

The impact of unconventional monetary policy on inflation in Algeria- an empirical study by applying the ARDL model

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Abstract:

This paper aimed to study the unconventional monetary policy and its possible effects on inflation in Algeria during the period 01-2016 to 07-2021, which knew the application of unconventional financing in Algeria in response to the remnants of the 2014 crisis. The study was carried out in a standard analytical way based on the ARDL model. The most important results were that the national economy was not affected much on the inflation side when applying the unconventional financing policy, but it was affected by a small percentage due to the rising of inflation for various reasons and not only the increase in the monetary mass.

Keywords: unconventional monetary policy, inflation, ARDL, Algerian economy, financing.

JEL Classification Codes: H50 ; E51 ; E31 ; C32.

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Introduction:

The global economy has known many challenges, as it has witnessed many financial crises and economic setbacks, which have caused the development of economic thought through various times and economic schools of thought. This forced the economic authorities to adapt to the various situations imposed by the crises. In 2008, the world witnessed a very suffocating financial crisis affecting various countries of the world, and the most important repercussions were the scarcity of global liquidity.

All this obliged many countries of the world to adopt an approach known as unconventional monetary policy, which represented a challenge to central banks, and this measure came with the aim of maintaining sustainable development and controlled economic programs, providing liquidity to economic actors and financing the internal deficit and public debt. However, the policies and choices made on the economic side carry different repercussions and consequences on the economic variables and according to the characteristics of each particular economy .

This new concept affected also the relationship between fiscal and monetary authorities in making their strategies and policies. Furthermore, central bank roles have changed to take care of the economy and make sure the needed financing to all its policies and sectors.

From the above, the question comes to our mind, which should be addressed as follows:

What's the unconventional monetary policy?

What are the effects of an unconventional monetary policy on inflation in Algeria?

We will try to provide scientific answers that are based on standard and descriptive scientific foundations in our research paper in the following.

The hypotheses on which we based our research paper are, of course, reflect the components of the Algerian economy and we summarize them in the following:

- * Sources of financing in general, whether through financial markets or financial institutions, are characterized by their smallness.
- * Not to resort to external debt due to the weight of debt service.

* High inflation rates are inevitable.

Firstly. literature review :

Boneva et al (2016), set out to determine the effects of quantitative easing and other unconventional monetary policy tools on wage and inflation expectations of manufacturing companies in the United Kingdom .the results of the study were that inflation plays a role in transferring quantitative easing to the real economy, unlike the forward guidance tool, which is not statistically significant. (Boneva et al , 2016)

Chadi & Daif (2020), discussed the extent to which inflation rates in Algeria are affected by following an inflation targeting policy .The study concluded that the inflation targeting policy in Algeria did not meet the general or primary conditions at the moment, and that non-traditional financing did not have inflationary effects in Algeria. (Chadi & Daif, 2020)

Boulouiz et al (2020), touched upon non-traditional financing as an alternative to financial sustainability in Algeria, and the most important results were that dependence on non-traditional financing should be only circumstantial and should not be relied on in itself for financial sustainability so as not to have negative consequences on controlling inflation rates in Algeria. (Boulouiz et al, 2020)

In another research, Aßhoff et al (2021), investigated the effects of unconventional monetary policies adopted by the European Central Bank on inflation in the euro area during the years 2009-2018, and the results of the study were that the unexpected shock of unconventional monetary policy raises inflation expectations, however, neither GDP enhancement nor realized inflation occurs, suggesting that the inflation expectations channel does not fully work even if the ECB managed to temporarily stabilize inflation expectations .the study was by using a standard approach VAR .(Aßhoff et al, 2021)

Secondly. Unconventional monetary policy as a new direction to face economic crises:

The various economic and financial crises that the world has witnessed have forced central banks to take measures to face risks. Within the framework of their competence and in accordance with the legal frameworks, central banks have taken innovative policy measures to deal with the global financial crisis and its post-disaster problems, where central banks have introduced new tools and made

changes to monetary policy framework in order to meet the challenges posed by the crisis and the economic environment that followed. (Potter & Smets , 2019,p05)

Davtyan(2016), mentioned that In response to the global financial crisis, and to improve deteriorated economic conditions, central banks have resorted to unconventional monetary policy instruments when their monetary policy rates have hit the effective zero lower bound. (Davtyan, 2016,p01)

2.1.The unconventional monetary policy :

the unconventional concept implies that the measures taken by monetary authority are not the usual and the economic situations are not the ordinary.even the role of central banks during crises and facing unusual economic situation are different.

Unconventional policy was born of necessity given the financial crisis, deep recession, and near-zero shortterm interest rates. (Rudebusch, 2018,p04)

2.2.unconventional monetary policy tools :

Like traditional monetary policy, unconventional monetary policy has its own tools, each tool is distinguished according to the situation facing the economy , as well as the characteristics of the economy itself .We will mention the most important of these tools, which are characterized by renewal according to the situation of each crisis,and the effectiveness of the Monetary Authority in creating tools.

2.2.1.quantitative easing:

This tool is considered the most important in light of the use of unconventional monetary policy, and was used for the first time by the Japanese, as it came to confront the bursting of the real estate bubble and the deflationary pressures that followed in the early nineties of the last century, followed by the US Central Bank And the European Union and Britain, by increasing the balance sheet assets of their central banks. (Joyce et al, 2012,p274)

2.2.2. Forward guidance:

The balance sheet of central bank remains the same by using a technique of influencing the non-standard interest rates. In Operation Twist, the Fed sells short-term government bonds and uses the proceeds to buy long-term bonds.the operation is dependent on the concept of saling and purchasing of an equal

amount, the balance sheet of the central bank is unaffected but through its purchase of long-term bonds, it drives up their price and lowers long-term interest rates. (Joyce et al, 2012,p272)

2.2.3.negative interest rate policy:

This tool focuses on the concept of stimulating banks by directing surplus reserves towards lending to revive the economy instead of placing them with the central bank and paying interest on it.

Potter and smets (2019), showed that this tool contributed in long-term yields adjustment downwards in line with expectations of future short-term rates, as result the desired expansionary stimulus will be provided. as well as, it has its side effects like the compression of bank interest margins,but they have not posed a major problem for banking stability to date because of offsets from other sources of income and the eventual recovery of bank portfolio values. (potter & smets, 2019,p02)

Thirdly. Unconventional monetary policy in Algeria:

The decision-makers at the top of the pyramid of economic and public authority in Algeria have sought to fight inflation because of its undesirable effects on the economy, and the circumstances imposed the adoption of an unconventional monetary policy to promote Algerian economic activity and to maintain the continuity and permanence of liquidity required by the economy, as Algeria is new to this method of monetary policy.

The council of ministers in Algeria approved the adoption of a new method of financing called the "non-traditional financing policy", due to the financial deficit suffered by the public treasury due to fluctuations in oil prices, to avoid external debt, also to avoid disrupting the economic and social development model, and to ensure the continuation of development programs followed for years.

In accordance with the provisions of Article 45 BIS of Law No. 17-10 of October 11, 2017 on the currency and loan law, which stipulates that the Bank of Algeria, starting from the entry of this provision, on an extraordinary basis and for a period of 5 years, purchases directly from the Treasury, the securities issued by the latter, in order to contribute in particular to: covering financing needs,

financing public debt, financing the National Investment Fund, and implements this mechanism to accompany and implement the program of economic structural and budgetary reforms, which should lead at the end of the said period at the latest to state treasury and balance of payments balances. (Sellouh & Benhamed, 2020,pp179-180)

3.1.Securities issued or guaranteed by the state under article 45 bis law n°17-10:

Table 01 shows the evolution of bank of algeria actif under article 45 bis law n°17-10 depending on monthly situation of bank of algeria:

Table 01: the evolution of bank of algeria actif under article 45 bis law n°17-10.

Date of unconventional monetary policy application	Total value of securities issued and guaranteed by state under article45 bis law n° 17-10(dzd)
October 2017	570.000.000.000.00
November 2017	2.185.000.000.000.00
January 2018	3.585.000.000.000.00
September 2018	4.005.000.000.000.00
November 2018	5.192.000.000.000.00
December 2018	5.556.200.000.000.00
January 2019	6.556.200.000.000.00

Source :made by authors depending on monthly situations of Bank of Algeria.

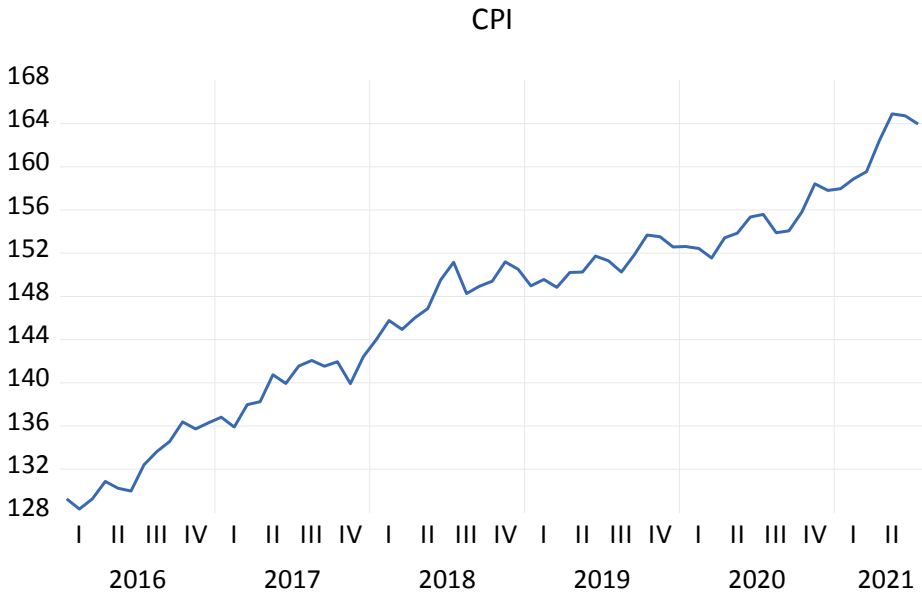
On october 2017 the bank of algeria started printing money for the state with the amount of 570 billion dzd, where the printed amount reached 3.585 billion dzd on january 2018.the main reasons of starting quantitative easing is that the Resource control fund ran out.furthermore, the oil crisis in 2014 and its affects on the liquidity providing to support the economic programmes launched by authorities, and financing the budget deficit.

The operation stopped until September 2018 the bank of Algeria restart it for four months where the value of money printed reached 6.556.2 billion dzd.

Fourthly.Data and methodology:

4.1.Consumer Price indicator in Algeria evolution from 01-2016 to 07-2021:

Figure N°01 : Consumer Price indicator in Algeria evolution from 01-2016 to 07-2021

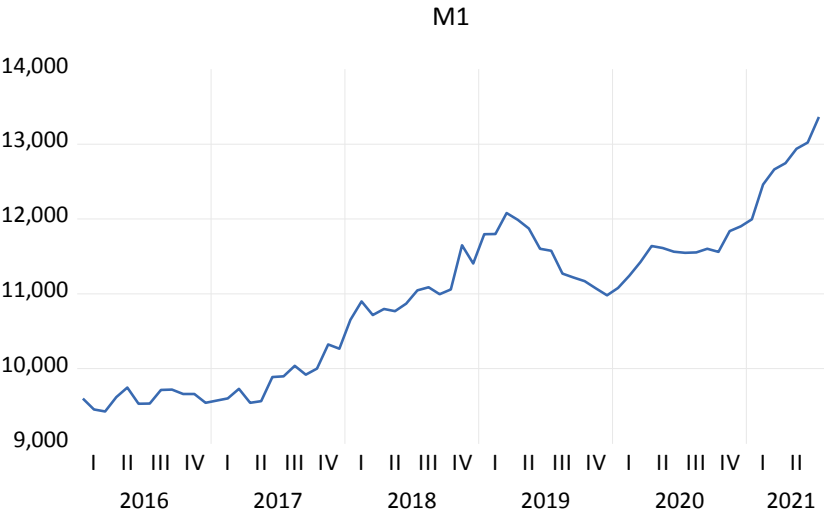


Source: evIEWS12 output using international financial statistics (ifs) data.

The data in figure 01 shows the way that consumer price indicator in Algeria rised every month to upper level, and especially after October 2017 the first injection of money under the law 45 bis n°17-10, it was somehow a big jump .and this rising on cpi percentage represents a lost of purchasing power.

4.2.M1 evolution in Algeria from 01-2016 to 07-2021:

Figure N°02 : M1 evolution in Algeria from 01-2016 to 07-2021



Source : eviews12 output using the Algerian bank data.

The monetary mass has known a development since october 2017,after restoring to what known as uncoventional financing .and continued to grow until the first trimester of the year 2019.

Then it decreased at the beginning of the year 2020 to see a significant increase after that until the year 2021, this is due to the liquidity injections of the economy by printing money .

4.3.Unconventional monetary policy in algeria as a binary variable:

Aßhoff et all(2021), considered that unconventional monetary policy measurement is not easy and simple, because it cannot be characterized by classic monetary variables like the interest rate .and they took the assumption which dueker(2005) pointed out to be crucial for the concept of binary variable .the unconventional monetary policy is assumed to lie behind a binary variable, which takes the value of one in case an UMP event took place and zero otherwise. (Aßhoff, Belke, & Osowski, 2021,p5)

As shonw in table 01 the ump took place in 7 periods by ijecting money printed in the economy.

Fifthly. Method and tools :

5.1.Study methodology:

The Autoregressive Distributed Lag (ARDL) is a model that can be applied regardless of the degree of stability of time series, whether they are stable at Level I(0) or at the first difference I(1) or a combination between them and only. and, robust when there is a single long run relationship between the underlying variables in a small sample size. (Nkoro & Uko, 2016)

It also enables to determine the integral relationship between the dependent variable and independent variables in the long and short term in the same equation, as well as the magnitude of the effect between the dependent variable and independent variables.and,it 's based on testing the limits. The basic model is written as follows: (chibi & seddiki, 2022,p93)

$$\Delta y_t = \delta_0 + \sum_{i=1}^p \delta_k \Delta y_{t-i} + \sum_{i=1}^q \beta_k \Delta x_{t-i} + \psi_1 y_{t-1} + \psi_2 x_{t-1} + u_t$$

5.2.The model of the study:

Therefore, in order to study the impact of unconventional monetary policy on inflation in Algeria during the period from 01-2016 to 07-2021, we decided to use independent variables, namely the complex M1, which represents the sum of payment methods, as well as a variable representing the process of occurrence of unconventional monetary policy and symbolized by the symbol UMP, so that it is a binary variable that takes the value 1 when unconventional monetary policy measures occur and takes the value 0 when non-conventional monetary policy measures are not taken. We have also adopted the monthly consumer price index variable in Algeria as a dependent variable expressing inflation in Algeria.The model on which the study was built was as follows:

$$CPI=f(M1;UMP)$$

$$\Delta CPI = \delta_0 + \sum_{i=1}^p \delta_{1k} \Delta CPI_{t-i} + \sum_{i=1}^q \beta_{2k} \Delta M1_{t-i} + \sum_{i=1}^q \beta_{3k} \Delta UMP_{t-i} + \psi_1 UCPI_{t-1} + \psi_2 M1_{t-1} + \psi_3 UMP_{t-1} + u_t$$

CPI:consumer price index.

M1: sum of payment methods.

UMP: unconventional monetary policy.

In order to estimate the model, the study data for the independent variables were based on the Bank of Algeria monthly data and the dependent variable was based on data from a website, and depending on the statistical program evIEWS12, the standard model of the study is estimated.

Sixthly. Empirical results :

6.1. Dickey and fuller unit root test:

Depending on evIEWS 12 outputs shown in table 01, table 02 and table 03 and 04 by using adf test ,the CPI and M1 are Integrated first-class I(1) and the UMP is i(0),so we can use ARDL to check the co-integration.

Table N°02 : dickey and fuller unit root test –level-

	level					
	intercept		Trend and intercept		none	
////////	t value	prob	t value	prob	t value	prob
Cpi	-0.66	0.84	-2.64	0.26	3.26	0.99
M1	0.76	0.99	-1.35	0.86	2.67	0.99
ump	-5.48	0.00	-5.46	0.0001	-3.11	0.0023

Source:made by authors depending on evIEWS12 outputs.

Table N°03 : dickey and fuller unit root test -1st difference-

	1st difference					
	intercept		Trend and intercept		none	
////////	t value	prob	t value	prob	t value	prob
Cpi	-8.64	0.00	-8.57	0.00	-7.35	0.00
M1	-8.08	0.00	-8.19	0.00	-4.07	0.0001

Source:made by authors depending on evIEWS12 outputs.

Table N°04: The degree of integration of variables

Variables	Cpi	M1	Ump
The degree of integration	I(1)	I(1)	I(0)

Source:made by authors depending on eviews12 outputs.

6.2. Co-integration testing using the boundary approach:

The results of the f-bounds test show that the calculated F statistics (8.69) is greater than the minimum at the level of 1%, 5%, 10%, therefore we reject the nihilistic hypothesis,for that, there is a long-term relationship between the study variables, and therefore the long-and short-term relationship can be estimated.

Table N°05 : F-Bounds Test

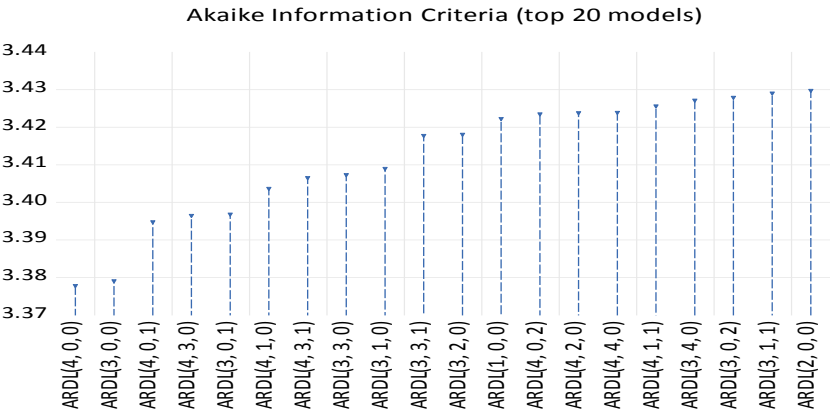
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	8.691161	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5

Source:eviews12output.

6.3. Testing the optimal slowdowns of the model:

Depending on the AIC standard, the optimal deceleration periods have been determined as (4.0.0) as shown in the figure 03.

Figure N°03: akaike information criteria(top20models)



Source:evIEWS12outputs.

6.4. Diagnostic tests of the model :

Before relying on the standard results of the model, the stability of the model and its validity must be revealed through several tests.

6.4.1. Model stability tests:

According evIEWS12 outputs represented in the figure n04 and figure n05, and figure n06, the cumulative sum of the residuals -CUSUM- and the cumulative sum of the squares of the residuals -CUSUM of squares- are an average line located within the boundaries of the critical zone, this indicates the structural stability of the model at a significant level of 5%, since it can be said that stability and harmony are achieved between the short-term and long-term result.

Figure N 04:cosum test.

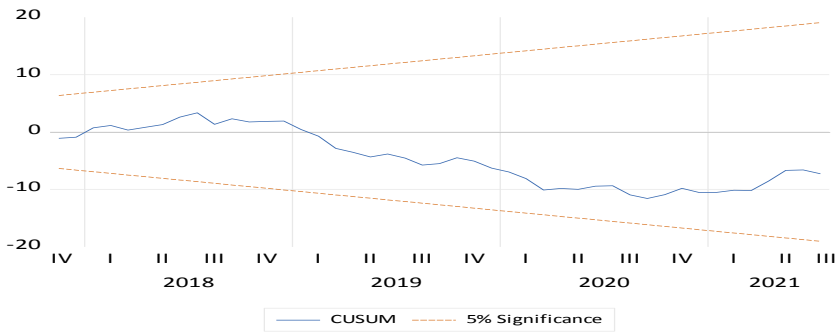


Figure N 05 :cosum of squares test.

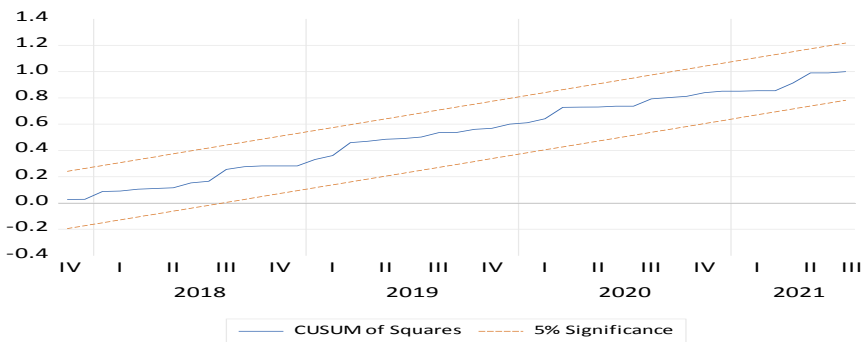
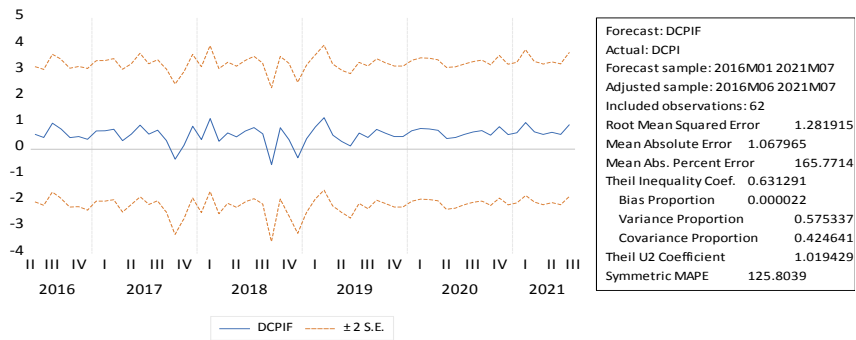


Figure N 06 :DCPIF



Source : evIEWS12output.

6.4.2. Test for the existence of the autocorrelation problem and the variance instability problem :

Table N06: Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.431183	Prob. F (2,53)	0.6520
Obs*R-squared	0.992654	Prob. Chi-Square (2)	0.6088

Source: evIEWS12 outputs

Using the Breusch - Godfrey Serial Correlation LM Test the results of Table 3 show the absence of the problem of serial self-correlation of errors in the two models and this is confirmed by the P-Value (0.6088) of the model greater than 0.05 and from it we accept the nihilistic hypothesis.

Test of the existence of the variance instability problem of chi-square in the model:

Table N07: Heteroskedasticity Test: Breusch-Pagan-Godfrey.

Null hypothesis: Homoskedasticity			
F-statistic	0.611512	Prob. F (6,55)	0.7200
Obs*R-squared	3.877381	Prob. Chi-Square (6)	0.6933
Scaled explained SS	2.186821	Prob. Chi-Square (6)	0.9017

Source: evIEWS12 outputs

Using the Heteroskedasticity Test: Breusch-Pagan-Godfrey , the results shows that the value of chi-square (0.6933) is greater than

(0.05) so we accept the nihilistic hypothesis and the model is free from the problem of variance instability as shown in Table 06.

6.5.Long-and short-term relationship estimation and error correction model:

Table 07 shows the results of the long-and short-term estimation as follows:

In the long term the parameters of the variables are all significant at the level of 1%, i.e. independent variables affect the Consumer Price Index and, consequently, inflation.

The explanatory ability of the independent variables of the dependent variable reached 61.38%, which indicates that the change in the Consumer Price Index is explainable by independent variables, and the change in M1 with an increase of 1% results in an increase in CPI by 0.001088%. as for the independent variable UMP, its increase by 1% results in a decrease in CPI by an estimated-1.021105%.

As for the short-term, the error correction coefficient is negative and significant, which achieves short-term adjustment of the relationship so that in the long term they remain balanced, since the adjustment speed reached -1.934139, and since the calculated Test value is 8.69 it is the largest of all values .

TableN08: Long-and short-term relationship estimation and error correction model

Long- term relationship			short-term relationship and error correction model		
Choosing the optimal model			ARDL(4.0.0)		
Dependent var DCPI	coefficient	prob	Dependent var D(DCPI)	coefficient	prob
C	1.101987	0.0001	D(DCPI(-1))	0.715483	0.0065
DCPI (-1) *	-1.934139	0.0000	D(DCPI(-2))	0.504557	0.0148
DM1**	0.001088	0.2764	D(DCPI(-3))	0.193286	0.1596
UMP**	-1.021105	0.0665	CointEq(-1)*	-1.934139	0.0000
R-squared			61.38		
F-statistic			8.69		

Source:made by authors depending on evIEWS12 outputs.

Conclusion :

Our paper is an investigation into the relationship between pursuing an unconventional monetary policy and inflation in Algeria during the period that defined Algeria's adoption of unconventional financing in the form of printing money in order to finance the deficit of development and economic programs, as this study covered the time frame from January 2016 to July 2021, using the ARDL model for economic measurement.

The most important results showed that inflation in Algeria during the study period has an inverse relationship with the variable that represents the occurrence or occurrence of unconventional monetary policy, and this is consistent with the reality of many countries where unconventional financing has had a positive impact when, according to economic theory, it directs investment and productivity and is considered an injection into the economy.

Since the independent variable M1 positively affects the consumer price index, i.e. an increase in the money supply leads to an increase in the level of the Consumer Price Index by a few but positive percentages, this is in line with economic theory, that is, an increase in the money supply without an increase in production leads to higher prices and thus higher inflation rates .As for the impact, if it is true, it reflects the reality of the Algerian economy by not being affected by inflation, only by the money supply .

The most important recommendations that can be made in order to support the national economy are :

The unconventional monetary policy should be purely circumstantial and in consultation with the monetary authorities, which are represented by the Bank of Algeria, in order to study the economic effects in the short and long term.

Start building efficient financial markets and financial institutions in order to provide new means of financing that support the economy and investment in Algeria.

Although the adoption of unconventional monetary policy is inevitable in times of crisis, the development of productivity and sustainable development remains a foundation on which to rely so

that there are no negative effects of following unconventional monetary policy.

The presence of strengthening the position of the Bank of Algeria technically and in the aspect of functional and institutional independence because the central banks are leading the process of unconventional monetary policy, which requires high efficiency in managing the objectives and tools developed.

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