# The effect of fluctuations of variables (oil price, degree of economic openness, terms of trade) on the real exchange rate in Algeria for the period (1980-2018)

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**Abstract:**

The objective of this study is to show the relationship between the effects of the variables, namely, oil prices, degree of economic openness, conditions of economic exchange on the real exchange rate in Algeria, Focusing on the crisis of the two oil crises of 1986, 2014 and the most important effects of the monetary variables of the Algerian economy, which depends on its exports to oil, The study concluded that there is a long relationship between the real exchange rate variable and the oil price, the degree of economic openness and terms of trade exchange, as explained by the error correction model.

**Keywords:** Oil prices, terms of trade, degree of economic openness, real exchange rate.

**Jel Classification Codes**: **:** G34

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## 1. INTRODUCTION

Algeria is one of the most important oil exporters in the world, but its economy suffers from financial problems after this commodity was hit by shocks in demand or global supply, because its economy is linked to this commodity, which is oil, where oil accounts for 97% of its total exports to the outside world, as well as As you earn an estimated revenue of 60% of the total oil collection.

Oil has been subjected to several global shocks, including the shock of 1973 and the shock of 1986 and the last shock in 2014, and since the price of oil is the main driver of Algeria's economy, this has influenced the majority of economic and monetary variables, including the real exchange rate. Oil price fluctuations, degree of economic openness, terms of trade on the real equilibrium exchange rate in Algeria based on the synchronous integration model. Through the above, the main problem can be raised:

**what are the effects of the variables (oil price, degree of economic openness, terms of trade) on the real exchange rate in Algeria?**

**The hypotheses of the study :**

to answer the previous central question was based on the following two hypotheses:

1. The change in oil prices positively affects the Algerian economy.
2. The real exchange rate is affected by the fluctuation of variables (oil price, degree of economic opening, terms of trade).
3. There is a simultaneous integration relationship between the independent variables (oil price, degree of economic opening, terms of trade) with the dependent variable real exchange rate in Algeria.

**The importance of the study:**

highlights the importance of the study in the exposure of the Algerian economy to severe financial shocks after the shocks of oil prices and the impact of macroeconomic variables,

including the shock of 1986, and the shock of 2014, so the attention of researchers on this subject to try to find solutions to get out of this crisis that shook the Algerian economy.

**The objectives of this study:**

are to highlight the relationship between low oil prices, oil price volatility, the degree of economic openness and terms of trade and their impact on the monetary variable of the Algerian economy, which is the real exchange rate, and highlight the most important economic effects of this volatility.

**Firstly. Theoretical framework and previous studies:**

1. **Theoretical framework:**

**1.1Developments in the Algerian exchange system**

**From January 1974,** the exchange rate of the Algerian dinar was pegged to a basket of currencies—in which the U.S. dollar was assigned a relatively large weight due to its importance in hydrocarbon export receipts and debt-service payments—with adjustments taking place from time to time. The substantial appreciation of the U.S. dollar during the first half of the 1980s led to a strong rise in the real value of the Algerian dinar (of about 50 percent during 1980–85), thus undermining the competitiveness of the nonhydrocarbon sector and stimulating imports.

**In 1986, Algeria's economy experienced the reverse oil shock,** and the government responded to the dramatic erosion of export revenue by borrowing abroad and intensifying import restrictions. In parallel, the Bank of Algeria let the Algerian dinar depreciate against the basket by 31 percent between 1986 and 1988. Restrictions imposed on the allocation of foreign exchange increased demand for foreign exchange in the informal market, driving the parallel market premium to about 400 percent. This rigid system was replaced in 1988 by a system of foreign exchange allocation to the five public commercial banks within a framework of credit ceilings, which were consistent with balance of payments targets. The public banks in turn would allocate foreign exchange to their client public enterprises. Between 1989 and 1991, the Algerian dinar was again allowed to depreciate (more than 200 percent in nominal terms) to counteract the terms of trade losses during this period. In 1991, as part of an attempt to realign domestic relative prices and increase openness, the Bank of Algeria let the dinar depreciate by more than 100 percent to DA 22 per U.S. dollar. During 1991–94, the rate of nominal depreciation averaged 4 percent annually, bringing the value of the Algerian dinar to about DA 24 per U.S. dollar on the official market. This relative stability of the nominal rate did not correspond to economic fundamentals: adverse terms of trade shocks and expansionary fiscal and monetary policies resulted in inflation being persistently higher than in Algeria's trading partners. The Algerian dinar, therefore, appreciated by 50 percent in real terms between October 1991 and end-1993.

**In 1994**, the authorities put in place an adjustment program. One of the immediate objectives of the program was to correct the previous real appreciation of the Algerian dinar. Along with broad trade liberalization measures, including on trade-related payments, a twostep devaluation of the Algerian dinar (in total 70 percent) took place between April and September 1994. The spread between the parallel market and official exchange rates fell to about 100 percent during this time.

**Since 1995**, Algeria's exchange rate policy has aimed at maintaining a stable real exchange rate against a basket of currencies weighted according to the country's main trading partners and competitors. In 1995, the managed float regime was implemented through fixing sessions between the Bank of Algeria and commercial banks. An interbank foreign exchange market was established in 1996. Between 1995 and 1998 the REER appreciated

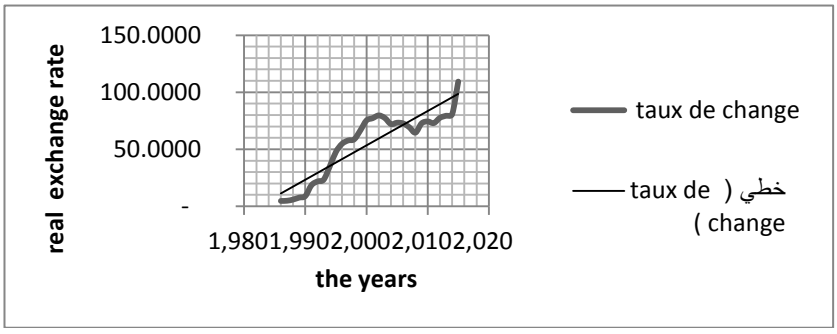
by more than 20 percent, followed by a depreciation of 13 percent between 1998 and 2001. Following 16 months of real depreciation since early 2002, due to the appreciation of the euro against the U.S. dollar, the authorities intervened in the foreign exchange market in the second half of 2003 to realign the REER to its end-2002 level instead of its end-1995 level. Between June and December 2003, the Algerian dinar appreciated against the U.S. dollar by 11½ percent and the REER appreciated by 7½ percent.

**The central bank strongly influences the nominal exchange rate on the official market**. Through its intervention, the Bank of Algeria adjusts periodically the nominal exchange rate so as to achieve its real exchange rate target. In practice, the central bank holds the counterpart of most transactions on the foreign exchange market, as a result of the combination of three factors: (a) hydrocarbon exports account for more than 95 percent of total exports; (b) by law, the foreign exchange receipts from hydrocarbon exports have to be converted into dinars directly at the central bank; and (c) capital account transactions are subject to strict controls. With the advent of the external convertibility of the dinar for current international transactions in 1997, the authorities have indicated that the parallel market has shrunk.

The spread between the interbank market and the parallel market exchange rates was about 25 percent at end-2003 (Koranchelian, July 2005, p. 4) .

The real exchange rate changes in Algeria for the period 1986-2015 can be illustrated as follows :

**Figure 1: Real Exchange Rate Changes for Years (1986-2015)**




**source**: is prepared by researchers based on the statistics and reports of the National Bureau of Statistics and the World Bank database.

## 1.2 The effects of oil price fluctuations on Algeria and General trend of prices :

Although oil income has contributed to a large extent to Algeria's economic prosperity by providing the required financial resources for investment in other sectors, the country's overall economic performance and development have never reached their full potential levels. Examining whether oil revenues did actually help fostering economic development in Algeria is at the heart of the investigation conducted in this paper (Farid GASMI,Imène LAOURARI, 2016, p. 2).

Some authors have argued that Algeria has limited potential to raise gas exports due to declining production and growing internal consumption. They point out that new projects scheduled to come on stream in the coming years will not be sufficient to compensate for the decline from Algeria's mature production fields in the medium term.22 This is not a new development, but rather a continuation of a trend observable since at least the beginning of the present decade.23 In addition, while Algeria's shale gas reserves are impressive and have become a topic of debate, Boersma et al. conclude that any development is years off.

Algerian natural gas production peaked in 2005 at 88 billion cubic meters (bcm) before declining to around 80 bcm/year in 2009–2010. Output rebounded to an estimated 85 bcm in 2015, and is expected to reach 100 bcm by 2020 with the startup of the new southwest gas projects. According to the projections from the Observatoire Méditerranéen de l'Energie, natural gas production in Algeria will increase to some 135 bcm in 2035 (Escribano, 2016, p. 15)

Oil market characterize by since the first oil shock in 1973 which mainly arose as a result of oil embargo of Middle East to countries that support Israel. And oil prices know deep fluctuation During the period 1973-1985 the pricing in oil market was controlled by oligopolistic and the OPEC; in 1973 Arab oil embargo backdrop of the support of the Zionist entity; As a result of the Yom Kippur war, crude oil price; quadrupled from 3$ per bbl in 1972 to 12$ per bbl by the end of 1974. Figure 2 show that the revolution in Iran and the subsequent Iran-Iraq war more than doubled prices from$14 per bbl in 1978 to $35 per bbl in 1981.The crush of 1986: this year know a severe decline in oil prices due to the most of countries members in OPEC don't respect the production quotas; in addition to the role played by countries outside OPEC (KU Britain and Norway) in supply side; on the other hand; lower consumption resulting from rising global prices during the crisis 73.

During most of the 1990s; crude oil prices fluctuated above 20$ per barrel. High price volatility is observable in 1990 – 1991 the second Gulf War when the oil prices know a positive shock; that led to increased oil prices because of the Iraq invasion of Kuwait in 1990.But after 1991; oil prices continued to fall; and during the Asian crisis in 1997 and 1998 when oil prices knew a significant decline reached less than 10 $; this crises occurred because of the Asian recession crisis and increased production of consumer countries. Since the end of 1999 all the raw materials began to know most of the recovery.

Prices fluctuated in the 25$ to30 $ range in the first half of 2000; and continued to display volatility. Crude oil prices continued to decline in 2001 as global economic activity slowed and with growth prospects dampened. Prices plummeted with the September 11 attack .But in the beginning of 2002 the prices know some of Recovery; due to strong world economic growth which led to strong world oil demand. Main drivers behind growth in oil demand included growth in consumption particularly from China, the US; and the Middle East. In the end of first quarter of 2003 the Oil prices began to record unprecedented and continuous increasing; influenced by the Iraq war as well as unrest in Venezuela. The price of oil rose in 29 of the 40 months between September 2003 and December 2006. The price of curd oil, which averaged only 34 $ per barrel in January 2004; rose steadily. During the Israel- Lebanon war of July 2006; oil prices reached 75$ per barrel. Prices fell briefly below 55$ per barrel in January 2007due to mild winter. In the period 2007/2008 oil prices volatility was characterized by sharp increase in the prices of oil; immediately followed by equally sharp declines.

The global financial crisis 2008: record high of US$147 by the July 2008; adding to the global inflationary environment. Worries about how energy prices were affecting the global economy; added to worries about the strengthening of the American dollar and declining demand in industrialized nations; and OPEC production cut. These factors as well as continued fears over global recession caused oil prices to plummet; reaching $43.25 by mid-December 2008.

2009 characterized by global recession and the declining in world economic output; which led to reduce the demand for oil in many sectors; as a result; oil prices collapse. During the first half of 2011; oil supply was affected by temporary shutdowns of production in countries that are not members of the Organization of Petroleum Exporting Countries

(OPEC) for maintenance and capacity expansions and by supply disruptions in Libya (Cherifa r, 2012, pp. 101-103)

The oil markets witnessed many shocks, in some, prices have fallen by about 70 percent of its value since june 2014, and even before that, five shocks, where prices dropped by 30 percent or more. In 1986, the first significant drop in oil prices occurred as a result of OPEC policy change. Other declines were the result of the decrease in global demand for oil due to the economic recession experienced by the United States (1990, 1991 and 2001), the Asian crisis (1997-1998) and the financial crisis (2008-2009). These have caused great damage to oil-dependent economies, including Russia, Venezuela and Algeria, after prices remained for years above 100$ per barrel. This decline cannot be attributed only to supply and demand factors. Some authors (Baffes et al, 2016) gave some interpretations of the current oil market situation. In addition to the factors of supply and demand, the change in the objectives of OPEC member countries6 , the geopolitical changes in the Middle East, the rise in the dollar exchange rate against other currencies7 , and the speculation in the oil market contributed to the deterioration of prices. We can add to these factors the entry of non- conventional oil production (shale) into the market, which reduced the dominance of the OPEC countries.

After falling to 40.6$ per barrel in the first half of 2016, oil prices have steadily strengthened to 50.9$, on average, first half of 2017 and reach $ 71.8 in the first half of 2018 (57.5$ in the second half of 2017). This increase has been continuous since the second quarter of 2017. On the other hand, the drop in the quantities of hydrocarbons exported, expressed in tonnes of oil equivalent (PET), which began in the first half of 2017, was continued over the last two semesters, rising from 54.96 million PET in the first half of 2017, at 53.27 million TEU in the second half of the year of the same year and 51.40 million toe in the first half of 2018, ie a decrease of 6.48% between the first half of 2017 and 2018 (Khaled Menna, 2019, pp. 7-8)

### 1.3 The Relationship between the Oil Prices and Exchange Rates:

Through following the phases of the Algerian dinar exchange rate, it is clear that it has fallen over several years. Economists have different views on the explanation of the sharp devaluation of the Algerian currency, but they all assert that the country's economy is vulnerable to economic shocks; it is not based on solid economic fundamentals that are not subject to relative market volatility. On the one hand, observers believe that the value of the Algerian dinar fell as a direct result of the decline in the oil prices. This collapse occurred immediately after the decline of oil prices in the international market. If this explanation is correct, the Algerian dinar will continue to weaken over the next year as long as the Algerian economy depends on oil as the only source of income. Thus, it will make it vulnerable to external shocks and then dealing with oil price volatility and uncertainty is a major challenge for the Algerian authorities. This study aims at demystifying the effects of shocks in the price of oil on the exchange rate in the national economy, especially as the crises of oil and currency devaluation together put Algeria in a severe economic crisis (Djebbouri, 2018, p. 134)

## 2-Literature Review:

**Korhonen et al. (2007)** estimated the real exchange rate in OPEC countries from 1975 to 2005 and three oil-producing Commonwealth Independent States (CIS) from1993 to 2005 using panel co-integration methods. Their results show that real oil price has a direct effect

on the equilibrium exchange rate in oil-producing countries. Nikbakht (2010) studied the longrun relationship between real oil prices and real exchange rates from 2000 to 2007 by using monthly panel of seven OPEC countries (Algeria, Indonesia, Iran, Kuwait, Nigeria, Saudi Arabia, and Venezuela). His results show that there is a long-run and positive linkage between real oil prices and real exchange rates in OPEC countries.Chen and Chen (2007) carried out a similar analysis for G7 countries and they found a long run relationship between real oil prices and real exchange rates (BENHABIB & other, 2014, pp. 130-131) .

**Chen (2009)**: finds that a 10% increase in oil prices increases the overall price level by approximately 0.05% points after one-quarter. He concludes that the effect has declined over time, and attributes this decline to improvements in the conduct of monetary policy and higher trade openness (Khaled Menna, 2019, p. 12).

**Edwards, 1989**:Second, the equilibrium real exchange rate is long run driven by a set of foreign and domestic real variables, called fundamentals by Edwards and Savastano (1999) Usually, theoretical models link the equilibrium real exchange rate with government spending, sectoral productivity differentials (the Balassa-Samuelson effect), terms of trade, country's openness to international trade, foreign capital inflows and net foreign assets among other variables. In the short run, both real and nominal variables affect the equilibrium real exchange rate (Jorge, 2008, p. 4) [1989] Edwards estimated the equilibrium real exchange rate of a group of developing countries, assuming a range of specific real equilibrium exchange rate variables such as technological development, capital accumulation, the level of distribution of public expenditure between tradable and non-tradable goods, and a combination of factors. Specified for the exchange rate (Aglietta, other, 1998, pp. 721-731)

**Second, provide the study model:**

In order to estimate the theoretical equation of estimating the effects of oil price fluctuations on the real balanced exchange rate in Algeria during the period (1970-2017), which we relied on through the above models, the study model consists of the following variables:

• Reer variable is the real actual exchange rate calculated by the price index (2010 100), where this indicator reflects the strength of competition and is calculated through the nominal exchange rate and cpi, expressing the exchange rate of the dinar in US dollars, and in order to calculate this indicator has been Rely on data from IMF statistics and the International Financial Statistics Database (IFS, FMI).

• Independent variables (oil prices, terms of trade, government spending, degree of economic openness) which we can explain as follows :

✓ Oil prices (POIL) know the price of crude oil through the price of the OPEC basket, where this basket contains the average oil price mix of member states, of which we mention what The following (The Price of Desert oil in Algeria, the price of light oil Basra for Iraq, the price of light Arab oil for Saudi Arabia ..... Etc.) taken from the following website :

https://www.statista.com/statistics/262858/change-in-opec-crude-oil-prices-since-1960/

✓ Trade terms (TOT) defined as the ratio between prices for exports and import prices (estimated at current US $ prices), ie calculated according to the following relationship:

$$p_m/p_x$$

This indicator was calculated based on the National Bureau of Statistics (ONS). The changes in the terms of trade of Algeria can be illustrated by the researcher based on the volume of Algerian exports and imports estimated in US dollars during the period 1980-2018.

✓ The degree of economic openness (OPEN) is calculated as follows:

$$\frac{X + M}{\text{GDP}}$$

his ratio represents the total exports and imports to gross national gdp, calculated by the researcher based on the Database of the National Bureau of Statistics and the World Bank, and the changes in the economic openness index for the period 1980-2018 can be explained. After compiling and encoding the standard model variables for each variable, the mathematical shape of the standard model is determined as follows:

$$Y = F(POIL, TOT, OPEN)$$

The multi-linear regression method will be used to estimate the model of the real balanced exchange rate and its linear mathematical formula as follows:

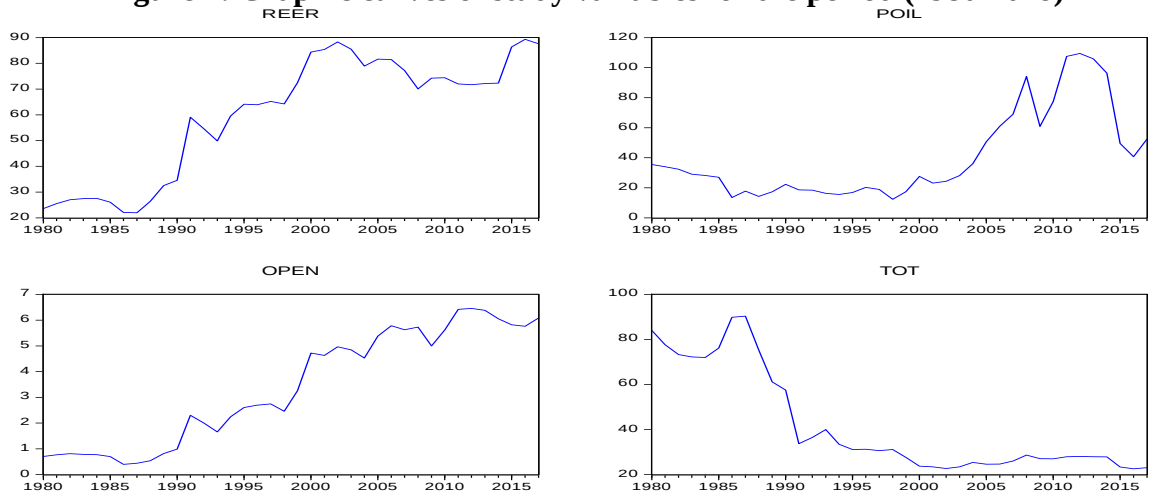
$$y_i = B_0 + B_1 POIL_i + B_2 TOT_i + B_3 OPEN_i + u_i$$

Whereas:

- i represents time, that is, the value of the variable in year i.
- Y represents the real effective exchange rate in Algerian Dinar against the US dollar REER.
- POIL represents the average price of crude oil for the OPEC basket estimated in US dollars.
- TOT terms of trade are calculated in relation to exports\/imports estimated at US$1 billion.
- OPEN DEGREE OF ECONOMIC OPENNESS CALCULATED BY RELATIONSHIP (IMPORT EXPORTS)\/GDP ESTIMATED IN US DOLLARS. B0, B1, B2, B3 unknown form parameters.
- Ui random variable (bamy).

The graphic curves of the study variables can be explained as follows:

**Figure 2: Graphic curves of study variables for the period (1980-2018)**




**Source**: prepared by researchers based on the outputs of the eviews9 program

Third: analysis and interpretation of the results

**Stability of chains** :Before estimating the study model, among the important conditions for the synchronous integration model, is that the time series are stable of the same degree in order to avoid obtaining problems in the estimated model, and we do not fall into the false estimate, which is shown in Table 1, whose results showed that the variables are open, poil , Reer, tot, Unstable at the level, because the critical values at 1%, 5%, 10% are greater than the calculated value of t calculated but stable at the first difference, because the calculated value of t is greater than the critical values at 1%, 5%, 10% and this It indicates that these variables are integrated from the first degree, and after studying the stability of the time series of the study variables, we found that they are consistent with the standard theory, as they assume that most of the macroeconomic variables are not static in the level but become static in the first difference.

**2. The simultaneous integration test by the Enger-granger test:** since the model variables are stable at the first difference, this leads us to be integrated of the same degree and to make sure that there is a long-term relationship we estimate the model by equation of micro squares, where the equation of the model according to the method the small squares shown by Table 2, where we can summarize the results of the estimate according to the following equation:

REER = 53.447284933 - 0.340369177658*POIL + 10.0458152944*OPEN - 0.333121564741*TOT

$R^2$=0.997612 DW= 1.5921 F=4735.419 Prob F= 0.0000

In order to neutralize the validity of the estimated model, a set of tests is required to determine its validity from the perspective of the logic of economic theory and statistically as follows:

✓ **In economic terms:**

- Note that the crude oil price coefficient its signal is negative and moral, it reflects the opposite relationship between the price of oil and the real exchange rate, and this is consistent with the economic theory, since the decline of the price of oil by one unit will lead to a decline in the actual exchange rate of 0.3403 units, if this variable has a moral A statistic, which was shown by the results of the estimate in Table 2.

- As for the coefficient of terms of trade, its signal was negative and moral and this indicates the opposite relationship between the exchange rate and this variable, as each increase by one unit will lead to a decrease in the real exchange rate by 0.3331 units, and this result is not compatible with the economic theory, where the improvement In terms of trade, it is supposed to result in a rise in the exchange rate, and this makes us judge that the real balanced exchange rate in Algeria is determined by administrative decisions.

- As for the degree of economic openness, his treatment is positive and moral, and this indicates that there is a direct relationship between the degree of economic openness and the actual exchange rate, as each one-unit increase will lead to an increase of 10.04, which is contrary to the economic theory that is aimed at this. It leads us to say once again that Algeria's real real balanced exchange rate is governed by administrative decisions.

✓ **Statistically :**

Based on table 2 data, we test the multiple linear regression model through a set of statistical criteria through which we test the statistical confidence in estimates of estimated model parameters through the use of the Stodent and Fisher statistics and the selection coefficient.

- For the Stuart statistic, through which the moral ity of the model parameters is assessed, thereby assessing the impact of the variables interpreted for the model on the dependent variable (real actual exchange rate), by testing the hypotheses of the estimated parameters as follows:

$H_0 = 0$ : Any model coefficients are non-significant (non-significant).

$H_1 \neq 0$: Any model transactions are non-existent (moral).

Note The table-based student value was extracted according to the following relationship : $T^{\alpha}_{n-2} = T^{0.05}_{37}$

We note that The Student's calculated values are greater than the brookings of The Stodent and therefore reject the nihilistic hypothesis and accept the alternative hypothesis that the transactions are moral for the estimated model, and we note that the lowest moral level is 0.0000 this indicates that the capabilities in the model are accepted without error at a moral level of 5%.

- For the Fisher F statistic, this test aims to determine the morale of the model as a whole according to the following two assumptions at the 0.05 indicative level, which we explain as follows:

H0: Lack of relationship between the independent variable and the dependent variable.

H1: There is a relationship between the independent variable and the dependent variable.

We have the calculated value of the Fisher statistic from Table 2 is estimated at 4735.419, and the scheduled value obtained according to the following relationship:

$$F^{1}_{n-1-1} = F^{1}_{39-1-1} = F^{1}_{37}$$

- he following value is 4.08, we note that the calculated value is greater than the table value and therefore reject the nihilistic hypothesis and accept the alternative hypothesis, i.e. there is a relationship between the independent variables and the variable of the actual actual exchange rate, hence we conclude that there is a moral linear relationship between the variables. The interpretor and the dependent variable this leads us to the existence of a total statistical morality of the estimated model.

- For the selection factor, we note that the value obtained based on Table 2 is estimated at 0.9976 and this value is close to the correct 1, which indicates that the independent variables (interpreted) included in the model are 99.90% and the rest is due to other variables not included in this model.

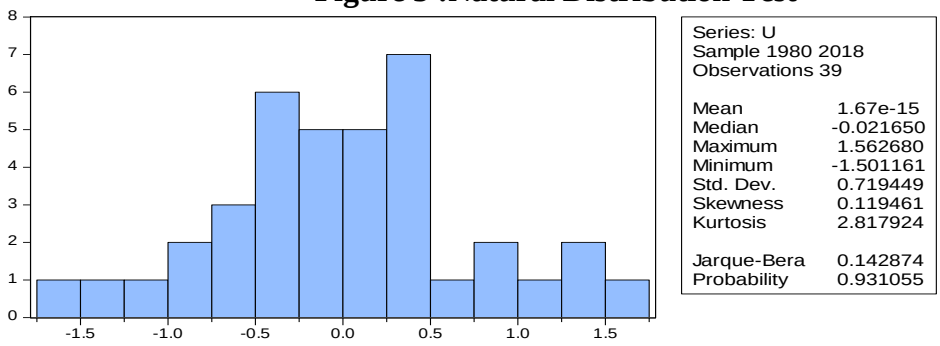
**3-The residual stability of the residues:** since the time series of open, poil, reer, tot are stable at the first difference, this prompts us to test and study the residual stability of the model at the level by the extended de-fuller test and after estimating the model using the regular least squares method (OLS) where we adopt On the following assumptions:

- If it's $t_{\emptyset j} < t_{tab}$ :We reject the nihilistic hypothesis (H0) that means that the chain of the bawais is unstable
- If it's $t_{\emptyset j} > t_{tab}$: We accept the null hypothesis (H0), that is, the residual chain is stable.

table 3 shows the results of the De Fuller series test:

as follows through table 3, we note that the value calculated $t_{\emptyset j}$ is lower than the critical numerical values in absolute terms at the level of 1%,5%, 0%1 respectively and therefore reject the nihilistic hypothesis, and this leads us to the series of condoms Stable and integrated class 0, and therefore they form white noise and are the natural distribution, and this can be confirmed by the following figure:

**Figure 3 :Natural Distribution Test**




**Source**: prepared by researchers based on the outputs of the eviews9 program.

Since the probability value is 0.9310055 and is greater than 0.05, this leads us to follow the natural distribution and this is evident by the shape it looks like the natural distribution.

**4. Estimate the relationship model in the short term**: we determine at this stage the relationship in the short term or what is known as the error correction model after calculating the bawaqi in the

previous period, where the results were described in table 4, which summarizes as follows:

DREER = -0.197384991677 - 0.347177455947*DPOIL + 10.5175789659*DOPEN - 0.334492258762*DTOT - 0.627472623877*U(-1)

$R^2$=0.9846 DW= 1.8509 F=512.441 Prob F= 0.0000

We note that this model is acceptable and therefore moral, since the appearance of the value of the error in the t-period with its negative signal estimated at 0.6274- has a moral, which means accepting the error correction model and this indicates that the actual exchange rate value in the short term is not equal to its long-term balance value, In the short term, there is a partial correction of this difference, as this coefficient represents the indicator of the adjustment of actual real exchange rate values towards its balance value for the next period, It indicates the speed of adjustment from the long term to the short term and measures the percentage of difference in the previous period, which represents the proportion of 62.74%, which is corrected in the period t towards the equilibrium value. In other words, the real exchange rate takes approximately (100 / 62.74.31= 1.5938) more From a period to correct the direction of its balance value after any impact or shock, one of the independent variables, especially oil prices, occurs because the Algerian economy is heavily dependent on its oil exports.

**5. Causality test for the deviation of the real exchange rate:** from its balanced level in order to study the causality between the deviation of the real exchange rate from its balanced level and the variables of the model which are open, poil, tot, we will use the Granger test which is based on the hypothesis test:

H0: deviation of the real exchange rate from its balanced level does not cause the following study variables open, poil, reer, tot.

H1: deviation of the real exchange rate from its balanced level causes the following study variables open, poil, reer, tot.

The test results can be explained in Table 5, where the results can be interpreted as follows:

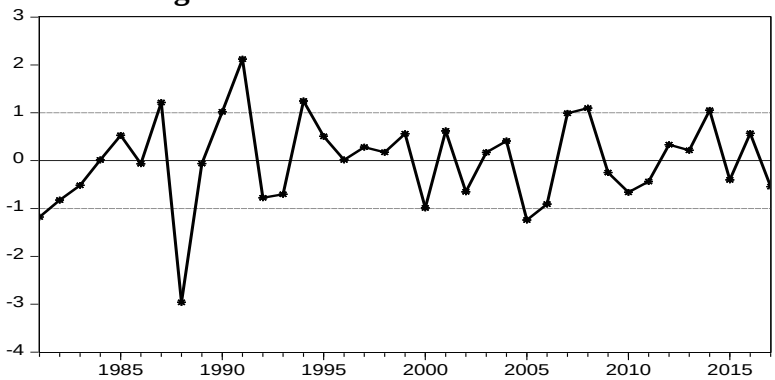
- Causality test between the real exchange rate and the price of oil revealed the existence of a causal relationship of one direction, i.e. the existence of a causal relationship extending from oil prices towards the real exchange rate and thus we accept the alternative hypothesis and reject the nihilistic hypothesis and this was shown by the results of the probability that was worth less than 0.05, but in the The opposite direction the real exchange rate does not cause oil prices to accept the zero hypothesis, where the probability value was greater than

0.05, which explains economically that the price of oil affects the real exchange rate of the Algerian dinar.

- The causality test between the real exchange rate and the degree of economic openness revealed the existence of a causal relationship from one direction, i.e. the existence of a causal relationship extending from the degree of economic openness towards the real exchange rate and thus accept the alternative hypothesis and reject the nihilistic hypothesis and this is shown by the results of the probability that It was valued below 0.05, but in the opposite direction the real exchange rate does not cause the degree of economic openness to accept the zero hypothesis, where the probability value was greater than 0.05, This explains economically that the degree of economic openness affects the real exchange rate of the Algerian dinar.
- The causality test between the exchange rate and the terms of trade revealed the existence of two causal relationships of two directions, i.e. the existence of a causal relationship extending from the terms of trade to the real exchange rate and thus we accept the alternative hypothesis and reject the nihilistic hypothesis and this is shown by the results of the probability which was worth less than 0.05, in the opposite direction the real exchange rate does not cause the terms of trade we accept the alternative hypothesis, where the probability value was less than 0.05 This explains economically that the terms of trade affect the real exchange rate of the Algerian dinar and vice versa.

The real exchange rate deviation curve from its balanced level can be explained as follows:

**Figure 4 : Natural Distribution Test**



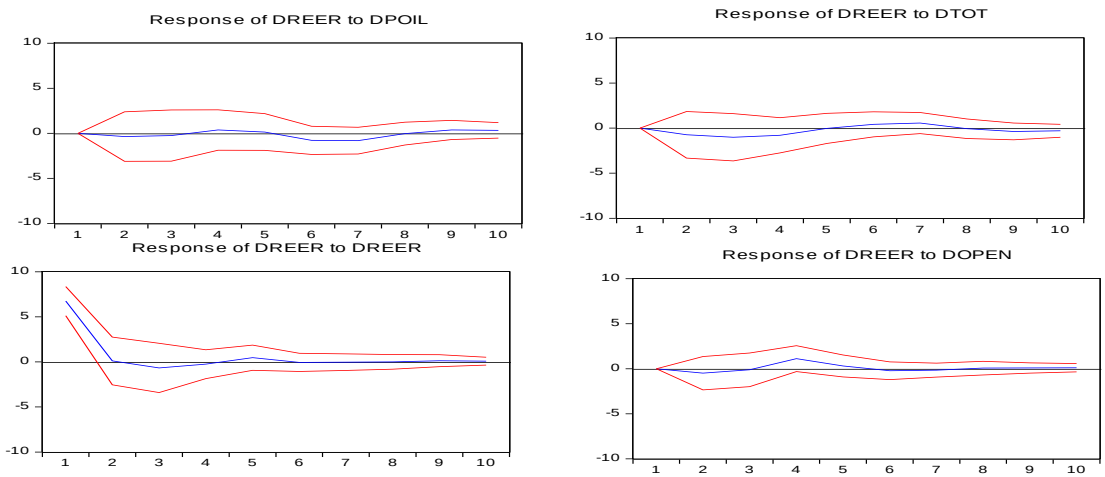

**Source:** prepared by researchers based on the outputs of the eviews9 program.

It is clear that when the real exchange rate is below its balance rate, there is an overvaluation of the local currency and vice versa. The figure shows that the period (1980-1983) saw the value of the Algerian dinar overvalued, during which time the government adopted a combination of non-permanent expansionary policies while maintaining the fixed exchange rate system.

During the period (1984-1988), the Algerian dinar was undervalued as a result of the implementation of economic reform programmes, and in the period (1989-1990), the local currency was overvalued as a result of political developments The period between 1991 and 1994 saw the real exchange rate lower, which indicates the beginning of stability in its value, and this is after the reforms adopted by Algeria, such as the Monetary and Loan Act, and the period from (1995-2017) in this period saw the exchange rate deviations not far apart as a result of Global oil prices have improved, due to the fact that oil prices control a large proportion of the foreign exchange basket from the outside world, returning to decline in 2014 due to the decline in oil prices on the world market.

The responses can also be explained as follows:

**Figure 5 :Functions Response to Motivation**




**Source:** prepared by researchers based on the outputs of the eviews9 program.

We note from the figure above that the 10-year response to the real exchange rate is as follows :

- that the real exchange rate response in itself to any shock responds positively throughout the study period.
- The real exchange rate response to a shock in oil prices is negative throughout the study periods.
- The real exchange rate response to a shock to the terms of the economic exchange was negative for the majority of the periods of study.
- The real exchange rate response to the shock of economic openness is positive for the majority of the periods of study.

**Conclusion :**

This study comes to analyze and evaluate the situation of the Algerian economy in light of the oil price crises and the extent of its impact on the real equilibrium exchange rate in Algeria for the period 1980-2018, as this period witnessed fluctuation in world oil prices between rise and fall, and we reached through the application side to the following results:

- There is an inverse relationship between the oil price and the real exchange rate of Algeria, as a decrease in the price of oil by one unit will lead to a decrease in the real effective exchange rate by 0.3403 units;
- There is a relationship between the independent variables and the variable of the actual actual exchange rate, hence we conclude that there is a moral linear relationship between the interpreted variables and the dependent variable;
- the value of the actual exchange rate in the short term is not equal to its balance value in the long term, in the long term Short there is a partial correction of this difference;
- there is a one-way causal relationship, i.e. a causal relationship extending from oil prices, GDP, degree of economic openness, towards the real exchange rate.
- There are two causal relationships that extend from terms of trade and the real exchange rate and in the opposite direction.

After the theoretical and applied study of the variables of the study, the results of the test of the hypotheses of the following study:

- accept the hypothesis that the deviation of the real exchange rate from its level of balance is due to the fluctuation of oil prices, where we found that the value of the real exchange rate in the short term is not equal to Its long-term balance value;

- Rejects the premise that the change in oil prices on the world market has a positive impact on the real exchange rate;
- Accept the hypothesis that there is a simultaneous integration relationship between the dependent variable and the independent variables.

Based on our findings through this study, it is possible to develop some proposals and recommendations that can help decision makers in Algeria to develop the appropriate strategy, which we consider necessary to remedy the shortcomings and reinforce the recorded positives that we provide below:

- Diversification of exports outside hydrocarbons, following the structuring of the productive sector, rationalization of spending and investment promotion;
- attention to human capital in all economic sectors, especially productive sectors; - disclosure of the exchange system adopted by the Algerian State with transparency and clarity, and the application of governance In all economic areas;
- reforms by reviewing the way the Algerian dinar is assessed in a manner consistent with current internal and external economic developments and conditions;
- Privatization of sectors, especially productive ones, and financial support for small investors.

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## Supplements :

**Table 1**: De Fuller's Extended Test of Study Variables

| Test the data of study variables data | | | | | | | |
|---|---|---|---|---|---|---|---|
| the decision | **1st difference** | | | **level** | | | |
| | **none** | **Trend and intercept** | **intercept** | **none** | **Trend and intercept** | **intercept** | |
| | 2.628961 | 4.226815 | 3.621023 | 2.628961 | 4.226815 | 3.621023 | Critical 1 values at % |
| | 1.950394 | 3.540328 | 2.945842 | 1.950394 | 3.540328 | 2.945842 | Critical values at % 5 |
| | 1.611339 | 3.200320 | 2.610263 | 1.611339 | 3.200320 | 2.610263 | Critical 10 values at % |
| Static at I(1) | -5.27019 | -4.31668 | -5.69232 | 1.213361 | -2.36888 | -0.64251 | open |
| Static at I(1) | -5.42995 | -5.27699 | -5.35777 | -0.60894 | -2.01310 | -1.32859 | poil |
| Static at I(1) | -5.33527 | -5.60129 | -5.65748 | 1.194443 | -1.56124 | -1.12706 | reer |
| Static at I(1) | -2.64180 | -3.86455 | -2.79170 | .34341-2 | -1.33795 | -1.73492 | tot |

**Source**: prepared by researchers based on the outputs of the eviews9 program.

**Table 2 :**long-term least squares estimation

| Dependent Variable: REER<br>Method: Least Squares<br>Date: 22/10/19 Time: 11:45<br>Sample: 1980 2018<br>Included observations: 39 | | | | |
|---|---|---|---|---|
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 53.44728 | 1.553213 | 34.41079 | 0.0000 |
| POIL | -0.340369 | 0.013606 | -25.01603 | 0.0000 |
| OPEN | 10.04582 | 0.313642 | 32.02953 | 0.0000 |
| TOT | -0.333122 | 0.022048 | -15.10877 | 0.0000 |
| R-squared | 0.997612 | Mean dependent var | | 60.01921 |
| Adjusted R-squared | 0.997402 | S.D. dependent var | | 23.44078 |
| S.E. of regression | 1.194852 | Akaike info criterion | | 3.293222 |
| Sum squared resid | 48.54082 | Schwarz criterion | | 3.465600 |
| Log likelihood | -58.57122 | Hannan-Quinn criter. | | 3.354553 |
| F-statistic | 4735.419 | Durbin-Watson stat | | 1.592161 |
| Prob(F-statistic) | 0.000000 | | | |

**Source**: prepared by researchers based on the outputs of the eviews9 program.

**Table 3:** Results of De Fuller's Extended Test for The Stability of The Poipers

| Null Hypothesis: U has a unit root<br>Exogenous: Constant<br>Lag Length: 1 (Automatic - based on SIC, maxlag=9) | | | | |
|---|---|---|---|---|
| | | | t-Statistic | Prob.* |
| Augmented Dickey-Fuller test statistic | | | -5.812909 | 0.0000 |
| Test critical values: | 1% level | | -3.626784 | |
| | 5% level | | -2.945842 | |
| | 10% level | | -2.611531 | |

**Source**: prepared by researchers based on the outputs of the eviews9 program.

**Table 4:** results of the estimation in the short term

| Method: Least Squares<br>Date: 23/10/19 Time: 12:15<br>Sample (adjusted): 1981 2018<br>Included observations: 38 after adjustments | | | | |
|---|---|---|---|---|
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | -0.197385 | 0.139050 | -1.419529 | 0.0002 |

| | | | | |
|---|---|---|---|---|
| DPOIL | -0.347177 | 0.013707 | -25.32839 | 0.0000 |
| DOPEN | 10.51758 | 0.422462 | 24.89592 | 0.0000 |
| DTOT | -0.334492 | 0.027694 | -12.07812 | 0.0000 |
| U(-1) | -0.627473 | 0.195115 | -3.215904 | 0.0030 |
| R-squared | 0.984628 | Mean dependent var | | 1.731081 |
| Adjusted R-squared | 0.982707 | S.D. dependent var | | 6.038115 |
| S.E. of regression | 0.794030 | Akaike info criterion | | 2.501697 |
| Sum squared resid | 20.17547 | Schwarz criterion | | 2.719389 |
| Log likelihood | -41.28139 | Hannan-Quinn criter. | | 2.578443 |
| F-statistic | 512.4411 | Durbin-Watson stat | | 1.850988 |
| Prob(F-statistic) | 0.000000 | | | |

**Source**: prepared by researchers based on the outputs of the eviews9 program.

**Table 5 :** Causal Test

| The nihilistic hypothesis H0 | **Views** | Possibility |
|---|---|---|
| REER Do not cause POIL<br>POIL Do not cause REER | 37 | 0.00780<br>0.96580 |
| REER Do not cause GDP<br>GDP Do not cause REER | 37 | 0.02820<br>0.85980 |
| REER Do not cause GOV<br>GOV Do not cause REER | 37 | 0.51208<br>0.00750 |
| REER Do not cause OPEN<br>OPEN Do not cause REER | 37 | 0.03873<br>0.86672 |
| REER Do not cause TOT<br>TOT Do not cause REER | 37 | 0.00900<br>0.00423 |

**Source**: prepared by researchers based on the outputs of the eviews9 program.