The impact of the interest rate channel on real output and inflation in Algeria :VAR Approach

تأثير قناة سعر الفائدة على الناتج الحقيقي والتضخم في الجزائر: باستعمال مقاربة VAR

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Abstract

This paper addresses mechanism for the transfer of monetary effect through interest rate channel to real output and inflation level .The study took place in Algeria during the period 1980-2018 using the Vector Autoregression (VAR) model. It is also based on the Impulse response functions and Variance decomposition.

Results showed that the response of real output and inflation level to the shock of the interest rate channel is very weak and almost non-existent. Moreover, results of the Variance decomposition showed that interest rate channel contributes a very low percentage in the variation of the error forecasting real output and the level of inflation. This paper presents an empirical evidence of the weakness of the interest rate channel in the mechanism of transferring monetary policy to the Algerian economy.

Keywords: interest rate channel, VAR model, real output, inflation.

ملخص

تعالج هذه الورقة البحثية موضوع آلية انتقال الأثر النقدي عبر قناة سعر الفائدة الى الناتج الحقيقي ومستوى التضخم في الجزائر، ببيانات سنوية خلال الفترة 1980–2018، باستعمال نموذج اشعة الانحدار الذاتي والاعتماد على أداة تحليل دوال الاستجابة وتحليل التباين.

أظهرت النتائج أن استجابة الناتج الحقيقي ومستوى التضخم لصدمة قناة سعر الفائدة ضعيفة جدا وتكاد تكون معدومة، كما أسفرت كذلك نتائج تحليل التباين ان قناة سعر الفائدة تساهم بنسبة ضعيفة جدا في تباين خطأ التنبؤ للناتج الحقيقي ومستوى التضخم، وبهذا تقدم هذه الورقة دليلا تجريبيا على ضعف قناة سعر الفائدة في آلية نقل السياسة النقدية الى الاقتصاد الجزائري.

الكلمات المفتاحية: قناة سعر الفائدة، نموذج اشعة الانحدار الذاتي، الناتج الحقيقي، التضخم

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1. Introduction

The task of achieving economic policy goals in its monetary aspect is entrusted to the monetary authority, represented by the Central Bank, which oversees both the formulation and the design of an effective monetary policy. Through this policy, it seeks to provide a sound working environment for the work's success of the rest of the policies by achieving the goal of internal and external monetary stability, and by providing an appropriate interest rate structure in line with local economic developments and international financial market developments to serve investment which is capable of achieving increased rates of economic growth and reducing unemployment. However, ensuring the success of monetary policy in achieving its objectives requires knowing the impact of the various decisions issued by the Central Bank, since the effect of these decisions appears gradually on the activity of active monetary and financial institutions in the state, then on real economy at a later stage.

Consequently, real output and inflation are affected by every decision of the central bank, whether it increases or reduces the money supply or changes the interest rates in the monetary market and elsewhere depending on the state of the economy, especially since monetary authority in a country is allowed to take this type of action aimed at achieving a set of effects on real output and inflation, thanks to a combination of links known as channels of monetary policy transition to the real economy": (The process through which the effect of monetary policy decisions is transferred to changes in gross domestic product and inflation) (Taylor, 1995, p. 11), it is also intended to: the process by which monetary policymakers' decisions are transferred to the economy in various ways - and ultimately reflected in the evolution of prices and production (Apostoaie Constantin & Roman, 2010, p. 659).

Macroeconomists have devoted their attention in the recent years to understanding the monetary-policy transition mechanism by stirring up a broad debate about the transition mechanism of monetary policy supported by the interest-rate channel in new structural criticism, with McKinnon

(1973) and Shaw (1973) being leading advocates of interest rates in developing countries (Mbewe & Johannes Peyavali, 2013 , p. 910), the American economist Taylor echoed this view, emphasizing the importance of the interest rate channel in the monetary impact transition mechanism, adding that there is solid empirical evidence of interest rates on consumer spending and investment (Apostoaie Constantin & Roman, 2010, p. 659).

The mechanism for transferring the effects of monetary policy through the interest-rate channel to real-economy variables concerns the structure of a country's economy in general and the characteristics of its financial and monetary system in particular. Algeria is not isolated from this because it has a young economic structure and a financial and monetary system compared to other developed countries. The transition to a market economy is taking place and many reforms are being implemented in the monetary, financial and economic spheres. These reforms have been under way since the early 1990s up to day.

The monetary policy was given an important place in the economic system through the law and regulation in force at the time - the Monetary and Loan Law 10-90 – by which the Central Bank (Bank of Algeria) was installed as supervisor and enforcer in order to adapt it to economic activity to promote economic growth rates in Algeria and to control the general level of prices.

From the above, we examine the following problem:

- **How responsive are real output and inflation to Algeria's interest-rate channel from 1980 to 2018?**

2. How the interest rate channel acts as a mechanism for transferring the monetary effect

The early beginnings of the monetary-policy transition mechanism were the interest-rate channel at the heart of the capitalist economic system's work, as evidenced by the Keynesians' ideas about the interest-rate channel in which they acknowledge that it is the main channel charged with transferring the effects of monetary policy (Adeoye & Shobande , 2017, p. 116) ,thus , Keynes used it to show the impact of money changes on economic activity, developed in 1937 under the famous IS/LM model, the Keynesian macroeconomic fundamentals of two markets:

- The market for goods and services is shown by the IS curve
- The money market is shown by the LM curve,

Monetary policy has been found to have real-area effects through movements in interest rates (Faouzi, 1999, p. 8).

The traditional primary interest-rate channel explaining the effect of monetary policy on aggregate demand due to changes in the level of interest rates is based on two basic assumptions:

First assumption:

The central bank can influence the nominal short-term interest rate - and thus the real rate - under the hypothesis of a price freeze, owing, among other things, to monetary illusion. The price level is set slowly, serving not only expansionary monetary policy that reduces the nominal interest rate, but also the real short-term and long-term interest rate according to the forecasting theory (Brinkmeyer, 2014, p. 8) , which explains that long-term real interest rates represent the weighted average of the expected future short-term interest rates. When the nominal interest rate declines in the future, it may result in a reduction in the long-term interest rate, and vice versa in the case of a nominal interest rate increase (Mishkin, 1996, p. 3).

Second assumption:

The degree of flexibility (sensitivity) of investment and consumption expenditures to changes in the real interest rate, the greater this flexibility, the greater the stimulus effect of monetary policy - especially on long-term investments (Brinkmeyer, 2014, p. 8) , that is, the response of "interest-rate sensitive" components to aggregate demand changes production and unemployment gaps and changes in wages and prices, which fuel spending decisions (PETER, ALBERTO, JULIAN, & JEAN-PIERRE, 2001, p. 10) for businesses and households.

To determine the operation of the interest rate channel, we provide the following analysis:

Assuming that economic activity is in a downturn, monetary authorities are pursuing expansionary monetary policy, which leads to an increase in the general level of expected prices and (an increase in expected inflation) resulting in a reduction in real interest rates even if the nominal interest rate

is fixed at zero, which affects investment decisions, thus increasing investment demand, and this results in an increase in gross output.

The American economist Mishkin distinguishes a graph of the transfer mechanism of the interest rate channel in the following manner: $\pi^e \uparrow \Rightarrow r \downarrow \Rightarrow I \uparrow \Rightarrow Y^{ad} \uparrow$,

That is: expansionary monetary policy: increase money supply ↑ ⇐ increase the level of expected prices ↑ ⇐ increase expected inflation ↑ ⇐ decrease real interest rates ↓ and then lower cost of capital ⇐ increase investment ↑ ⇐ increase aggregate demand ↑ increase GDP ⇐ ↑....., the adverse effects occur in the case of deflationary monetary policy(Mishkin F. S., 2018, p. 609).

As a set of problems arise when using the interest-rate channel, monetary policy makers have to use it carefully according to the demands of economic activity, enough to produce its effects on the real economy. It is recommended that the process of transferring the effects of monetary policy changes through the interest-rate channel should take place ideally and within a relatively short period of time, since a rapid transition would enhance the impact of monetary policy on the real economy (Kovanen, 2011, p. 3), i.e., for the interest-rate channel to be effective, the central bank should have control over the short-term interest rate, the prices should be fixed, and in the end production should interact with real prices (Tomasz, Jan , & Ewa, 2008, p. 23).

3. Literature review

Several previous studies on the transition mechanism of monetary policy across the interest-rate channel have been conducted in developed and developing countries, using different approaches to confirm or deny the existence of a practical guide to the interest-rate channel with which to exercise or not exert an influence on real output and price level. These include:

The study of (Norris & Floerkemeier, 2006, p. 1):the paper examined the transition of monetary policy in Armenia at the time when the authorities are shifting to a medium-term inflation targeting system, and found that the ability of monetary policy to affect economic activity and inflation is still

limited, that the channels charged with transferring monetary impact are not fully operational, and the researcher concluded that the interest rate channel exerts a weak influence, Contrary to what the researcher (ASSENMACHER-WESCHE, 2008, p. 246) did when she studied the monetary-policy transition mechanism in Switzerland using a vector model to correct structural error and analyze pulse-response parameters, she found that there was a reasonable response to inflation and production to the monetary-policy shock. Yet, despite the inclusion of money and oil prices, the puzzle of the exchange rate remains.

Given the increasing role of monetary policy in producing the desired effects on the real economy, the study of (P, N, & M, 2011, p. 334) was about the Monetary Policy Transition Mechanism of the State of Mauritius by choosing two channels: Interest rate and exchange rate channel, using the Vector Autoregressive (VAR) model, based on quarterly data from 1985 to 2006.

The results of the analysis of pulse response functions and the analysis of variance of expected error showed that monetary policy was important in the short term. In addition, the response of output and price level to interest rate and exchange rate shocks indicated that both channels were transferring monetary policy decisions in Mauritius, but were moving the interest rate channel more strongly.

In his paper,(Wulandari, 2012, p. 557) sought to highlight the importance of any money transfer channel that contributes to the management of inflation and contributes to economic growth in the State of Indonesia, He used the Structural Self-Regression (SVAR) model and the variable error analysis tool to verify the extent to which each variable contributes to both inflation and economic growth. He concluded that the interest rate channel plays an important role in the monetary transfer mechanism to maintain inflation, but has a limited role in economic growth on the one hand; on the other hand, he concluded that the channel of bank lending is effectively affecting economic growth.

As domestic financial markets evolved and interest rates were liberalized, India's monetary-policy enforcement measures evolved toward a greater reliance on interest rates to signal the effects of monetary policy. On this

basis, (Mohanty, 2012, p. 1) attempted to answer the question: How does changing the rate of monetary policy affect production and inflation in India? After estimating the structural vector – auto regression ray for quarterly data, the researcher found that monetary policy rate increases have a negative impact on production growth with a delay of about two quarters, in addition to a moderate effect on inflation with an estimated delay of three quarters. He also found a strong one-way relationship starting from interest rate to output.

In another study, (Ishioro, 2013, p. 377) studied the transition mechanism of monetary impact channels in Nigeria. The study reviewed the theoretical aspects of the monetary impact mechanism and the adoption of the Granger Causation Test in assessing the relationship between the various channels and the selected macroeconomic aggregates. Through this study, the researcher found three channels for transferring the impact of monetary policy to the macroeconomic indicators in Nigeria: interest rate channel, exchange rate channel, and credit channel.

In a sectoral study of the Algerian economy, the researchers(Omolade & Ngalawa, 2016) , whose main objective was to uncover the relationship between monetary policy and the growth of the manufacturing sector in Algeria using the SVAR Structural Self-Regression (SVAR) model, conducted quarterly data from Q1 1980 to Q4 2010. They concluded that interest rates explain nearly one third of the changes in the growth of industrial output, indicating that the manufacturing sector is sensitive to interest rates. In another study, (Bokreta & Benanaya, 2016) found that, by studying the relative effectiveness of monetary and fiscal policy in Algeria using the economic measurement techniques of the Common Integration Model and the Error Correction Ray Model, the effect of fiscal policy is stronger than monetary policy in boosting Algeria's economic growth rates. In another study emphasizing the transition mechanism of monetary policy in Morocco, taking into account external constraints on monetary policy, and using the Structural Vector Self-Regression (SVAR) model, (OUCHCHIKH, 2017, p. 2) concluded that monetary policy shocks were transmitted to the Moroccan economy mainly through credit channels and interest rates, while exchange-rate channels and asset prices were broke. In

addition to the study of researchers (Çela & Turan, 2019, p. 61) who analyzed the cash transfer mechanism in Albania from 2002 to 2016 using VAR model analysis, after analyzing the pulse response functions, they found that interest rates and the money supply had a significant impact on real output, while the exchange rate channel effect was weak.

A study of the Vietnamese economy conducted by a team of researchers (Tung Hoang, Nguyen Thi, Nguyen Thi, & Tran, 2020, p. 569), which grounded the theoretical aspect of the Mishkin approach: Cash Transfer Mechanism using the Vector Error Correction Model (VECM) to test the impact of the interest rate channel as a cash transfer mechanism in Vietnam in 2005-2019. The results showed that: The money supply had a clear impact on the average lending rate from the refinancing rate. The interest rate channel also played an important role in conveying the impact of monetary policy on inflation. They concluded that the impact of the exchange rate and interest rate channel on economic growth in Vietnam is stronger than the impact of the channel of credit prices and financial assets.

The opposite of what (Ali, 2020, p. (31) study shows, he evaluated the economic environment and the effectiveness of monetary policy transmission channels in Algeria between 2000 and 2017 by examining the most important economic indicators relevant to the transfer of monetary policy effects. His study results showed that the most effective channel for the transfer of monetary policy in Algeria is the exchange rate channel. The second channel that is likely to be effective is bank loans. Furthermore, he concluded that the interest rate channel was ineffective because of the appearance of excess liquidity at the level of the banking system during the study period.

Through previous empirical studies, the results obtained showed that in most cases the interest rate channel has a great influence on production and prices, especially the developed countries, but it remained weak in some developing countries, including Algeria, especially according to the latest study by the researcher (Ali, 2020).

Our study attempts to cover the research gap of the Study (Ali, 2020), which was limited to an analytical and analytical aspect, in which we use the method of economic measurement with an approach based on the

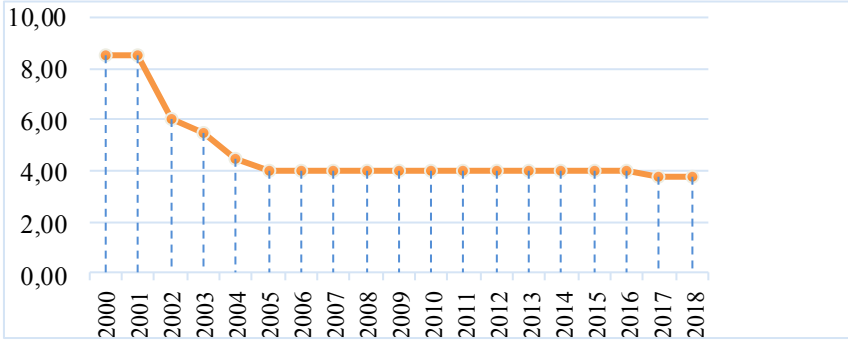
model of self-regression to detect the overlapping relationships between the interest rate channel on the one hand and production and price level on the other, as well as confirm or deny the existence of the interest rate channel in the Algerian economy using annual data covering the period 1980-2018.

4. Analysis of the development of monetary and economic indicators in Algeria for the period 2000-2018.

At the beginning of the transitional period, the Bank of Algeria accelerated the formulation of monetary policy parameters in Algeria through the Monetary and Loan Act 90-10, setting out monetary policy objectives of stabilizing prices, as well as achieving high economic growth rates, using a range of multiple monetary indicators such as interest rate (rediscount rate), as well as the supply of cash (M2) as indicators that reflect the management and direction of monetary policy.

We examine the evolution of monetary indicators, such as the rediscount rate and the monetary pool in a broad sense, and the objectives of monetary policy that take the rate of economic growth expressed by the variable gross domestic product and the general level of prices expressed at inflation rates for analysis and evaluation, according to the period from 2000 to 2018.

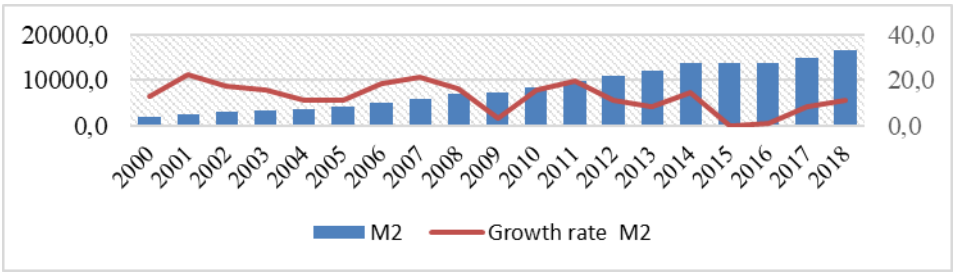
Figure 1: the evolution of the discount rate (interest rate channel)



Source: Bank of Algeria**.**

We see from figure 1 that the rediscount rate has steadily declined since 2001, where it was estimated to be 8.5% to 3.75% in 2018, due to the reluctance of commercial banks to request refinancing by the Bank of Algeria to improve their financial position and availability at a high level of liquidity (MABRUKA, 2019, p. 65).

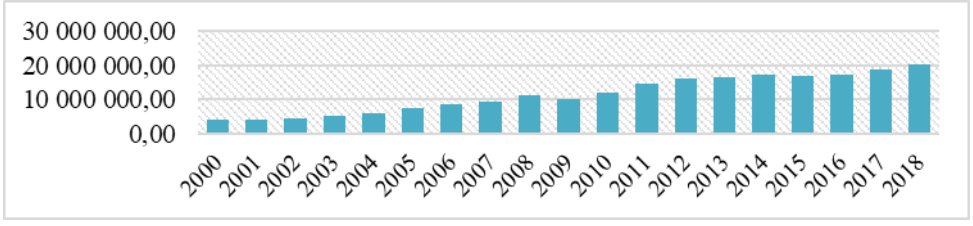
Figure 2: the evolution of the size and growth rate of the M2



Source: Bank of Algeria.

At the beginning of the new millennium, the volume of the monetary mass increased significantly from 2001 to 2018, with m2 volume rising from 2022.5 million DA to 16,636.7 million DA, increasing on average by 8,899.37511 DA. The M2 high rate was estimated at 22.3% in 2001, due to the state's implementation of economic recovery programmes (2001-2004), while M2 recorded a low of 0.13% in 2015, due to the significant reduction in deposits. For the hydrocarbon sector estimated at -41.1% (d'Algérie, Rapport annuel de la Banque d'Algérie 2015, 2015, p. 99)

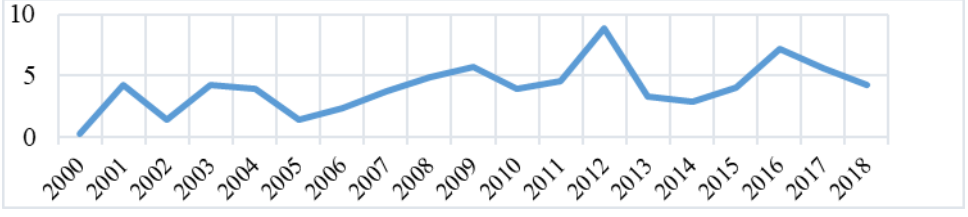
Figure 3: the evolution of GDP



Source: Bank of Algeria.

We note from figure 3 that the volume of gross domestic product (GDP) increased from 4123,513.90 million DA in 2000 to 2018 to 2019,600 million DA in 2018, a 4.89-fold increase in 19 years due to the rise in oil prices despite the free fall in 2014 (Abdelkader, 2017, p. 19).

Figure 4: the evolution of the inflation rate



Source: Bank of Algeria.

In figure 4, inflation rates fluctuate up and down, but overall throughout the period from 2000 to 2018, Algeria maintained an inflation rate of around 4%, except in 2012, when inflation rose by 8.89%, from 4.52% in 2011, due to an increase in the salaries of employees in that year (d'Algérie, 2012, p. 36).

3. Experimental

5.1. Data and Methodology

5.1. 1.The VAR model

In this axis, we will measure the impact of the interest rate channel on the real economy in Algeria in the form of a statistical and standard model that explains the different economic relationships between the variables of the study, where we will use the VAR model to identify the size and nature of the relationship between the variables included in the model, where each variable is expressed by the value of the previous periods and the value of the remaining variables used in the estimate, (Bourbonnais, 2015, pp. 276-277).

The VAR model of several variables (K), with a P in the general case, can be mathematically expressed as follows:

$$X_t = A_0 + A_1 X_{t-1} + A_2 X_{t-2} + \cdots + A_p X_{t-p} + \varepsilon_t \text{ ..... } \mathbf{(2)}$$

Equation **(2)** can be rewritten as follows: $X_t = A_0 + \sum_{i=1}^{P} A_i X_{t-i} + \varepsilon_t \ldots$ **(3)**

Where: X_t vector of internal variables, A_i matrix of parameters that will estimate, (p) the degree of model lag, (ε_t)a random variable.

5.1.2. Data Description

Economic measurement studies are based on the need to identify the variables on which the model will be based, which are inspired by economic theory and in the light of previous studies, and for this purpose we relied on annual data covering the period from 1980 to 2018, with 38 observations based on annual data obtained from the Annual Reports of the Bank of Algeria, to obtain results from STAT. 15, and the table below illustrates and describes the following:

Table 1. Study variables

Variables	Description	Symbol	Data Source
*Domestic Output	Of The Real Gross Domestic Product Algeria (Base Year 2001 And In MILLION DA)	L RGDP	Bank Of Algeria
*Money Supply	Supply Broad Money Supply (M2) In Million DA	LM2	Bank Of Algeria
Inflation	Consumer Price Index (Base Year 2001)	LCIP	Bank Of Algeria
Interest Rate Channel	Discount Rate(%).	LDR	Bank Of Algeria

Source: Prepared by researchers

* My real output valueand the cash offer has been converted to a unit of one million dinars, up from one billion dinars according to the annual reports of the Bank of Algeria.

5.1. 3. Statistical descriptive study:

Before starting the standard study and estimating the model, it is advisable to refer to the statistical characteristics of the variables included in the model, namely the number of observations that make up the model and the standard deviation... Etc, and the table that explains this:

Table 2. the statistical characteristics of study variables

Variable	Obs	Mean	Std. Dev.	Min	Max
lRGDP	39	4.531734	.7421168	.3129619	5.019372
lDR	39	.7230367	.2352282	.4393327	1.176091
lM2	39	6.192882	.7180209	4.970993	7.221067
lCPI	39	1.760526	.4553317	.9201233	2.305889

Source: STATA.15

Table 2. above shows the descriptive analysis of the characteristics of the time series for the variables included in the study model with 39 views, where the arithmetic mean of the logarithm of the real gross product LRGDP, the LM2 money supply logarithm, the LDR logarithm of the discount rate, and the LCPI logarithm amounted to: 4.35%, 0.72%, 6.19% and 1.76%, respectively, while the standard deviation values of the previous variables, respectively, were as follows: 74.21%, 23.52%, 71.80%, 45.53%..

5.2 Empirical results

5.2.1 Unit root test

The conduct of any standard study requires ensuring the stability of the variables studied, as the unit root tests are a way to examine the characteristics of the time series and ascertain the extent of their integrity and determine the degree of integration of each variable individually. To study the stability of the time series most studies use the test of the developed Dickie Fuller, and therefore we will use this test to determine the model that can be used, and the table below reviews the results of the ADF test.

Table 3. the ADF test.

Variables	ADF test						I
	After the first difference			After the second difference			
	noconstant	drift	trend regress	noconstant	drift	trend regress	
LRGDP	-7.102	-7.010	-6.908	-	-	-	**I(1)**
	(1.95)	(-1.69)	(-3.55)				
LDR	-2.912	2.875-	-3.178	-7.203	7.086-	6.975-	**I(2)**
	(-1.95)	(-1.69)	(-3.55)	(-1.90)	(1.69)	(-3.56)	
LCPI	-1.170	-1.662	-2.009	-3.102	-3.053	3.021-	**I(2)**
	(1.95)	(1.69)	(3.55)	(-1.95)	(-1.69)	(-3.56)	
LM2	-1.654	-4.195	-4.426	-5.500	-5.469	-5.375	**I(2)**
	(-1.95)	(-1.69)	(-3.55)	(-1.95)	(-1.69)	(-3.56)	

Source: STATA.15

Values in parentheses ( ) indicate the critical value at 5% significance level.

The results of the ADF test indicate that the time series of study variables are unstable at the level after comparing the calculated value and the critical value at a moral level of 5% because it contains the root of the unit, and after conducting the process of differences on the time series of variables LRGDP, LDR, LCPI and LM2 it is clear that most of the variables are integrated from the second degree where the variables LDR, LCPI and LM2 were integrated and stable second-class while the LRGDP variable was integrated and stable of the first degree, and therefore the absence of a correction model of error, and therefore the lack of a correction model, the error correction is estimated, and therefore the error correction model is estimated. Var model directly without resorting to the common integration test.

5.2.2 - Lag Length Selection in the VAR model

The degree of delay of the VAR path can be determined by estimating different delay grades on stable chains, depending on different criteria, including: Akike (AIC), Schwartz (SC), Hanan Quinn (HQ), and the Final Predictive Error Standard (FPE), (Syema, 2018, p. 5) with the lowest statistical value of these criteria being based on the optimum degree of delay, as illustrated by the following table.

Table 4. the Lag Length Selection of the var model

Selection-order criteria
Sample: 1984 - 2018 Number of obs = 35

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	120.801				1.5e-08	-6.67433	-6.61297	-6.49658
1	159.96	78.317	16	0.000	4.0e-09	-7.99769	-7.69088	-7.10892*
2	188.105	56.292*	16	0.000	2.1e-09*	-8.69174*	-8.1395*	-7.09195

Source: STATA.15

It is clear from table (04) that the optimal slowing period is two periods (2) where the lowest value corresponds to most of the criteria in the previous table and therefore the VAR model will be assessed slowly with two delay periods in this case.

5.2.3- VAR results

After determining the degree of integration of the time series related to the study variables, and determining the degree of slowing down of the VAR model, we estimate 4 equations (models) that is, we will estimate the VAR self-regression beam model for the stable chains that take the following mathematical model.

$$LRGDP\_d1 = f(LDRD2, LM2D2, LCIPD2) \quad \text{.....(4)}$$

That is, we will try to estimate the VAR model in the following matrix form:

$$\begin{bmatrix} LRGDP\_d1_t \\ LDRD2_t \\ LM2D2_t \\ LCIPD2_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} LRGDP\_d1_{t-1} \\ LDRD2_{t-1} \\ LM2D2_{t-1} \\ LCIPD2_{t-1} \end{bmatrix} + \cdots + A_p \begin{bmatrix} LRGDP\_d1_{t-p} \\ LDRD2_{t-p} \\ LM2D2_{t-p} \\ LCIPD2_{t-p} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \\ \varepsilon_{4,t} \end{bmatrix} \text{.... (5)}$$

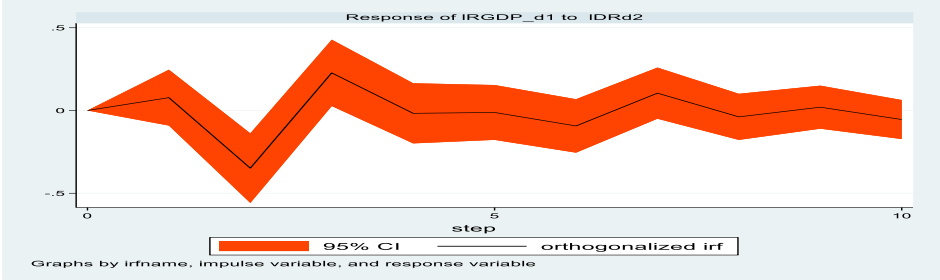
After estimating the study model we found that the model is statistically and economically moral, and does not suffer from standard problems i.e. there are no roots greater than one so that all variables fall within the boundaries of the circle and therefore our estimated study model is stable.

5.2.4 - Impulse Response Functions and Variance Decomposition

We use two instruments to determine the impact of the interest rate channel on real GDP and the consumer price index (CPI) and track the trajectory of these effects, the first being the reaction functions and the second for the contrast analysis tool respectively

5.2.4.1 - impulse response functions

Fig.5. the aggregate output response to interest rate channel shock



Source: STATA.15

It is clear from figure (5) that real GDP (LRGD_d1) responds to a negative impact of the interest rate channel, during the first period by (-0.348332) which is compatible with economic theory, but it turns into a positive shock that does not correspond to economic theory by a weak rate estimated (0.22731) because it was economically known when the central bank raised interest rates in the implementation of a monetary policy that would lead to a decline in real investment, which leads to a reduction in real output (reverse relationship).

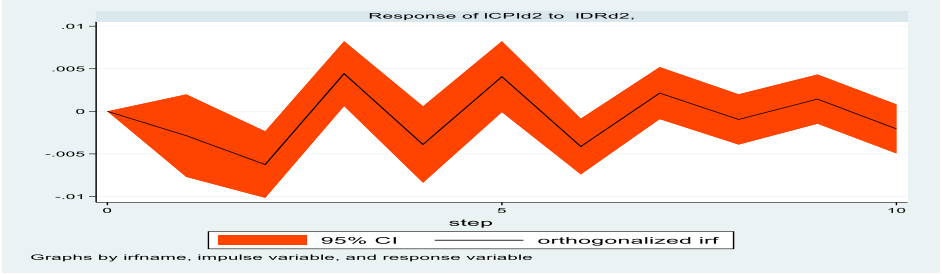
From the fourth period to the sixth period, it is clear that real GDP responds to the interest rate channel, but in very weak proportions although it agrees with the economic theory, to witness the seventh period a positive response of (0.14732) which is contrary to what is stipulated by the

economic theory, to return during the eighth and tenth period The real GDP of the interest rate channel responds to (-0.038377) and (-0.054537) respectively, but this response remains very weak and almost disappears after the response during the ninth period was positive and weak at the same time and not appropriate. Economic theory.

Overall, we conclude that the real GDP response to the short-term interest rate channel shock is very weak, as well as for the medium and long term where it has experienced constant fluctuations as well as its disapproval of the economic theory, The weak response to the real output of the impact of the interest rate channel is due to the decline in domestic investments, as a result of the unstable relationship between the central bank and the banks charged with financing investments that use the proceeds of financing to finance the development process, which failed without granting them in the form of meaningful loans that contribute to the increase in productive domestic investment, allowing for the strengthening of economic growth rates on the one hand, and on the other hand the unstable relationship between the main price of the Bank of Algeria and the high lending rate imposed by commercial banks, which poses the problem of cost. This does not encourage domestic investment, distorts real output in Algeria and leads to a decline in economic growth.

It also explains from another point of view that the interest rate channel does not affect the size of economic loans in the country. This is because most of them are due to public investment, which always seeks to obtain the necessary financing from the public treasury through the tax channel and resort to obtaining the necessary loans in the framework of financing the deficit in the balance of the budget to serve the purposes of the state policy. Hence, this made the real output not respond to the interest rate channel, and therefore we can say that the channel of interest rate is not effective in transferring the impact of monetary policy to Real gross product in Algeria. This is what many studies have found, especially those conducted on Algeria, (Benziane, 2019) and (Ali, 2020).

Fig.6. the CPI response to interest rate channel shock



Source: STATA.15

Observing the reaction of the inflation variable to a sudden shock in the interest rate channel variable of one standard deviation shows that the shock is negative and compatible with the economic theory in the first and second period, where it amounted to (-0.002855) and (-0.006252). In order to arrange very weak values, this relationship disappears and becomes positive in the third stage where the consumer price index responds to the shock of the interest rate channel at a very weak rate estimated at (0.004427) and it does not agree with the economic theory because it was expected when the central bank raised interest rates. In the context of easing high inflation rates, it will result in the absorption of the monetary mass (cash supply) in the economy and thus the decline of inflation rates (reverse relationship). However, from the third period to the end of the period the response of the consumer price index to the shock of the interest rate channel fluctuating and swinging down and upwards with negative and positive values. Although during the tenth period the variable (LICPd2) responds to the shock of the interest rate channel by a very small percentage is almost non-existent, even if it is not compatible with economic theory.

In general, the response of the consumer price index that translates inflation rates to the shock of the interest rate channel in Algeria is very weak in the short term, as well as the medium term where it is fluctuating and unclear in the long term.

This result leads to the argument that the monetary factors have affected the inflation rates are very weak and marginal, due to the institutional structural aspects of the Algerian economy, perhaps most notably the political decisions during the period of the presidential elections of 1999 and the subsequent years of government, which moved towards financial expansion due to the huge oil revenues that benefited the public treasury without taking into account the specificity and requirements of the Algerian economy, as well as imported inflation.

This finding is in line with a study (Rakisheva, Kalikhan, & Saydaliev, 2020) ,which found that the interest rate channel has a secondary role in Kazakhstan's monetary transfer mechanism after the main role of the exchange rate channel in the previous transport mechanism was revealed.

5.2.4.2 - variance decomposition

Table 5. The Real output variance decomposition

step	(1) fevd	(1) Lower	(1) Upper
0	0	0	0
1	0	0	0
2	.010136	-.033523	.053794
3	.172424	-.015373	.36022
4	.218299	.000428	.436171
5	.213125	.003879	.422371
6	.205482	.004445	.406519
7	.212211	.00295	.421473
8	.220562	.00019	.440934
9	.219512	.000493	.438532
10	.217632	.001577	.433688

Source: STATA.15

The interest rate channel contributes a very weak percentage to the variation of the forecast error of real GDP, where it contributes 0.01% to the variable error variation (DLRGDP) for the first period, to rise slowly from 0.17% and settle at 0.21% and this during the period range from the third to the seventh period, after the highest contribution of the channel interest rate in real GDP to 0.22% approval for the eighth period, to return at the end of the period to the same rate as the previous period of 0.21%.

What can be generally inferred is that the interest rate channel's contribution to the real output forecast error in Algeria is very weak despite the marginal rise from medium to long term, which supports the results of the real output response function of the interest rate channel shock.

Table 6. The CIP variance decomposition

step	(1) fevd	(1) Lower	(1) Upper
0	0	0	0
1	0	0	0
2	.026579	-.06127	.114428
3	.13029	-.007579	.268159
4	.146239	.006652	.285826
5	.153678	.017136	.290221
6	.17507	.030175	.319966
7	.199081	.044842	.35332
8	.204473	.046947	.361998
9	.203555	.045547	.361562
10	.204851	.044644	.365059

Source: STATA.15

It is clear from table no 6 that the interest rate channel contributes a weak percentage in the variation of the error of forecasting the general level of prices (inflation) between 0.026% and 0.2048%, and this is from the second period to the tenth period, recorded by a very decent contribution and this is what we see through the continuous and small rise throughout the forecast period, which begins almost in the medium term and reaches the long term, after a non-existent contribution during the first period of the short term, and these results come to support what was reached when we analysed the CPI response to the interest rate channel.

This experimental section can be divided into subsections, the

contents of which vary according to the subject matter of the article. It must contain all the information about the experimental procedure and materials used to carry out experiments.

6. Conclucion

In this study, we looked at the impact of the interest rate channel on real output and inflation as a vehicle for conveying monetary policy decisions in Algeria using annual data covering the period from 1980 to 2018, using a standard approach of self-regression radiation, as well as the use of pulse response and contrast analysis.

Our study found that the response of real output and the consumer price index expressed inflation rates does not benefit from the interest rate channel, as the results of the analysis indicate that the interest rate channel does not contribute to the variation of the error of forecasting real output and the consumer price index, respectively. This confirms the weakness of the interest rate channel in causing the desired impact on the targets assumed by the Bank of Algeria in its implementation of monetary policy. Based on this result and considering the unstable relationship between key interest rates and high lending rates in Algeria, this contributes to curbing investment due to the high cost, which hinders economic growth rates as well as raising inflation rates. We believe that dealing with competing Islamic participation formulas for traditional interest rate formulas will have the desired impact on the Algerian economy.

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