stability of the model was tested.

Fig.1. Stability Tests of the Estimated



Source: Prepared by the researchers based on EVIEWS10.

The figure above makes it clear that the estimated model meets the stability condition (VAR) because all of the coefficients are less than one and all of them are inside the unit circle. This means that the model is stable and doesn't have any problems with errors being correlated or variance not being stationary.

4.2 Diagnostic tests of the model

The model's residuals were studied and analysed according to the following:

A. Autocorrelation test for residuals

To analyse the autocorrelation of errors, we rely on the LM test. The Lagrange multiplier is one of the most well-known tests for identifying the problem of autocorrelation of residuals. The test is based on the lag.

Table 2. Lagrange Multiplier Test

VAR Residual Serial Correlation LM Tests

Sample: 1990 2022

Included observations: 32

Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	1.666251	4	0.7968	0.415195	(4, 52.0)	0.7969
2	8.931955	4	0.0628	2.386289	(4, 52.0)	0.0629

Null hypothesis: No serial correlation at lags 1 to h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	1.666251	4	0.7968	0.415195	(4, 52.0)	0.7969
2	10.67257	8	0.2210	1.396637	(8, 48.0)	0.2222

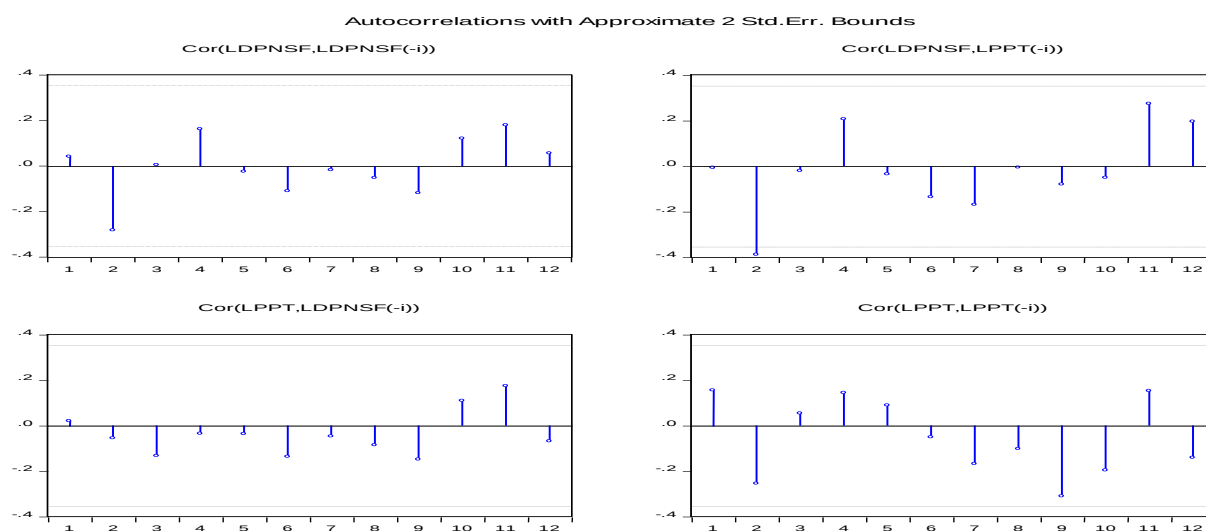
Source: Prepared by the researchers based on EVIEWS10.

We can see from the previous table that the LM test statistic has a high level of statistical significance and is linked to a delay degree of 0.05 or less, which means we have to accept the null hypothesis at these delays..

b. Residuals Test

Figure (02), featuring the correlogram of the residuals, demonstrates that the majority of values reside within the confidence interval, signifying their statistical insignificance

Fig.2.Graphing of autocorrelation functions of residuals



Source: Prepared by the researchers based on EVIEWS10.

C . Testing the stability of error variance

One of the standard problems is the instability of error variance, which leads to false estimation results. Testing the stability of error variance confirms the absence of this problem, as shown in the following table:

Table 3. Testing the variance stability of the model's residual series
VAR Residual Heteroskedasticity Tests (Levels and Squares)

Joint test:					
Chi-sq	df	Prob.			
7.909922	12	0.7921			
Individual components:					
Dependent	R-squared	F(4,27)	Prob.	Chi-sq(4)	Prob.
res1*res1	0.131680	1.023630	0.4129	4.213752	0.3778
res2*res2	0.095906	0.716040	0.5883	3.069002	0.5463
res2*res1	0.082406	0.606196	0.6616	2.636997	0.6203

Source: Prepared by the researchers based on EVIEWS10.

The table indicates a chi-squared value of 0.7921, beyond 0.05, signifying no disparity in the error variances.

d. Normality Test of the Estimated Errors

We employ the Jarque-Bera test to analyse the characteristics of the time series and assess their normality, with the null hypothesis asserting that the residual series adheres to a normal distribution. The p-values (Prob), as shown in the subsequent table, validate the hypothesis.

Table 4. Results of the Normality Test for Estimated Errors

VAR ResidualNormality Tests

Orthogonalization:Cholesky (Lutkepohl)

NullHypothesis:Residuals are multivariate normal

Sample: 1990 2022

Includedobservations: 32

Component	Skewness	Chi-sq	df	Prob.*
1	0.620391	2.052721	1	0.1519
2	-0.624076	2.077179	1	0.1495
Joint		4.129901	2	0.1268

Component	Kurtosis	Chi-sq	df	Prob.
1	3.665489	0.590500	1	0.4422
2	2.950750	0.003234	1	0.9546
Joint		0.593734	2	0.7431

Component	Jarque-Bera	df	Prob.
1	2.643221	2	0.2667
2	2.080413	2	0.3534
Joint	4.723635	4	0.3168

*Approximate p-values do not account for coefficient estimation

Source: Prepared by the researchers based on EVIEWS10.

From the results shown in the table above, we note that the calculated values of the Jarque-Bera statistic for all residuals are greater than the tabulated value, i.e., $\text{Prob}(\text{LM}) > 0.05$, meaning that the residuals of the series follow a normal distribution.

5. Analysis of the Model Estimation Results

Following the model estimation, stability assessment, and residual analysis, we will now evaluate the estimation results based on the subsequent tests:

5.1 Estimation of the VAR(3) Model

Table No. (05) presents the estimation process of the VAR(3) model parameters using the EVIEWS10 software.

**Table 5. Estimation of the VAR(3) Model**

VectorAutoregressionEstimates

Date: 04/24/24 Time:09:24

Sample (adjusted): 1991 2022

Includedobservations: 32 afteradjustments

Standard errors in ()& t-statistics in []

	LDPNSF	LPPT
LDPNSF(-1)	0.867107 (0.03524) [24.6051]	0.129880 (0.07362) [1.76420]
LPPT(-1)	0.124229 (0.05913) [2.10092]	0.754845 (0.12353) [6.11076]
C	1.565876 (0.34838) [4.49479]	-0.893528 (0.72777) [-1.22776]

$$\text{LDPNSF} = C(1,1)*\text{LDPNSF}(-1) + C(1,2)*\text{LPPT}(-1) + C(1,3)$$

Source: Prepared by the researchers based on EVIEWS10.

The previous results indicated that the model does not contain any standard deviations. To ensure the statistical significance of the model's estimated parameters, we decided to estimate the model according to the previously determined degree of lag. The model estimation results are analysed and interpreted as follows: $\text{LDPNSF} = 0.867107345354*\text{LDPNSF}(-1) + 0.124229322444*\text{LPPT}(-1) + 1.56587628281$ Table (5) indicates that the model quality is acceptable, based on:

- The estimated model equation shows that operating expenses are written in terms of their lagged value in addition to the lagged value of the oil price variable.

5.2 Causality Test

The Granger causality test assesses the existence of a reciprocal relationship between two variables. To investigate the causal relationship between the variables, we performed this test, and the findings are as follows:

Table 6. Granger Causality Test Results

VAR Granger Causality/Block Exogeneity Wald Tests

Sample: 1990 2022

Includedobservations: 32

Dependentvariable: LDPNSF

Excluded	Chi-sq	df	Prob.
----------	--------	----	-------

LPPT	4.413858	1	0.0356
All	4.413858	1	0.0356

Dependentvariable: LPPT

Excluded	Chi-sq	df	Prob.
LDPNSF	3.112395	1	0.0777
All	3.112395	1	0.0777

Source: Prepared by the researchers based on EVIEWS10.

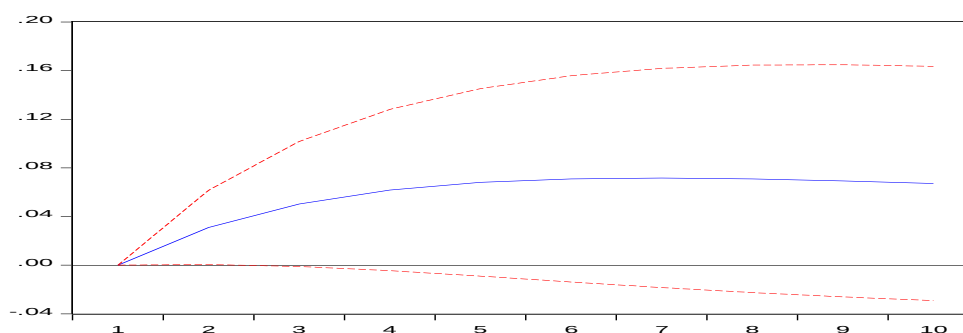
The above table shows that there is a causal relationship between the two variables. This is shown by the fact that the probability that changes in oil prices are a cause of changes in operating expenses (prob(Wald test) = 0.03) is less than the 5% significance level. Therefore, there is a causal relationship in one direction between the two variables. This relationship is the focus of this study, meaning that any change in oil prices could cause changes in the statistical data for operating expenses over the long term. This demonstrates the connection between fluctuations in oil prices and operating expenses.

5.3 Analysis of Impulse Response Functions (IRF)

allows for the study of the future time course of the response of a variable to itself and to the variable included in the model, as a result of the impact of a sudden random shock of one standard deviation in one of the study variables. Accordingly, a test of the response of operating expenses to a sudden change in oil prices was conducted over 10 times, and the following results were obtained using the EVIEWS10 program:

Fig.3.Graphical Representation of Impulse Response Functions

Response of LDPNSF to LPPT Innovation
using Cholesky (d.f. adjusted) Factors



Source: Prepared by the researchers based on EVIEWS10.

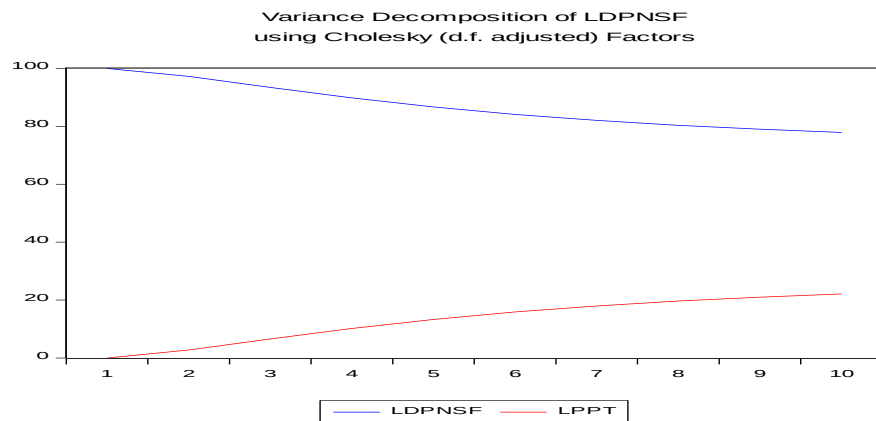
The estimates of the immediate response functions over a decade indicate that a positive structural shock in oil prices, as illustrated in the figure above and quantified at one standard deviation or one dollar, will yield a beneficial impact. The response values of operating expenses exhibited an increase, peaking at 7.1% in period (7) before following a positive regression curve to return to long-term equilibrium.

5.4 Variance Decomposition



The term "analysis of variance" refers to assessing the significance of predictions concerning the error variance attributable to abrupt changes in each variable over the entire model. In our analysis of variance, we will determine the percentage of future fluctuations in operational expenses that may be attributed to the volatility of oil prices. Figure No. (04) presents the outcomes of the analysis of variance.

Fig.4.Graphical Representation of Forecast Error Variance Decomposition



Source: Prepared by the researchers based on EVIEWS10.

The results in Figure 04 indicate that fluctuations in oil prices significantly impact variations in operating expenses. The operating expenses variable constitutes 100% of the forecast error in variance during the initial period, although this percentage diminishes over time. Ultimately, 86.66% of the forecast error for the operating expenses variable is attributable to its own fluctuations, whereas merely 13.33% is a result of variations in oil prices. The percentage persists in declining until the ninth stage, culminating at 77.89%, ascribed to the operational expenditures variable, in contrast to 22.10% for the oil prices variable. This research validates the significance of oil prices in affecting the behaviour of operating expenses over time. Based on the statistical results derived from the two variables, we accept the alternative hypothesis, which posits that "there is a statistically significant effect of oil price fluctuations on operating expenses in Algeria from 1990 to 2022," and we reject the null hypothesis. Our findings suggest that fluctuations in oil prices influence operating expenses in Algeria, as the Algerian economy relies on a public spending plan funded by oil tax income.

6. CONCLUSION

Considering the significance of oil to the Algerian economy as a principal source of financial resources, which underpins government expenditure and serves as a key indicator of financial resource fluctuations, it is essential to formulate strategies to mitigate the effects of oil price volatility on operational expenses in Algeria. The objective is to maintain the efficient operation of public services and institutions while avoiding an overall budget deficit.

Findings and Recommendations: Based on this study, we present the following key findings and recommendations:

- Since the advent of petroleum, oil prices have exhibited perpetual dynamism and volatility, attributable to the interplay of various economic, political, military, and other forces.
- The hydrocarbon sector is the predominant sector in Algeria's overall economic activity. Notwithstanding the initiatives undertaken throughout Algeria's economic reform phase to diminish the economy's reliance on this sector, the correlation between oil prices and economic activity persists robustly to the present day.
- Operating expenses are a crucial financial policy instrument that aids in the administration of state facilities.
- A positive shock in oil prices, quantified at one standard deviation, will significantly elevate operating expenses in Algeria during the short-term response period, peaking at 5%, which will persist at this rate throughout the response duration. Approximately 97% of the variations in operating expenses are attributable to shocks within the variable itself, whereas around 3% of the swings in operating expenses result from shocks in the oil price in Algeria.
- It is advisable to augment the efficiency of public expenditure to guarantee the optimal utilisation of financial resources through the enhancement of budget planning and accounting systems, the evaluation of spending programs, and the eradication of corruption.
- Algeria must endeavour to establish adequate financial reserves to safeguard the nation during years of diminished oil prices by conserving surplus income in times of economic growth.
- Promoting effective governance and transparency in public financial management is essential for the appropriate and equitable utilisation of financial resources

7. Bibliography List :

1. Bessissa, a., & Bouafia, R. (2020). The Impact of Oil Price Fluctuations on Public Expenditure in Algeria: A Standard Study During the period 1990-2017. *Journal of Business Administration and Economic Studies* , 06 (02).
2. bouamra, j. (2015). The Impact of Oil Price Fluctuations on Public Spending Policy in Algeria 1990-2013. *Revue d'Economie et de Développement Humain* , 06 (03).
3. djilali, y. (2023). Classification and distribution of public expenditures in Algeria, a comparative study between the previous budgetary system established by Law 17-84 related to financial laws, amended and supplemented, and the budgetary reform established by Organic Law. *Journal of Legal and Political Thought* , 07 (02).
4. kasmouri, q., & kenchour, d. (2020). A standard analytical study For the effect of public expenditure (management and processing expenses) on inflation in Algeria1980-2018. *Journal of Financial, Accounting And Managerial studies* , 07 (02).
5. katouch, r. (2017-2018). The problematic relationship between oil price fluctuations and some labor market variables in Algeria (PhD thesis). Algeria: University of Algiers 3.