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An Econometric Study Of The Impact Of Oil Price Fluctuations On The Algerian Dinar Exchange Rate During The Period 1990-2020

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Abstract:

This Study Aims To Find Out The Impact Of Oil Price Fluctuations On The Exchange Rate Of The Algerian Dinar During 1990 To 2020, As Our Study Relied On The Historical Descriptive Approach In The Theoretical Side Of The Study And On The Analytical Approach On The Applied Side By Analyzing The Curves And Tables Of The Study Extracted From The Eviews 12 Program .

Our Study Concluded That The Time Series Of Oil Prices And The Exchange Rate Are Not Stable At The Level According To The ADF And PB Test, And Showed That There Is No Common Integration Relationship Between Oil Prices And The Exchange Rate According To The Statistical Impact Test, In Addition To The Absence Of A Causal Relationship In The Trend From Oil Prices Towards The Exchange Rate According To The Granger Causality Test As Well As The Exchange Rate To Oil Prices.

Keywords: Oil Price, Exchange Rate, ADF , VAR, Economy Of Algeria.

1. Introduction :

Oil is the first and primary source of energy, and the focus of all industrial and agricultural production in the contemporary world, and thus it is considered a strategic commodity that controls the fate of the world and its economy, and oil is no longer the most important source

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of energy only, but also became a source of extraction of at least 11 thousand different industrial commodities in the world, and thus became the most important commodity in international trade, as it constitutes 33% of the global energy trade due to its versatility and the flexibility of its products (mkhlafi, 2014).

The Algerian economy depends on the hydrocarbon sector, as Algerian oil exports are estimated at 96.72% of the total exports during the year 2021, and oil collection revenues constitute 69.8% of the total public revenues with a value of 1722 billion dinars in 2021 (mkhlafi, 2014), where Algeria's proven oil reserves are estimated at 124.5 thousand million tons in 2020 (mkhlafi, 2014). Exported oil revenues contribute about 40% of GDP annually.

In view of the important place of hydrocarbons in general and oil in particular in the Algerian economy due to their fundamental role in the macroeconomy and the expectation of an increase in domestic demand for oil and its derivatives over the next 50 years, we find it an essential element in its energy policy as well as its financial collections.

The exchange rate produces undesirable consequences from the economic side and the value of the national currency. The link between the exchange rate and a particular currency or a basket of currencies makes it a carrot and subject to multiple policies, the most influential foreign currencies on the financial markets are mainly the dollar, and therefore their impact on what happens in the financial markets in turn has an impact on the currencies associated with them up and down and what is priced in dollars of goods and services is also affected by that, as oil commodities that represent the main resource of the budget in the Algerian economy are affected like commodities priced in US dollars in the rest of the world.

Algeria is among the oil countries that suffer from the instability of its exchange rates, especially its heavy dependence on the export of a single commodity, which makes it face some economic problems. Economists have offered a range of explanations behind the poor economic performance of some resource-rich countries, or the so-called natural resource curse, and considered the Dutch economic disease theory among the most important economic explanations for the impact of oil price fluctuations on the real exchange rate. Coinciding with the fluctuations in the exchange rate of the Algerian dinar since the beginning of the second millennium, between decline at times and slight improvement at other times, with the general trend being downward but at weak rates.

The purpose of this study is to answer the following problem:

What is the impact of oil price fluctuations on the exchange rate in Algeria during the period from 1990 to 2020?

2. The Concept Of Petroleum

Definition: " It is a complex mixture of hydrocarbons compounds, each of which has some natural properties that differ from the other due to the difference in the number of carbon atoms in its molecules, but they are all composed of only two elements: carbon and hydrogen" (Dahou soleiman, 2018, p. 209).

3. The Concept Of The Exchange Rate

There are many definitions of the exchange rate, which we mention below:

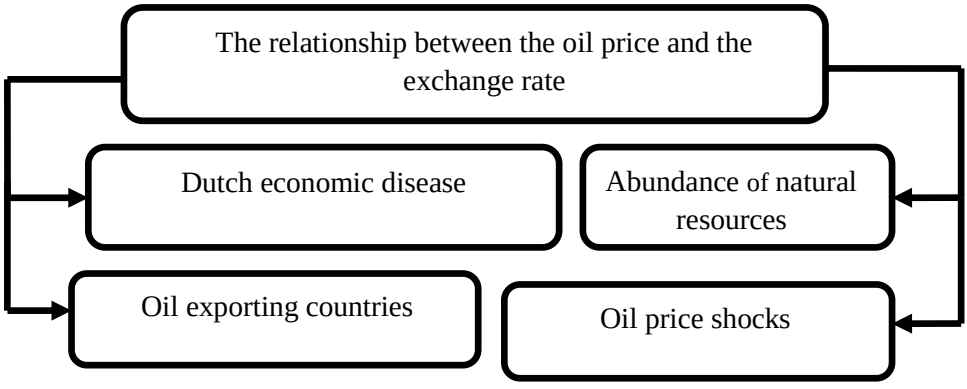
- The exchange rate in a country means the rate at which a currency is exchanged with the currencies of the rest of the world, that is, the number of units that are paid from the currency of one country in exchange for obtaining a number of units of the currencies of other countries." (Al-Moussawi, 2016, p. 7)
- It is a means that enables the local currency to be linked to foreign currencies and is a tool for settling international exchange transactions." (Mahi Zakaria, 2022, p. 294)

Based on the previous definition, a comprehensive definition can be given as "the number of units of local currency paid to obtain a unit of foreign currency." (Sarah Bousis, 2021, p. 4).

4. The Relationship Between The Price Of Oil And The Exchange Rate:

We will try to highlight the relationship between the price of oil and the exchange rate, through economic explanations as follows:

Figure 1 : The relationship between the price of oil and the exchange rate



Source: Prepared by researchers based on Soumia Brakni And others, "The impact of oil price fluctuations on the real exchange rate 2019.

Through the figure, we will try to define the relationship between the price of oil and the exchange rate, highlighting the most important economic explanations for this relationship, which is mainly represented in the economic interpretation of the natural resource curse, which indicates that many economic and political factors may play an important role in the decline in the performance of resource-abundant economies, considering that resource-rich and oil-exporting countries in particular are much lower than the performance of resource-poor countries. This negative correlation between resource wealth and growth has led to factors Chair (Faiza", 2018, pp. 107-109):

- the theory of the Dutch economic disease, which leads to an increase in the contribution of the petroleum sector in the growth of national income in addition to the low role of non-petroleum sectors of most producing countries and this phenomenon is called the Dutch bug has shown experimental studies of growth rates in countries rich in natural resources that tend to slow growth than others and addresses the theory of the Dutch bug fluctuations that result from the sudden change and rapid and permanent price of the natural resource and this for the beneficiary country.
- Globalization has changed the rules and the exchange rate has become a unit of measurement by which international markets operate, and this situation has led to the dollar having a fixed relationship with gold (Bretton Woods system) over time lost the value of gold and introduced currencies and central banks were able to direct fluctuations around dollar currencies, which replaced gold as the currency on which the international monetary system is based (Lamia, 2019, pp. 37-40);
- Algeria is an oil exporter as petroleum is the main source of development and has an impact on the decline in its prices on the Algerian economy through fuel revenues due to its impact on several variables (Mehor, 2019, p. 5), and depends mainly on fuel exports, which constitute 98% of the total export surplus, its economy remains subject to price fluctuations of these resources and among the most important indicators that reflect the economic situation of the country, we find that the relationship between the price of oil and the exchange rate varies according to the period of time, whether it is the short term or Long term, thus improving the exchange rate in addition to the high general level

of prices makes domestic prices greater than those of foreign goods (Dhwifi Shafiqa, 2021).

5. Discussion and analysis of results:

5.1.1- unit root test for time series stability.

Many standard studies have proven that time series related to macroeconomic variables are characterized by instability resulting in the problem of false regression, and this appears through the results obtained, it is necessary to ensure the stability of the study variables depending on the unit root test, and therefore we will test Dickie Fuller and Phillips Perron to test the stability of time series.

5.1.2- Determine the degree of stability of the chains:

Table 1. result of study variables

the level				
possibility	t-statistic Calculated	Critical value at%5		
0. 8412	-1.396792	-3.568379	trend and intercept	oil price
5456.0	-1.447935	-2.963972	intercept	
0.4484	-0.601265	-1.952473	none	
0703.0	-3.434491	-3.612199	trend and intercept	exchange rate
0.7508	-0.970268	-2.963972	i ntercept	
0.9989	3.029500	-1.952473	none	

Source: Prepared by researchers based on the outputs of 12 Eviews.

Through the results of the PP unit root test, it is clear that the series is instable at the level because the calculated values of a statistic are less than the tabular values at 5%, while there is stability at the first difference, i.e. integrated from the first degree, and since the model variables are integrated at the first difference and of the same degree, for this it is necessary to ensure a long-term relationship by conducting the Johansen test for joint integration.

5.1.3- **Degree of delay model**

Table. 2: Degree of delay of a model

Lag	LogL	LR	FPE	AIC	SC	Q
1	**-189.0531**	**111.950***	**6466.992***	**14.438***	**14.73634***	**14.53400***
***Indicates lag order selected by the criterion**						

Source: Prepared by researchers based on the outputs of 12Eviews.

5.1.4- Johansson test

We perform the Johansson test to determine which of the trends (long or short) represents a statistically significant significance.

Table 3: Trace statistic results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05Critical Value	**Prob
None	0.108970	4.330034	15.49471	0.8752
At most 1	0.033364	0.984079	3.841465	0.3212

Source: Prepared by researchers based on the outputs of 12 Eviews.
**MacKinnon-Haug-Michelis (1999) p-values.

5.1.5- VAR model estimation

Table 4: VAR model estimation using the OLS least squares method

EX = C(1)*EX(-1) + C(3)				
	Coefficient	**Std. Error**	**t-statistic**	**Prob.**
C(1)	**0.957727**	**0.042317**	**22.63217**	**0.0000**
C(2)	**0.011935**	**0.036275**	**0.329015**	**0.7434**
C(3)	**6.255423**	**2.821280**	**2.217229**	**0.0308**
C(4)	**0.069644**	**0.118094**	**0.589737**	**0.5578**
C(5)	**0.843921**	**0.101233**	**8.336429**	**0.0000**
C(6)	**3,478698**	**7.873338**	**0.441833**	**0.6604**
R-squared	**0.960638**	**Mean dependent var**		**72.88934**
Adjusted. R-squared	**0.957722**	**SD dependent var**		**27.36796**
SE of regression	**5.627285**	**Akaike info criterion**		**14.30148**
Some squared residence	**854.9910**	**Schwarz Criterion**		**14.58172**
Log likelihood	**92.81656-**			
F-statistic	**329.4691**			

Source: Prepared by researchers based on the outputs of 12 Eviews

5.1.6- Economic explanation:

The existence of a correlation between the fluctuations of oil prices and the change in the exchange rate of the Algerian dinar during the study period, which is due to the dominance of the hydrocarbon sector in the Algerian economy, and therefore any decline in oil prices will affect itself and any decrease in the exchange rate of the Algerian dinar will affect itself;

The absence of a direct relationship between the exchange rate and the price of oil.

Table 5: Estimation of VAR Model by Least Squares (OLS)

PB= C(5)*PB(-1) + C(6)				
	Coefficient	**Std. Error**	**t-statistic**	**Prob.**
C(1)	0.957727	0.042317	22.63217	0.0000
C(2)	0.011935	0.036275	0.329015	0.7434
C(3)	6.255423	2.821280	2.217229	0.0308
C(4)	0.069644	0.118094	0.589737	0.5578
C(5)	0.843921	0.101233	8.336429	0.0000
C(6)	3.478698	7.873338	0.441833	0.6604
R-squared	0.777580	Mean dependent var		49.7956
AdjustedR-squared	0.761104	SD dependent var		32.1297
SE of regression	15.70405	Akaike info criterion		14.3014
Some squared residence	6658.662	Schwarz Criterion		14,5817
Log likelihood	123.6053-			
F-statistic	47.19,597			

Source: Prepared by researchers based on the outputs of 12 Eviews.

5.1.7- Economic explanation:

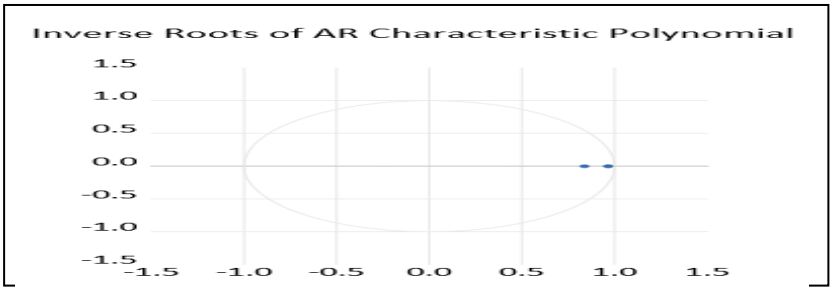
- The absence of a correlation between the fluctuations of oil prices and the change in the exchange rate of the Algerian dinar during the study period, and therefore any decrease in the exchange rate of the Algerian dinar or in oil prices affects itself;
- There is no direct relationship between the price of oil and the exchange rate.

Table 6: Study of the stability of the VAR model

Root	Model
0.964614	0.964614
0.837034	0.837034
No root lies outside the unit circle VAR satisfies the stability condition	

Source: Prepared by researchers based on the outputs of 12 Eviews.

Figure 2: AR Roots test



Source: Prepared by researchers based on the outputs of 12 Eviews.

We can see from the figure above that all the points of two variables (exchange rate and oil price) are located within the unit circle (all roots are within the unit circle) this means that there is stability and from it the model is stable and does not suffer from the problem of correlation of errors.

5.1.8-Autocorrelation test

Table 7:Explains the autocorrelation test

Lags	LM-Stat	Prob
1	0.960955	0.4375
2	0.975717	0.4296
Probs from chi-square with4df.		

Source: Prepared by researchers based on the outputs of 12 Eviews.

We can see from the table that the p-value is greater than 0.05, so we accept the hypothesis H0 and therefore there is no subjective correlation from the second-order error between the variables and therefore there is homogeneity in the variance.

5.1.9- Variance instability test:

Table 8: Shows a test for the problem of instability of variance

Join test		
Chi-sq	Df	Prob
15.21003	12	0.5002

Source: Prepared by researchers based on the outputs of 12 Eviews.

We can see from the table that the p-value is greater than 0.05, so we accept the hypothesis H0 and therefore there is no self-correlation from a second-order error between the variables and therefore there is homogeneity in the variance.

5.1.10- Normal distribution test:

Table 9: Normal distribution test

Componen t	**Jarque-Bera**	**Df**	**Prob**
1	3.333647	2	0.1888
2	0.802972	2	0.6693
Join	4.136619	4	0.3878

Source: Prepared by researchers based on the outputs of 12 Eviews.

We note that the p-value 0.3878 is greater than 0.05 and from it we accept the null hypothesis H0 and therefore the residuals follow the normal distribution.

5.1-11- Causality test:

Table 10: Causality test

Null hypothesis H_0	**Number of views**	**possibility**
PB does not cause EX	30	0.7447
EX does not cause PB	30	0.5603

Source: Prepared by researchers based on the outputs of 12 Eviews.

5.2- Presentation Of Applied Results

Table 11: Discussion of Results

Pointer	comment
Dickey Fuller and Phillips Peron Test	Through the results, we found that two series are unstable at the level of because the calculated values of a statistic are less than the tabular values at 5%, in addition to that because they contain the unit root according to the ADF and PP test, and they also matched in their stillness after taking the first difference, which means that they are complementary from the first order
Degree of delay	From the results, it is clear that the degree of delay is better1
Statistical Impact Test	Statistical Impact Test By presenting the results, we found that the probability value is greater than 5%, which means that there is no co-integration, and therefore the error correction model cannot be estimated, but on the other hand, the relationship can be studied by the self-regression vector model (VAR).
Estimate the VAR model in Equation (1)	- Through the results of the existence of stability because all points are located within the circle of the unit and that the value of the calculated statistic for Fisher is greater than the tabular value of this test 4,17 Ftab>329,4691 = F, which reflects the existence of a significant linear relationship between the dependent variable and the independent variable and therefore that the model has a total significance in addition to the value of the coefficient of determination is very high at a rate of 0.95%, which means that the rate is interpreted by the exchange rate 95% with the value of the previous and the current value, while the remaining values are explained by other factors by adding a relationship Correlation between oil price fluctuations and the change in the exchange rate of the Algerian dinar during the study period This is due to the dominance of the hydrocarbon sector on the Algerian economy, and therefore any decline in the exchange rate of the Algerian dinar will affect oil prices
Estimate the VAR model in Equation (2)	Through the results that the calculated statistical value of Fisher is greater than the tabular value of this test 4,17 Ftab>47,19597= F, which reflects the existence of a significant linear relationship between the dependent variable and the independent variable, and therefore the model has a total significance, in addition to the high value of the coefficient of determination is very high at a rate of 0.76%,

	which means that the price of oil interpreted by the exchange rate is 76% with the value of the previous and the present value, while the remaining values are explained by other factors, in addition to the existence of a correlation between oil price fluctuations and the change in the exchange rate of the Algerian dinar during the study period, and this is due to the dominance of the hydrocarbon sector on the economy Algerian, and therefore any decrease in the price of oil will affect the exchange rate Algerian dinar
Causality Test	The absence of a causal relationship and this negates the validity of the first hypothesis

Source: Prepared by researchers

5.3- discussion of results

After presenting our findings in the previous requirement, we try in this requirement to present a discussion through the following points:

– The time series of petroleum prices and the exchange rate are not stable at the ADF and PB levels;

– The number of slowdowns by one interval was selected based on the tests performed;

- The absence of a co-complementarity between oil prices and the exchange rate according to the statistical impact test;

– the presence of stability in the VAR model so far all values are less than 1 and all points are within the unit circle;

- The explanatory ability of fluctuations for each dependent and independent variable reached high values;

- The absence of a causal relationship in the trend from oil prices towards the exchange rate according to the causality test of Granger as well as the exchange rate to oil prices, which negates the validity of the first hypothesis.

6. Conclusion :

In this paper, we have reviewed a set of possible repercussions of oil price fluctuations on the exchange rate in Algeria and reached a set of results, the most important of which are:

– The time series of petroleum prices and the exchange rate are not stable at the ADF and PB levels;

- The absence of a co-complementarity between oil prices and the exchange rate according to the statistical impact test;

- The explanatory ability of fluctuations for each dependent and independent variable reached high values;

- There is no causal relationship in the trend from oil prices towards the exchange rate according to the causality test of Granger as well as the exchange rate to oil prices.

In light of these effects or findings in this standard study, we develop a set of recommendations and suggestions as follows:

- Non-hydrocarbon export revenues must be diversified, and this will only be done by restructuring the productive sector;
- Not relying heavily on hydrocarbon revenues and working to encourage non-hydrocarbon exports by increasing support for the agricultural and industrial sector;
- Encouraging the creation of micro-enterprises and medium-sized enterprises that create added value;
- Intensifying efforts in the field of renewable energies, which represent a real bet for Algeria.

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