The effects of Monetary and Fiscal policies on Economic growth in Algeria Empirical study over the period 1995-2019

أثر السياسات النقدية والمالية على النمو الاقتصادي في الجزائر دراسة تطبيقية خلال الفترة 1995-2019

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Abstract

This paper examines the impact of both monetary and fiscal policies on economic growth in Algeria over the period 1995-2019, through the establishment of VAR model. The results show that economic growth is well linked to monetary policy and fiscal policy, where both policies play an increasingly significant role in economic growth. However, the role of monetary policy is stronger than fiscal policy; this study also attempts to make recommendations based on the research results.
Keywords: Monetary Policy; Fiscal Policy; Economic growth; VAR model; Algeria

الملخص

تبحث هذه الورقة أثر كل من السياسة النقدية والمالية على النمو الاقتصادي في الجزائر خلال الفترة 1995-2019، من خلال إنشاء نموذج شعاع الانحدار الذاتي VAR. تظهر النتائج أن النمو الاقتصادي يرتبط بشكل جيد بالسياسة النقدية والسياسة المالية، حيث تلعب كل من السياستين دورا متزايد الأهمية في النمو الاقتصادي. بالرغم من هذا فإن دور السياسة النقدية أقوى من السياسة المالية، كما تحاول هذه الدراسة أيضا تقديم توصيات استنادا إلى نتائج البحث.
الكلمات المفتاحية: **السياسة النقدية؛ السياسة المالية؛ النمو الإقتصادي؛ نموذج شعاع الانحدار الذاتي ؛ الجزائر**

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Introduction

The global economy has fast turnaround and intensive transformations as a result and the significant expansion of international exchange, the emergence of the open market globally and with tremendous development in technology of information and global communication, different economies has been forced to adopt economic policies that are characterized by coordination between their various tools to achieve their desired objectives, among its tools are both monetary and fiscal policies. So, they must be coordinated to attain the coveted goals, where economic growth is the main objective of these objectives.

The impact of economic policies on economic activity is an important topic in a macroeconomic analysis which controversy continues around them, while supporters of the Monetary school see that monetary policy is the most effective, we find that the proponents of the Keynesian school confirm the importance of the financial policy in achieving economic growth.

The procedures taken by the country to influence the gross domestic product (GDP) to obtain a many of economic goals, the most important of raising growth rates, access to full employment and price stability, are defined as economic policies, which are divided into two important parts: fiscal policy is meant the use of taxes and government spending, which means the set of actions taken by the country, including its expenses and revenues. While monetary policy uses the legal reserve ratio, discount rate and open market operations as instruments to achieve economic objectives.

However, the effectiveness of the performance of each of the policies depends on the structure of the economy and the degree of its development, it's openness to the outside world and the degree of development of the financial sector, which effects the economic growth and efficiency of share capital, where there are many of theoretical and applied studies that confirmed the role of financial intermediaries in the credit supply operation which concluded that there is a strong relationship between financial development and economic growth.

Capital movement During the period of study (1995-2019) Algeria used different tools of economic policy, including monetary and fiscal policy, where these policies differed according to the prevailing economic conditions for each of the stages of the Algerian economy, which aimed overall to seek an increase in the rate of economic growth.

To precisely clarify the relationship between monetary and fiscal policy and economic growth in Algeria, we will try to ask the following problematic:

How do monetary and fiscal policies affect economic growth in Algeria, and which of them is more effective?

From here, we ask the following sub-questions:

- To what extent can monetary and fiscal policies affect economic growth in Algeria? How do they contribute to this effect?

From this, we derive the main hypotheses of the study, which are:

- There is a significant direct relationship between the macroeconomic variables studied (monetary policy, fiscal policy, and economic growth) in Algeria.
- Monetary policy is more effective than fiscal policy for economic growth in Algeria.
- The impact of fiscal policy on economic growth in Algeria is stronger than that of monetary policy.

To answer the problem of our research, we divided it into two parts, a theoretical side and an empirical study, using three economic variables represented by real gross domestic product (RGDP) as an indicator of economic growth, real money supply (M2) to measure the monetary policy, and real government expenditure (GE) to measure financial policy for the period from 1995 to 2019, and in the last part we will highlight the main results and recommendations.

1. Theoretical background and previous empirical works:

Controlling both monetary and fiscal policy is one of the ways to influence economic output. This principle has been supported by a substantial theoretical literature. According to IS-LM model, which, introduced in 1937 by Keynesian economist "John Richard Hicks", where we can find interest rate values and income levels that balance both markets (goods and services market and money market).It is possible that the equilibrium in both markets will occur at a lower level of income than that which balances the labor market, if the real income that balances the two markets is lower than the full employment income, this imbalance can be managed by applying the expansionary fiscal or monetary policy or combine them together, but if it is greater, labor market equilibrium can be achieved through deflationary fiscal and monetary policy. But referring to open economic system, Mundell-Fleming model also stated similar ideas related to the relationships between monetary and fiscal policy and economic growth. Where the effectiveness of policies varies according to the exchange rate system and the intensity of for interest rates, Therefore, the state as an economic facilitator can exploit these policies to achieve the best rates of economic growth, provided that the highest level of coordination is achieved to avoid inefficiencies for any policy (Mankiw, 2010)

Similarly, according to study of M.Friedman & Schwartz "1963"; they provided an important evidence supports the view that changes in the money supply has a significant impact on the economy. They justified that by studying the evolution of the historical record of the United States of America, and they were assumed the existence of a causal

relationship between the money supply and economic activity during the economic cycle, where the money supply increases during periods of the economic boom and decrease over periods of economic recession.

Despite the strong relationship between the money supply and economic activity during the economic cycle, but this relationship is not complete because of only inadequate indicators of economic activity or statistical errors in the measurement of the money supply. Through from their test of historical development, they found that the change in the money supply is not due to a change in economic activity, for this Friedman and Schwartz believe that the causal relationship is from money supply to economic activity and the substantial change in the growth rate of money supply causes a fundamental change in the growth rate of monetary income, and they emphasize that the growth rate of money supply in the long-term will express itself in the difference in the rate of change in prices, on the contrary, the growth rate of money supply in the short-term would be affected by the growth rates of both prices and output. (Carl.E & Wals , 2010) (Friedman & Jcobson schwartz, 1963)

In accordance with the study of Chari & All 1995, concluded that the monetary policy contribute mainly in determining rates of inflation as well as to the existence of a relationship between inflation and growth by testing a cross section of a group of countries and proving that there is a nonlinear negative correlation between inflation and growth, and they used the growth rate of money supply for measuring interrelationships between inflation and growth for purpose of measuring the differences in monetary policy between countries. Although many models have confirmed that in the long term, any increase in growth rate of money supply leading to a decrease in the growth rate of economic output, but recent studies have proved that the changes in the rate growth of the money supply had little quantitative impact on the growth rate of GDP. (Chari, Larry E, & Rodolfo E, 1995)

In the standard study of St.Louis submitted to US Federal Reserve, which confirmed the validity view of monetary of the importance of monetary policy on fiscal policy through a standard model adopted in the test, which includes the main equation used to measure the impact of the increase in growth rate of money supply **M1** and government spending on gross domestic product **GDP** from period (1960-1982) using quarterly data. The results showed that the impact of both monetary and fiscal policy continues for the current period and different periods of times, and the increase in M1 and government spending have explained about 30% of the change in GDP, the test also proved that most of the effects were of monetary variables, while none of the financial variables had a significant effect.

The most important conclusion in this study is that when collecting the coefficients of monetary variables where almost equal to one, with the stability of the other variables, the increase in the growth rate of money supply M1 will result the same increase in nominal GDP in about one year. (Wachtel, 1989, pp. 299-302)

Moreover, Boualfi Mohamed (2013) conducted a study on impact of monetary and fiscal policy on economic growth in Algeria, using annual data for the period 1970-2011 applying St.louis model. The findings of the study showed that the efficiency and effectiveness of fiscal policy versus monetary policy in influencing economic activity, and the ability of fiscal policy to predict changes in economic activity outweighs the ability of monetary policy. Based on the estimation results and the coefficients of the significant variables, it was concluded that fiscal policy requires a relatively shorter period to have an impact on economic activity than those required by monetary policy. (Mohamed, 2013)

2. Empirical Analysis and Results:

The objective of this paper is to investigate the effect of monetary and fiscal policy on economic growth in Algeria using the annual data for the period 1995 to 2019. In this study, the variables are a real gross domestic product (RGDP) as an indicator of economic growth, real money supply (M2) to measure the monetary policy, and real government expenditure (GE) to measure financial policy indicators. All the variables above data adjusted to CPI index (base year set as 2010). To eliminate the factors, impact of price changes on the empirical analysis. Then the variables are taken in their natural logarithms to avoid heteroscedasticity.

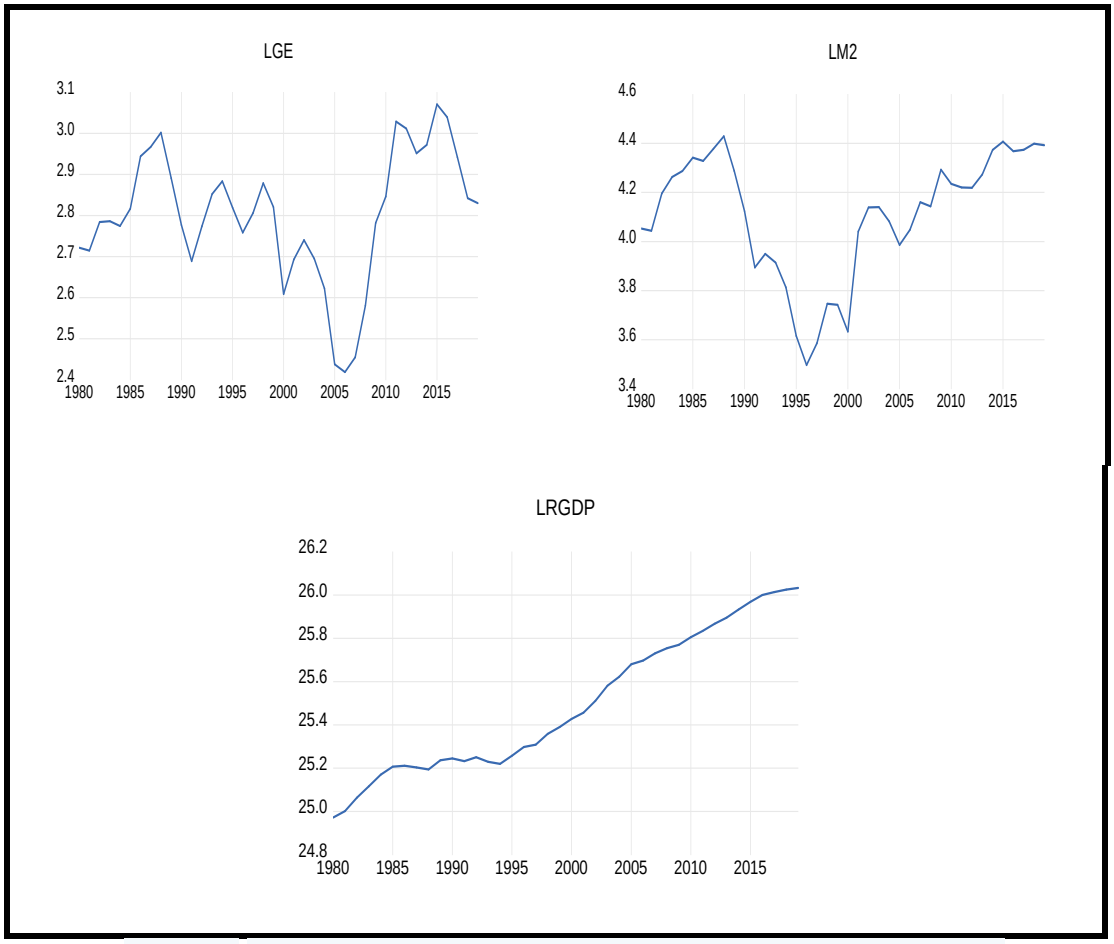
We used some econometrics techniques to reach the purpose of this study such as cointegration and causality. The entire estimation consists of three steps: the first step is to test whether the variables contain a unit root to confirm the stationary of each variable (Engle and Granger, 1987). This is done by using the Augmented Dickey-Fuller tests (F-ADF) and Philips–Peron (PP) tests (1998). The second step is to test whether there is a long run cointegrating relationship between the variables. This is done using the Johansen-Fisher methods. For the last step, if all variables are I (1) (integrated of order one) and cointegrated short-run elasticities can be computed using the vector error correction model (VECM) method suggested by Engle and Granger (1987). If there is no cointegration, the estimate will be in the VAR method.

2.1 Stationary: graph, ACF function and Unite Root Test

2.1.1 Graph:

In any econometric analysis, a critical first step is to visually inspect the data, a stochastic process is said to be covariance stationary if the means, the variance, and the covariance of the process are constant through time. (Melard, 1990, p. 282)

We show in Figure 1, the three series (RGDP, GE and M2) are not stationary and have an increasing trend during the period of study (1995-2019).



Source: prepared by researcher based on (Eviews 9) output

2.1.2 ACF function:

Another way to make the same point is to note that the series shown in Figure 1 has a clear trend. However, the tight fit of the estimated model might fool a researcher into thinking the series is stationary around the cubic trend line shown in Figure 1. Our eyes can be deceived because such trend lines are fit to make the observed residuals as small as possible.

Table1 showed the ACF of the logarithmic real GDP, logarithmic real government spending and logarithmic real money supply (M2), we can see that the ACF decays slowly. In fact, this type of slow decay in the ACF is typical of a series with a stochastic trend. Thus, detrending the data does not seem to result in a stationary series.

Rather than rely solely on an analysis of correlograms, it is possible to formally test whether a series is stationary. We examine such tests in the next several sections. The testing procedure is not as straightforward as it may seem. We cannot use the usual testing techniques because classical procedures all presume that the data are stationary. For now, it suffices to say that Nelson and Plosser are not able to reject the null hypothesis of a unit root. However, before we examine the tests for a unit root, it is important to note that the issue of non-stationary also arises quite naturally in the context of the standard regression model.

Table 1: **ACF function**

Variable / AC	LRGDP	LGE	LRM2
1	0.892	0.857	0.852
2	0.779	0.625	0.679
3	0.656	0.405	0.544
4	0.533	0.209	0.441

Source: prepared by researcher based on (Eviews 9) output

2.1.3 Unit root test:

To test the stationary of variables and the presence of unit roots, we use the unit root test, and to determine the degree of differencing necessary to induce stationary, Augmented Dickey-Fuller test (ADF) based on the work of Dickey and Fuller (1979) is used. It's said that order of integration is "d" if a non-stationary variable becomes stationary after differencing "d" times. The test is based on the estimate of the following regression which contains both a constant term and a trend: (Enders, 2014, p. 207)

$$\Delta y_t = a_0 + \gamma y_{t-1} a_2 t + \sum_{i=2}^{p} \beta_i \Delta y_{t-i+1} + \varepsilon_t \ \ldots\ldots\ldots\ldots (1)$$

The null hypothesis is: γ= 0, the series has a unit root and is nonstationary. The results of unit root test are summarized in Table 2.

The estimated values of γ for logarithm real GDP, logarithm real GE and logarithm real M2 are not statistically different from zero at the 0.01, 0.05 and 0.1 levels.

We show when we take the first difference of the variables that absolute of ADF statistic is more than the critical values at 5% of significance, so the null hypothesis of presence of a unit root can be rejected in case of the first differenced variables and therefore the variables (LRGDP, LGE and LM2) under consideration are I (1).

Table 2: **Unit root test**

Unite Root Test			
Variables	**LRGDP**	GE	M2
Levels	-2.217 P=(0.2055)	-1.852 P=(0.3647)	-1.392 P=(0.5687)
First Difference	-3.246 P=(0.03)	-3.325 P=(0.0254)	-3.791 P=(0.000)

Source: prepared by researcher based on (Eviews 9) output

2.2 Lag length test:

Appropriate lag length has been selected using VAR framework for cointegration test, VEC model, and causality test, to assure consistency of the research findings with real economic situations and economic theories. The result of lag length selection criterion is shown in Table 3.

As shown in Table 3, LR, FPE, AIC and HQ criterion suggested lag length 1. So, lag length 1 will be used for cointegration test and vector error correction model.

Table 3: **Lag selection based on VAR lag length criterion**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	31.75	NA	0.000	-2.61	-2.46	-2.58
1	121.59	**147.02***	**9.57e***	-7.89	**-9.36***	**-8.82***
2	131.18	13.06	9.60e	-10.02	-8.97	-9.77
3	140.68	10.37	1.06e	-10.06	-8.57	-9.71

Source: prepared by researcher based on (Eviews 9) output

2.3 Cointegration Test:

After establishing that concerned variables does not include unit root and they are integrated of the same order one I (1), the following step is to check whether there is any long-run relationship among them. Johansen's (1988) approach is applied to allow us to test for the presence of multiple cointegration relationships, r, in a single-step procedure. The likelihood Ratio (LR) test is based on the trace statistics (λ trace) which tests the H0: $r \leq q$against H1: $q = r$ is calculated thus:

$$\lambda_{trace}(r) = -T\sum_{l+1}^{p} \ln(1-\hat{\lambda i})$$

Where $\lambda r + i$……..λn, are the last value of eigenvectors (p-r).The second test is the maximal eigenvalue test (λ_{max}) which tests the H_0: there are r cointegrating vectors against the H_1: there are r+1 cointegrating vectors and is calculated as follows: (Hamid & Sbia, 2013, p. 7)

$$\lambda_{max}(r, r+1) = -T\ln(1-\hat{\lambda}r+1)$$

Here we want to determine if money supply, government expenditure and GDP are co-integrated. Cointegration explains how a set of economic variables behaves in the long-run equilibrium. "If several variables integrated, then they may drift apart in the short-run. But in the long-run, economic forces will draw them back to their equilibrium relationship'' (Ahmed Hassan & Masan, 2015, p. 106)

The results of cointegration are shown in table 4, where it is clear to us that there is no cointegration between the variables under study and the absence of a long-term relationship between them.

Table 4: **Johansen cointegration test:**

Hypothesized	Trace	Max-Eigen
No. of CE(s)	Statistic	Statistic
None*	32.37	19.31
At most 1	13.05	7.70
At most 2	5.35	3.84
Trace test and Max-Eigen statistics indicate no cointegrating eqn(s) at the 0.05 level * Denotes rejection of the hypothesis at the 0.05 level		

Source: prepared by researcher based on (Eviews 9) output

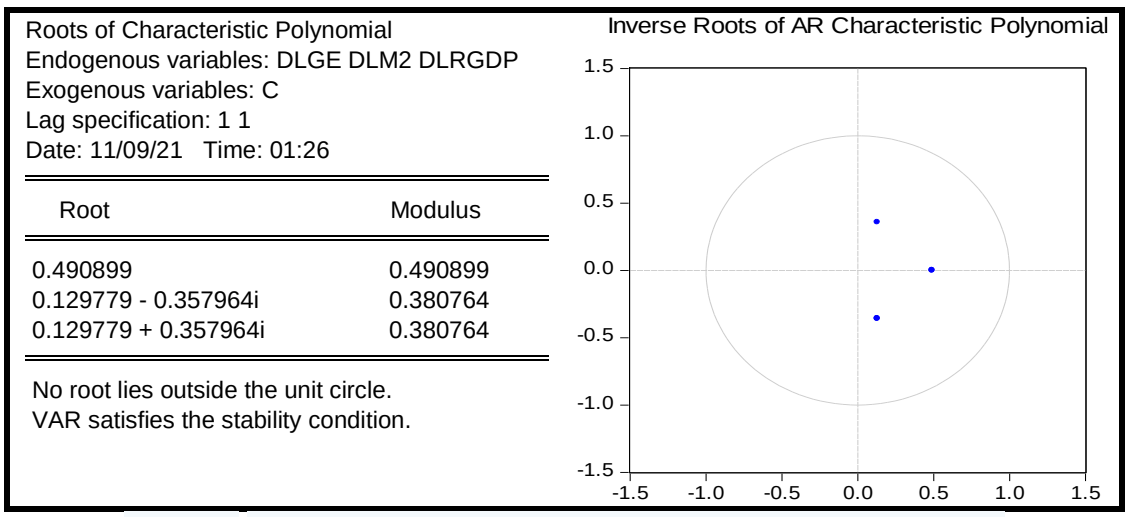
2.4 Estimating the model:

In this study, we will use the multivariate autoregressive VAR model to determine the model. Since in this technique we use the stable series, we determined the lag of length and obtained the optimal lag period of one, and the selection of VAR (1) model is optimal.

2.4.1 The Stability of VAR (1) Model:

The VAR stability condition check of the model is done; it is a type of a diagnostic test used to determine whether the model meets the stability properties of a good model. The results in Figure 2 show that most of the roots of the characteristic AR polynomial have absolute value less than one and fall inside the unit circle. However, the modulus of one root is equivalent to one, this is statistically acceptable since the root does not lie outside the unit circle. The implication is that our VAR model satisfies the stability condition, and it is statistically acceptable.

Figure 2: **The Stability of VAR (1) Model**



Source: prepared by researcher based on (Eviews 9) output

2.4.2 Causality Test:

Table 5 reports results from Granger Causality Test based on the estimated VAR model discussed above. The results for model with the real GDP as a dependent variable indicate that:

- The null of real money supply does not granger causes real GDP is not rejected; similarly, the null of real government expenditure does not granger causes money supply also rejected, so we can say the real money supply causes real GDP and government expenditure causes the GDP by money supply.
- There is no mutual and no single effect between real government expenditure and real gross domestic product (GDP), it means that the change in government expenditure does not cause a change in GDP.

As the causality test shows the direction of the relationship between the variables only and does not indicate the amount of effect between them, so we pass to estimate the VAR equation, as follows:

$$dlrgdp = 0.39dlrgdp(-1) + 0.016dlrg(-1) + 0.066dlrm2(-1) + 0.016$$

Looking critically at the numerical values of the coefficients and their effects, the above equation is saying that a 1% permanent increase in real money supply will cause the real GDP to increase by 66%, while the same 1% increase in real government expenditure will increase real GDP by 16%. This shows that Algerian's GDP increase more by monetary policy channel, and this is consistent with the monetarist theory which asserts that variations in the money supply have major influences on national output in the short run.

Table 5: **Causality Test Result**:

Dependent variable: DLRGDP			
Excluded	Chi-sq	df	Prob
DLGE	0.22	1	0.63
DLM2	4.84	1	0.02
All	7.97	2	0.02
Dependent variable: DLGE			
Excluded	Chi-sq	df	Prob
DLRGDP	0.65	1	0.41
DLM2	0.06	1	0.80
All	0.68	2	0.71
Dependent variable: DLM2			
Excluded	Chi-sq	df	Prob
DLRGDP	1.41	1	0.23
DLRG	2.73	1	0.09
All	3.66	2	0.86

Source: prepared by researcher based on (Eviews 9) output

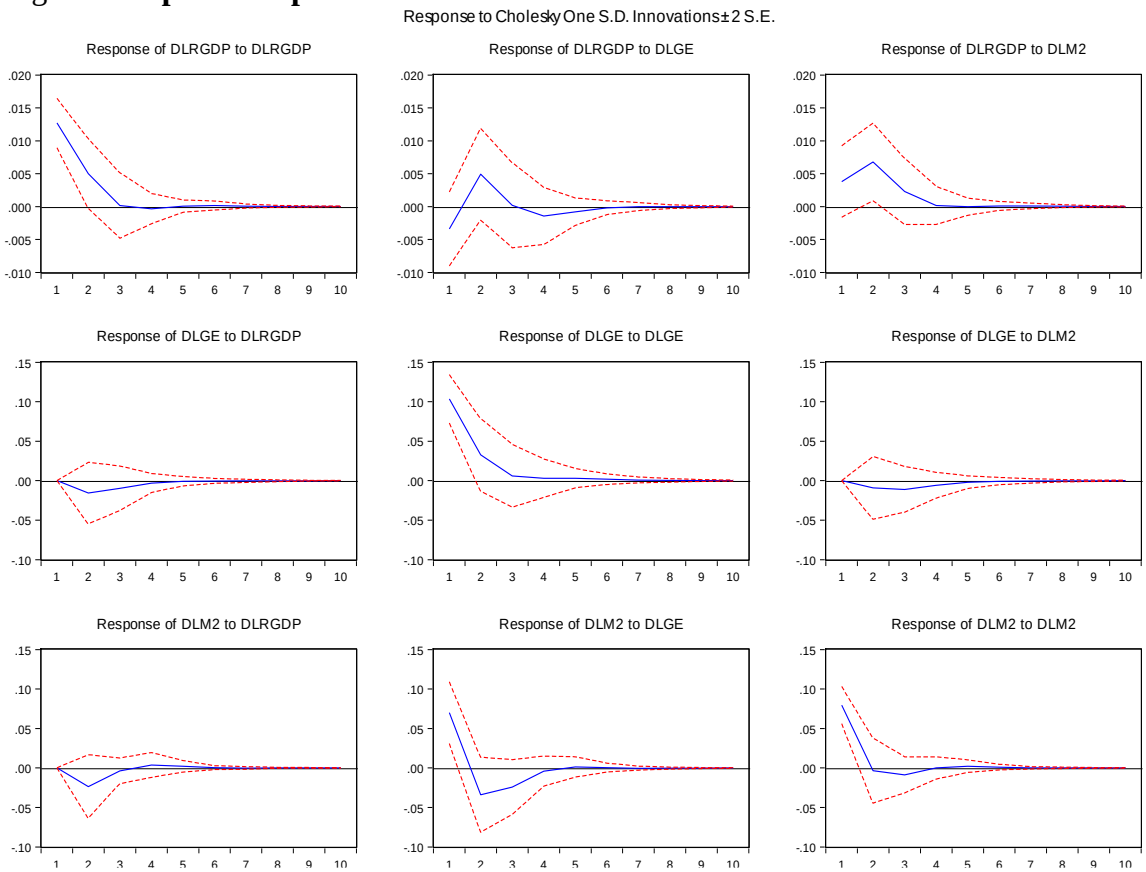
2.5 Impulse Response Functions:

To find out the dynamic relationship between the variables of monetary policy, fiscal policy and economic growth, the impulse response of VAR (1) model needs to be analyzed.

We employ impulse response functions (IRFs), which trace the impact of a one-standard deviation shock in a variable on current and future values of the variables, to capture the short-run dynamics of the model. Considering that the IRFs based on a Cholesky decomposition is sensitive to the ordering of the variables, we apply generalized impulse-response functions (IRFs) proposed by (Pesaran & Shin, 1998).
Figure 3 shows a positive impact on monetary policy (DLM2) during the current period when rapid economic growth (DLRGDP) responds and reaches its maximum at phase 0.07, and this response continued for about 6 periods. But the effect of monetary policy was negative and instantaneous on government expenditure then this effect begins to diminish for about 5 Periods.

The real gross domestic product (DLRGDP) response to the positive shock in government spending (DLGE) was very small and was not instantaneous where it reaches its maximum at phase 0.005, then this effect begins to diminish after period 3 and the impact of fiscal policy gradually declined. The short-term effects of Algeria's monetary and fiscal policy on economic growth are all obvious.

Figure3**: Impulse Response Functions**



Source: prepared by researcher based on (Eviews 9) output

2.6 Variance decomposition analysis:

To understand the proportion of changes in the economic growth (DLRGDP) under the impact of itself and other variables, a predictive variance decomposition of the economic growth was conducted.

Table 6 is the result of the forecast variance decomposition of economic growth (DLRGDP). In the first period, the economic growth is all explained by itself, indicating that there is a time difference between monetary policy and fiscal policy for the level of economic growth. As the number of period changes, economic growth is gradually explained by monetary and fiscal policies. At the time of issue 4, the part of economic growth explained by itself has dropped to 64.37%, while the contribution rate of monetary policy and fiscal policy to its impact respectively reached 22.59% and 13.02%; this contribution stabilized until the 10 issues.

In the first 10 periods, the major impact on the change in GDP is the size of previous years GDP and the monetary policies of previous years. The role of fiscal policy is weaker than fiscal policy.

Table 6 : **Variance decomposition**

Period	S. E	DLRGDP	DLGE	DLRM2
1	0.1037	86.14	6.177	7.68
2	0.1102	666.05	12.63	21.33
..				
9	0.1117	64.23	13.22	22.55
10	0.1117	64.23	13.22	22.55

Source: prepared by researcher based on (Eviews 9) output

3. Conclusion and Recommendation

The research study examined the impact of fiscal and monetary policies on economic growth of Algeria to the period of 1970 to 2016. The study concluded that money supply and government expenditure are significant policy variables that affect economic growth in Algeria (i.e., using Real Gross Domestic Product as proxy for economic growth).

We can conclude from the above research that:

- Economic growth is closely related to monetary policy and fiscal policy, and there is a long-term and stable equilibrium relationship between them.
- From the impulse response analysis, the effect of monetary policy on economic growth is more obvious, and the effect of fiscal policy in the short term is not obvious.
- We may see from the forecast variance decomposition analysis, the monetary policy and the financial policy grow the function to the economy to be more and more important, but the fiscal policy function must weakly in the monetary policy.

The study therefore opined and recommends that to put Algerian economy on the path of sustainable growth; the government must put emphasis on its fiscal and monetary policies with the cooperation of Algerian Bank in order to enhance the welfare of their citizen.

Since fiscal policy affects economic growth through monetary policy, we recommend that the Algerian government pay more attention to fiscal policy and its instruments. For example, the government can increase the effectiveness of fiscal policy by improving government spending, by developing sources of revenue other than oil revenues, and by focusing, for example, on the tourism sector, on which most countries depend to develop their economies.

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