Do the oil shocks have an effect on the objectives of monetary policy in Algeria?

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Abstract:

The purpose of this article is to analyze the impact of oil shocks on monetary policy objectives. Therefore, we conducted a study based on SVAR modeling applied to a series of quarterly data spread over the period 2001-2019.

The main results reveal a possible asymmetric link between the macroeconomic variables of monetary policy and variations in oil prices. Moreover, we note that monetary policy was able to be effective in the face of oil shocks between 1990 and 2001, whereas it had many limitations from 2002 to 2020.

Keywords: *oil shock, monetary policy, inflation, GDP.*

Jel Classification Codes : *C011; C013 ; E51.*

Résumé:

L'objectif de cet article est d'analyser l'impact des chocs pétroliers sur les objectifs de la politique monétaire. De ce fait, nous avons mené une étude basée sur la modélisation SVAR appliquée à une série de données trimestrielles étalées sur la période 2001- 2019.

Les principaux résultats dévoilent un éventuel lien asymétrique entre les variables macroéconomiques de la politique monétaire et les variations des prix du pétrole. De plus, on remarque que la politique monétaire a pu être efficace face aux chocs pétroliers entre 1990 à 2001, alors qu'elle a présenté beaucoup de limites de 2002 à 2020.

Mots clés: *choc pétrolier, politique monétaire, inflation, PIB.*

Jel Classification Codes : *C011; C013 ; E51.*

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I. Introduction

Monetary policy is part of the general framework of a cyclical economic policy with the ultimate objective of achieving what is called the "magic square" (Mouffok, 2013, p132) namely: price stability, growth economy, full employment and a balanced balance of payments. Several studies have focused on the role of monetary policy in managing oil shocks. Indeed, this is seen as a stabilization policy likely to help economies cushion shocks and boost activity. Nevertheless, oil shocks increase the risk of errors in these policies, especially when the reaction function of monetary policy relies on the underlying inflation target.

The empirical literature (JD Hamilton & Herrera, 2001, p22; SPA Brown & Yucel, 2002, p196) has shown that the effects of oil price volatility vary considerably from country to country depending on the state. current economy: if the economy is a net importer or exporter of oil, the exchange rate regime and the monetary policy framework and its transmission channels. In this context, the latter element refers to the mechanism by which the effects of changes in interest rates are felt throughout the economy and even on the rate of inflation. This is a complex process and there is an element of uncertainty about when this influence is exerted and about the relative importance of certain influencing relationships at play (Bank of Canada, 2012).

Several studies have focused on the role of macroeconomic policies in the management of oil shocks (evaluation of the reaction of macroeconomic policies to shocks). Indeed, these are considered to be stabilization policies that can help economies cushion shocks and boost activity. Nevertheless, oil shocks increase the risk of errors in these policies, especially when the reaction function of monetary policy relies on the underlying inflation target. Indeed, if the monetary authorities focus only on cushioning the recessionary effects of the oil shock, this risks fueling domestic inflation. Conversely, a policy aimed at neutralizing any effect of the shock on the price level will lead to a reduction in economic activity while increasing unemployment. Central banks therefore find themselves stuck between two alternatives and it becomes difficult to develop long-term monetary strategies.

Bohi (1991) in a study of four countries (Germany, Japan, the United Kingdom and the United States) concludes that the tightening of monetary policy in response to energy price shocks is the obvious explanation for the recessions experienced in the four countries. On the other hand, Bernanke et al (1997) show that the fluctuations in aggregate economic activity experienced by the United States as a result of oil price shocks were not the result of oil price changes per se, but of the resulting tightening of monetary policy. Similarly, Barsky and Kilian (2002) point out that stagflation in the 1970s was not caused by oil shocks but mainly by the excessively expansionary monetary policy adopted by the Fed. For the Algerian case, Miloud Lachheb and Abdalla Sirag (2016) using a non-linear ARDL model showed that an increase in oil prices generates an increase in the general price level but a decrease in oil prices has no influence. Benziane Radia, Salah Nadine, and Labaci Billel (2018) suggest that the explanation of inflation by monetary aggregates as well as oil price changes is relatively weak. These results can be explained by several factors, including the non-competitiveness of markets and the subsidization of certain prices.

From their introduction by (C. Sims, 1986, p7), structural VAR models have been widely used in applied time series research for their ability to improve forecasting performance and better capture channels of transmission of economic policies and macroeconomic shocks. This methodology is used today to address a number of major concerns, including: determining the factors influencing business cycle fluctuations, the effect of a monetary policy shock, and the effects of oil price shocks. So the question that arises is:

What are the effects of the oil shocks on the objectives of monetary policy in Algeria?

The hypotheses of positive and negative effects depending on the nature of the oil shock are tested. The contribution of this study concerns the effects of oil shocks on monetary policy objectives in Algeria, using quarterly data over the period from 2001 to 2019, examining the response of monetary policy to oil shocks, capturing the dynamic and asymmetric effects of oil shocks and their transmission mechanism on economic growth and inflation, and Evaluate and compare the relative strength of each channel. To achieve these objectives, the study is based on the structural modeling (SVAR). From their introduction by (C. Sims, 1986, p8), structural VAR models have been widely used in applied time series research for their ability to improve forecasting performance and better capture transmission channels economic policies and macroeconomic shocks. This methodology is used today to address a number of major concerns, including: determining the factors influencing business cycle fluctuations, the effect of a monetary policy shock, and the effects of oil price shocks.

II. Model construction

As previously noted, most studies of monetary policy transmission (or oil shocks) use VAR modeling. The object of this section is the construction of the structural VAR model which will be used later in the analysis of the impact of oil shocks as part of the monetary policy transmission process. The VAR model is given by:

$$y_t = A_1 y_{t-1} + \cdots + A_P y_{t-P} + e_t \qquad (1)$$

- $y_t = (y_{1t}, y_{2t}, \dots \dots \dots, y_{nt})^T$ est vecteur de n variables endogènes ;

- A_i $(i = 1, \ldots., p)$est matrice carrée de $n * n$ des coefficients ;
- $e_t = (e_{1t}, \ldots \ldots, e_{nt})^T$ vecteur de termes résiduels de matrice variance-covariance $v(e_t) = \Sigma_e$ de taille $n * n$ et $E(e_t / e_{t-i}) = 0 \ \forall i > 0$.

Unfortunately, however, most relationships in economics are not nonlinear. Each unit change in the exogenous variable will not always lead to the same change in the endogenous variable. Thus, we introduce non-linearity by means of partial sum decompositions in the VARS model of (Schorderet, 2003, p12). They make it possible to capture asymmetries in the transmission mechanism. Explicitly, by distinguishing its positive and negative increments, any time series can be decomposed into its initial value and its cumulative negative and positive sums.

For a series $\{x_t\}_{t=0}^{T}$:

$$x_t = x_0 + x_t^+ + x_t^- \qquad (2)$$

Where x_0 is the initial value of the process and [1] $\{x_t^+\}_{t=1}^{T}$ and $\{x_t^-\}_{t=0}^{T}$ are respectively the cumulative sums of the positive and negative shocks defining the level of the original series at time t:

$$x_t^+ = \sum_{i=0}^{t-1} 1\{\Delta x_{t-i} > 0\} \ \Delta x_{t-i} \qquad (3)$$

$$x_t^- = \sum_{i=0}^{t-1} 1\{\Delta x_{t-i} < 0\} \ \Delta x_{t-i} \qquad (4)$$

The application of the above definition to the equation (.) is as follows:

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-P} + (\beta^+ x_t^+ + \beta^- x_t^-) + e_t \qquad (5)$$

Where $\beta^+$is the coefficient associated with the positive variation of x_t and β^- is the coefficient with the negative variation of x_t. Thus, the relation between y_t and x_t test modeled like a linear relation by pieces subjected to the decomposition of x_t. If $\beta^- > \beta^+$, this suggests that the effect of a negative unit change is larger than the effect of a positive unit change. Thus, the model includes a regime change relation in which regime transitions are governed by the sign of x_t.

However, the reduced form of VAR may be unsatisfactory for two reasons, one pertaining to each equation of VAR. First, it allows arbitrary delays but does not allow contemporary relationships between its variables. Economic theory often links variables in a contemporary way, and if we wish to use the VAR to test these theories, it must be modified to allow contemporary relationships between the variables in the model. A VAR that allows contemporary relationships between its variables can be written as follows:

$$Ay_t = C_1 y_{t-1} + \cdots + C_P y_{t-P} + (\theta^+ x_t^+ + \theta^- x_t^-) + e_t \qquad (6)$$

With A the matrix characterizing the contemporary relationships between the variables of the VAR.

The second defect of VAR models is that the so-called canonical residues are not in general orthogonal. It is therefore impossible to interpret them as structural shocks. To do this, Sims defines a non-singular matrix linking canonical residues to structural shocks. The VARS model is then given by:

$$Ay_t = C_1 y_{t-1} + \cdots + C_P y_{t-P} + (\theta^+ x_t^+ + \theta^- x_t^-) + Bu_t \quad (7)$$

WB a matrix of format $n * n$ with n^2 free parameters;

- u_t vector of structural shocks assumed to be normally distributed with zero mean and a normalized diagonal variance-covariance matrix $\mathbb{E}(u_t u_t^T) = I_t$.

Assuming that the matrix A is invertible, we can write the VARS as follows:

$$y_t = A^{-1}C_1 y_{t-1} + \cdots + A^{-1}C_P y_{t-P} + (A^{-1}\theta^+ x_t^+ + A^{-1}\theta^- x_t^-) + A^{-1}Bu_t \quad (8)$$

$$y_t = A^{-1}C_1\, y_{t-1} + \ldots + A^{-1}C_P\, y_{t-P} + (A^{-1}\theta^+ x_t^+ + A^{-1}\theta^- x_t^-) + e_t \quad (9)$$

$$\text{Avec } e_t = A^{-1}B\, u_t \quad (10)$$

The residuals e_t with symmetric and positive semi-definite variance covariance Σ_e matrix of $n * n$ format, with $n(n+1)/2$ free parameters. With regard to the transformation described in equation (10), identify the structural shocks u_t assuming that the matrices $A^{-1}B$ are invertible. Since the terms of u_t are orthogonal and that $\mathbb{E}(u_t u_t^T) = I_t$,, it follows that:

$$\Sigma_e = A^{-1}BB^T A^{-1^T} \quad (11)$$

So $A^{-1}B$ is a matrix with $2n^2$free parameters. So we will need some restrictions to do the identification. That is ;

$$\alpha = 2n^2 - \frac{n(n+1)}{2} \quad (12)$$

Our methodology is particularly inspired by the work of (Demachi, 2012, p21) and (Omolade et al., 2019, p11). We can write the VARS model in the form of the following equation:

$$y_t = A^{-1}C_1 y_{t-1} + \cdots + A^{-1}C_P y_{t-P} + (A^{-1}\beta^+ x_t^+ + A^{-1}\beta^- x_t^-) + A^{-1}Bu_t \quad (13)$$

with y_t, x_t^+et x_t^- are vectors $(n * 1)$ of variables given by :

$$y_t = (LOGPP, LOGPIB, LOGIPC, LOGM2, LOGTCH, LOGTES) \quad (14)$$

$$x_t^+ = LOGBRENT\_POS \quad (15)$$

$$x_t^- = LOGBRENT\_NEG \quad (16)$$

The restrictions imposed on contemporary relationships between variables are characterized by equations (17) and (18). The identification technique used in this study is developed by (Bernanke, 1986, p52; Blanchard & Watson, 1986, p128; C. A. Sims, 1986, p12). It is a technique of identifying a more general structural form which did not require the incorporation of triangular simultaneity constraints. Indeed, they retained the recursive approach developed by (C. Sims, 1986, p12) consisting in imposing restrictions only on contemporary interactions, but broke with the recursive structure by imposing economically significant contemporary restrictions, allowing a more realistic simultaneity in the model (Faust & Leeper, 1994, p39).

In this way, all variables are assumed to have simultaneous effects on each other and are also expected to describe the performance of the oil-exporting economies. The informal sector is completely excluded in the model.

III. Preliminary data analysis

In what follows, we will present an analysis of the selected data, which includes descriptive statistics, correlation and a visual (graphical) analysis of the series. Table 1 presents the descriptive statistics of the variables used in the study. We note that :

- The real values of the oil price are between 2.962175 and 4.806018 with an average of 4.100323 and a median of 4.126794;
- The positive partial sums of oil prices are between 0.053667 and 4.616348 with an average of 2.586525 and a median of 2.908582;
- The negative partial sums of oil prices are between -3.742509 and 0 with an average of -1.737221 and a median of 3.253857;
- The real values of GDP are between 14.12975 and 15.11229, with an average of 14.81576 and a median of 14.96467;
- The values of the general price level are between 4.296741 and 5.023335 with an average of 4.630297 and a median of 4.603822;
- The real values of the money supply are between 8.976981 and 9.356929 with an average of 8.82464 and a median of 8.976981;
- The exchange rate values are between 4.107042 and 4.791152 with an average of 4.413534 and a median of 4.356208;
- The values of the discount rate are between 1.252763 and 1.791759, with an average of 1.414889 and a median of 1.386294.

Table (01): Descriptive statistics of the selected variables in logarithm

	LOGPP	LOGBRENT_POS	LOGBRENT_NEG	LOGIPC	LOGM2	LOGPIB	LOGTCH	LOGTES
Mean	4.100323	2.586525	-1.737221	4.630297	8.882464	14.81576	4.413534	1.414889
Median	4.126794	2.908582	-1.808929	4.603822	8.976981	14.96467	4.356208	1.386294
Maximum	4.806018	4.616348	0.000000	5.023335	9.356929	15.11229	4.791152	1.791759
Minimum	2.962175	0.053667	-3.742509	4.296741	8.003651	14.12975	4.107042	1.252763
Std. Dev.	0.486290	1.395341	1.159144	0.233752	0.400943	0.290947	0.187709	0.121437
Skewness	-0.457274	-0.348621	-0.298233	0.195703	-0.614855	-1.027344	0.878775	2.021243
Kurtosis	2.358331	1.846780	1.756431	1.684553	2.016499	2.803071	2.419298	6.312671
Jarque-Bera	3.848430	5.599528	5.865226	5.807768	7.645000	13.13662	10.56410	84.22272
Probability	0.145990	0.060824	0.053258	0.054810	0.021873	0.001404	0.005082	0.000000
Sum	303.4239	191.4028	-128.5544	342.6420	657.3023	1096.366	326.6015	104.7018
Sum Sq. Dev.	17.26289	142.1293	98.08381	3.988729	11.73516	6.179471	2.572121	1.076524
Observations	74	74	74	74	74	74	74	74

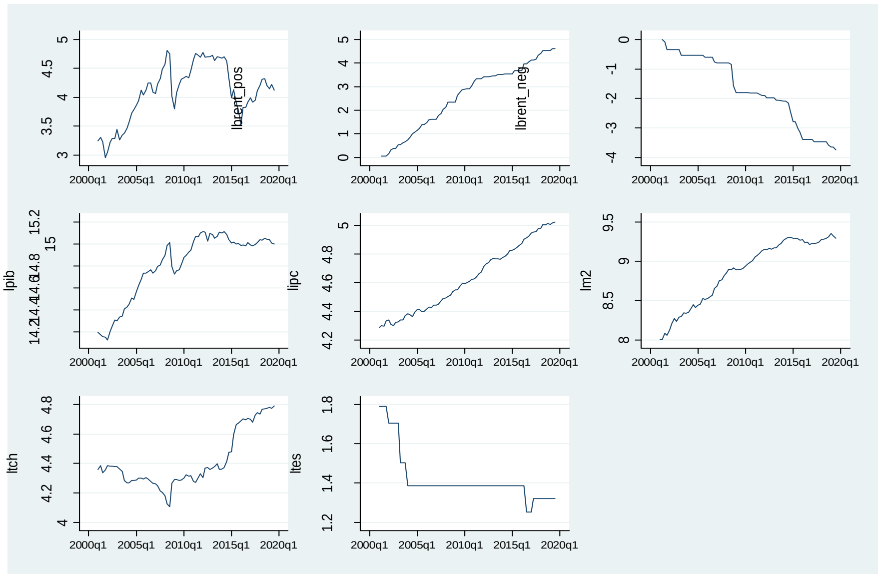
Source : Eviews 10

The value of the Kurtosis statistic for all the variables is less than 3 (the theoretical value for the normal distribution) except for the discount rate variable for which the value of the statistic is greater than 3. We thus conclude that all the variables do not have a leptokurtic distribution, unlike the discount rate variable which appears to have a leptokurtic distribution. The value of the Skewness distribution parameter is nonzero for all variables. We notice that the value of the parameter for the variables: the real price of oil, the positive and negative partial sums, the real GDP and the real money supply is negative, this indicates that the distribution of these variables is spread on the left (the volatility of variables is more affected by a negative shock than by a positive shock).

On the other hand, for the variables: the general price level, the exchange rate and the discount rate, the value of the Skewness distribution parameter is positive, therefore, the distribution of these variables is spread on the right and are therefore more affected by a positive shock than by a negative shock.

The estimated values of the Jarque Berra statistic of the variables: the real price of oil, the positive and negative partial sums and the general price level are lower than the tabulated value of the chi-square law with 2 degrees of freedom (5.991). We thus accept the assumption of normality of these variables. Unlike the estimated values of Jarque Berra's statistic, variables: GDP, real money supply, exchange rate and discount rate are above the critical value at the 5% threshold. Therefore, these variables are non-Gaussian (non-normal). In addition, the positive and negative partial decompositions of the oil price are more volatile (high volatility) unlike the other variables in view of the standard deviation of each variable.

Fig.(01): Presentation and graphical analysis of the series



Source: The authors

IV. The results of the econometric analysis estimates

This point consists in establishing the possible relationships that may exist between the various variables selected from a structural vector autoregressive modeling presented in the previous chapters of our work.

The determination of the optimal number of lags for the SVAR representation is done by minimizing the Schwarz information criterion. The literature suggests that, for the study of impulse responses based on quarterly VAR processes, the Schwarz information criterion is most accurate for sample sizes up to 120 quarters, while for sample sizes more important, it is the Hannan and Quinn information criterion which is the most precise (Kilian & Ivanov, 2005, p1221).

IV.1 Analysis of the effects of oil shocks on monetary policy objectives

The results of the stability test show that all the roots of the characteristic polynomial lie inside the unit circle, so the model satisfies the stability condition. Likewise, the results of the Lagrange multiplier (LM) test for autocorrelation allow us to conclude that there is no autocorrelation between the residuals since the probability of the chi-square is not statistically significant at 5% threshold at the end of period 1 and 2.

Table (02): Estimation results of the coefficient matrix

	LOGBRENT_POS	LOGBRENT_NEG	LOGPP	LOGPIB	LOGIPC
LOGBRENT_POS	1				
LOGPP	-1.567125*		1		
LOGPIB	0.1913434*		-0.2438623*	1	
LOGIPC	0		0	0.0737454**	1
LOGBRENT_NEG		1			
LOGPP		-1.243671*	1		
LOGPIB		-0.1698729**	-0.0652998	1	
LOGIPC		0	0	0.0727387**	1

Source: Built by the authors.

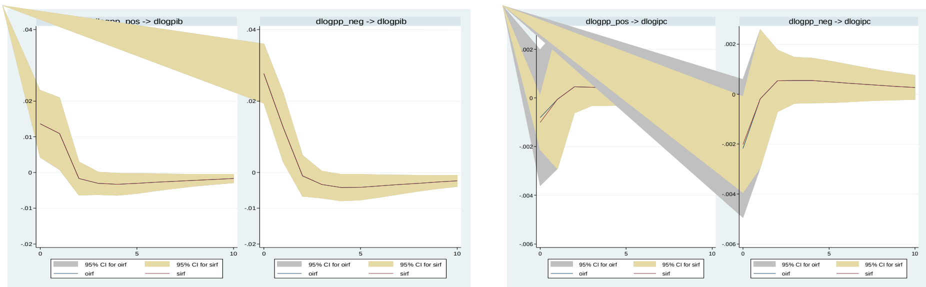
Note: LR restriction identification test is χ^2 (2) = 0.05277 [p-value = 0.974]. *, **, *** indicate the significance of the coefficients at the 1%, 5% and 10% level respectively.

Estimation results indicate that an oil price shock has a negative effect on real GDP, but this result may be biased. Indeed, it is possible that the fall in the price of oil is a bad signal for economic activities in Algeria since most of the economic performance of the country depends on the price of oil, it is also possible that an increase in the price of oil will not. not harm economic activities, hence the need to differentiate the effects of the increase and decrease in the price of oil on real GDP. Thus, the use of positive and negative partial sums shows that a positive oil shock has a positive and significant effect on real GDP, and a negative oil price shock decreases real GDP significantly. In addition, the coefficient of a positive oil price shock is greater than that of a negative shock, which means that oil shocks have asymmetric effects on economic growth. The estimated coefficient of the production shock on inflation is positive and statistically significant. A 1 percentage point increase in real GDP leads, all other things being equal, to an increase of 0.07% (at the 5% threshold) in the general price level as oil prices rise or fall.

IV.1.1 Study of the impulse response functions

The impulse responses of real GDP and inflation to oil shocks are shown in Figure xx. Note that the reaction of real GDP to structural innovation by one standard deviation of the negative and positive partial sums of the oil price is almost similar. The GDP continuously drops passing equilibrium after a quarter and a half to reach its lowest level during the 3rd quarter, the effect remains stable until the 5th quarter then gradually rises towards equilibrium as and when we are approaching the 10th quarter.

Fig.(02): Impulse responses of real GDP and inflation to oil shocks



Source: The authors

Moreover, the reaction of inflation to a positive and negative shock in oil prices is almost similar. After a shock in negative oil prices, inflation rises to peak in the 2nd quarter, then gradually declines to equilibrium from the 2nd quarter to the 10th quarter. During a positive oil shock, inflation reacts positively, this may be due to the increase in foreign exchange reserves and the money supply in circulation generated by the positive oil shock. Real GDP also reacts positively, but it does not respond to rising oil prices until 5 quarters after the shock. Rising oil prices lead to a transfer of income from oil-importing countries to oil-exporting countries (the wealth effect) which results in an increase in national income (Berument et al., 2010b, p3553; Rotimi & Ngalawa, 2017, p173). However, the increase remains small.

In contrast, when oil revenues fall due to a negative oil shock, the level of gross intermediaries and imported capital, which is mainly financed by oil revenues, will decline. Thus, domestic production will decrease. This means a shift in the supply curve to the left. Due to the government's deficit spending on central bank borrowing (or withdrawals from the oil stabilization account), which increases the basic money supply and the money supply, the demand curve shifts to the right. A combination of these two changes in the supply and demand curves leads to an increase in prices and a reduction in the level of production in the economy. The economy suffers from inflationary pressures with both positive and negative shocks to oil prices. Our results are similar to those of (Farzanegan & Markwardt, 2009, p13; Bala & Chin, 2018, p7) where positive and negative oil price shocks were found to be inflationary.

IV.1.2 Variance decomposition

Table 3 presents the decomposition of the variance of real GDP at a positive and negative shock in oil prices. The positive partial sums of oil prices represent a larger proportion of the variations in GDP (0%, 0.47%, 0.52% and 0.53% after 1, 4, 8 and 10 quarters) than the negative partial sums estimated at (0%, 0.46%, 0.47% and 0.47% after 1, 4, 8 and 10 quarters). In addition, we find that when oil prices rise, less than 1% of changes in the inflation rate can be explained by changes in the price of oil.

Table (03): Decomposition of real GDP variance and inflation at a positive oil shock

	LOGBRENT_POS	LOGPIB	LOGIPC
LOGPIB			
1/Trm	0	52.93	3.42
4/Trm	0.47	49.02	3.40
8/Trm	0.52	47.61	3.40
10/Trm	0.53	47.28	3.39
LOGIPC			
1/Trm	0	0	93.53
4/Trm	0.14	0.37	93
8/Trm	0.14	0.36	92.46
10/Trm	0.14	0.36	92.33

Source: The authors

However, when oil prices fall, a greater proportion of fluctuations in the inflation rate are explained by changes in the price of oil (0% and 0.48% after 1 and 10 quarters). This highlights the asymmetric response of real GDP and inflation to oil shocks.

Table (04): Decomposition of real GDP variance and inflation at a negative oil shock

	LOGBRENT_NEG	LOGPIB	LOGIPC
LOGPIB			
1/Trm	0	53.26	3.24
4/Trm	0.46	48.14	3.35
8/Trm	0.47	46.45	3.33
10/Trm	0.47	46.03	3.32
LOGIPC			
1/Trm	0	0.21	93.91
4/Trm	0.48	0.29	93.27
8/Trm	0.48	0.29	92.63
10/Trm	0.48	0.29	92.48

Source: The authors

V. Interpretation of the results of the econometric analysis estimates

The objective of this chapter is to test the role of monetary policy in the transmission of oil shocks in Algeria. The results of the analysis of the impulse function responses and the variance decomposition show that the reaction of real GDP to oil shocks is asymmetric. However, the effect of oil shocks on economic growth is ambiguous. Indeed, the estimation results and the variance decomposition show that economic growth is more sensitive to a positive oil price than a negative oil price shock. In contrast, analysis of the impulse function responses shows the opposite, that is, growth is more sensitive to falling oil prices. According to the results, real GDP does not respond until 5 quarters after the positive oil shock. Several factors may explain why the country is not benefiting, or very little, from the improvement in the oil market. Indeed, despite the surge in oil prices leading to an increase in foreign exchange reserves and boosting investments, the notorious weaknesses which characterize the macroeconomic fundamentals of the country.

These weaknesses are either linked to macroeconomic imbalances inherited from previous decades (colossal deficits in public finances and external accounts, overvalued exchange rate) or to the initial conditions of the Algerian economy (weakness of governance indicators, rigidities in institutions, binding business framework). This environment means that the starting point of the Algerian economy is weak despite the financial windfall generated by the export revenues from hydrocarbons, pulling growth down. The sensitivity of economic growth to falling oil prices is due in large part to this structural weakness of the Algerian economy. The crisis is already occurring in an unbalanced economy without medium and long term perceptions, with weak growth, and on which no catching up or recovery is possible, therefore, a negative shock on oil prices results in a strong reduction export gains and devastating consequences for Algerian economic growth.

The asymmetric relationship is also evident with regard to inflation and the exchange rate. This asymmetric relationship comes down to the fact that Algeria is heavily dependent on exports and oil revenues for their foreign exchange earnings. Thus, during a negative shock on oil prices, the country experiences a depreciation of the exchange rate which makes imports more expensive. In contrast, during a positive price shock, foreign revenues increase, however, the government must use these revenues to finance imports. As a result, the exchange rate does not appreciate much and imports do not become cheaper, which creates an asymmetric response. This confirms the verdicts of several studies, notably those of (Baek & Choi, 2021, p32) for Indonesia (El Abed et al., 2016, p14) for some oil-exporting countries in the MENA region. At the same time, our estimates support the conclusions of (Ahmad & Moran Hernandez, 2013), who find that Brazil, Nigeria and the United Kingdom show a much larger adjustment after a positive shock to the system than after a negative shock.

This means that the appreciation in real exchange rates following a rise in real oil prices is eliminated much more quickly than a depreciation following a fall in oil prices. In other words, these countries are much more tolerant of depreciation rather than appreciation when caused by changes in oil prices. The results also corroborate with those of (Bala & Chin, 2018, p8) for four African OPEC member countries and those of (Attouchi et al., 2020, p6) for Algeria. These show that the inflation rate is more sensitive to a negative oil shock than to a positive oil shock.

The results show that the effect on the demand for money is insignificant. The same result has been reported by (Abderrezak, 2005, p176) and (Bouchaour & Al-Zeaud, 2012, p5). This finding of no effect is clearly at odds with the hypothesis that oil price shocks have an impact on changes in the money supply. This unexpected statistical result reveals that monetary policy measures appear to have absorbed some of the excess market liquidity. It appears that monetary policy adjustments in the form of lower growth rates of the money supply have been used to cope with exogenous shocks in export earnings.

The results also show that the demand for money represents a greater proportion of fluctuations in real GDP and inflation than exchange rates, the latter contributing only slightly to fluctuations in the two objectives of monetary policy, indicating that the Money supply may be a more important intermediate target of monetary policy than exchange rates in transmitting monetary policy where the policy objective is real GDP and inflation targeting.

The results also show that with the rise in oil prices, there is a negative impact followed by a rise in the interest rate in response to an increase in the money supply. In addition, we see that with the fall in oil prices, there is a transient impact of non-response followed by a slight increase in the discount rate. On the other hand, this tightening of monetary policy by increasing the interest rate only comes after a quarter following the shock, so the reaction of the monetary authorities seems slow to the shock, which weakens the efficiency of this transmission channel. .

The results also show that in Algeria, the contribution of monetary policy objectives to changes in the money supply differs depending on the nature of the shock. Thus, fluctuations in the inflation rate represent a larger proportion of changes in the money supply during a positive oil price shock than during a negative shock, while fluctuations in real GDP represent a larger proportion. changes in the money supply during a negative oil price shock than during a positive shock. This shows that the monetary policy asymmetry observed in monetary policy objectives can also be traced through intermediate objectives.

In addition, the study reveals that monetary authorities react asymmetrically to changes in the price of crude oil. When the price of crude oil rises, monetary authorities react more quickly and adjust interest rates with larger margins than when the price of crude oil falls. This probably explains why rising crude oil prices tend to have a weaker impact on monetary policy goals than falling oil prices. Thus, the response of monetary policy to rising and falling oil prices is a very likely source of the asymmetric relationship between monetary policy goals and the evolution of oil prices.

Analysis of the impulse function responses of monetary policy instruments shows that monetary policy can influence inflation through the money supply. In addition, the exchange rate significantly affects real GDP, this channel allows economic policy to influence macroeconomic performance, namely growth, on the other hand it has almost no effect on inflation. In addition, the results suggest that real GDP is weakly sensitive to changes in the discount rate, rendering this channel inoperative.

VI. Conclusion:

We conducted an empirical study of the asymmetric impact of oil shocks on monetary policy objectives through quarterly data for Algeria from 2001 to 2019. The results show that the relationship between operational tools, intermediate targets, and monetary policy goals tends to be different depending on whether crude oil prices rise or fall

More precisely, our results show that:

- The reaction of monetary policy to oil price shocks oil is a very likely source of the asymmetric relationship between monetary policy objectives and the evolution of oil prices;

- The money supply and rate channels exchange rates are important in the process of transmitting monetary policy in Algeria;
- The reaction of real GDP to oil shocks is asymmetric. However, the effect of oil shocks on economic growth remains ambiguous;
- The asymmetric relationship is also evident with regard to inflation and the exchange rate.

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