



A STUDY ECONOMETRIC ON THE IMPACT OF MONETARY POLICY TOOLS ON ECONOMIC GROWTH IN ALGERIA DURING THE PERIOD USING THE ARDL MODEL -1990-2020

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Abstract:

This research paper aims to know the extent of the impact of certain monetary policy tools on economic growth in Algeria , especially in light of the differences in some studies on the type of impact these tools have on economic activity in many countries, Where an econometric study was used to discover this effect, and this study found that there is a long-term equilibrium relationship between monetary policy and economic growth, as well as there is a short-term relationship, This study also found that the relationship between the components of monetary policy and economic growth in Algeria is positive for some variables and may be inverse for some other variables, and this during the study period extending from 1990 to 2020.

Jel Classification Codes: C22, E52, F43

Key words: growth rate, monetary mass, exchange rate rate, rediscount rate, ARDL model

Introduction:

Monetary policy is one of the most important policies in economic life, and therefore its main objective lies in the objectives of economic policy which is to achieve monetary stability as well as economic growth and to reduce unemployment, however several questions still arise as to the extent to which policy tools affect real economic variables. The classics see that money practices the principle of neutrality (the neutrality of money) that is, money enters only as a medium of exchange and does not exert any influence on the level of economic activity, However, Keynesians see money from another angle, because according to Keynesian theories money plays a role key in income through the rate of interest, and it is also considered by them as a good store of value, and that is what drives individuals to keep it. On the other hand, supporters of the monetary school headed by Mr. Friedman, they went to the absence of the impact of monetary policy on long-term economic variables and the task of monetary policy remains influence the credit rate through the expansion of credit and money supply in order to achieve economic growth, but the development of an effective long-term and short-term monetary policy requires the development of appropriate mechanisms to obtain liquidity in flows and in kind in the economy and this is intended to move away from the general rise in prices which have a negative impact on economic growth, And Algeria is among the countries which are constantly striving to achieve rates positive growth because it is inevitable to avoid economic deterioration and underdevelopment, In addition to the many reforms it has carried out in many areas, it has not neglected reforms in the field of policy monetary policy, especially after the enactment of the Loan and Currency Act in 1990 and up to recent years.

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Problematic: The problematic of our research can be formulated on the following question:

To what extent can monetary policy tools affect economic growth in the case of the Algerian economy?

Hypotheses:

- ✓ Monetary policy tools have a positive impact on the long term economic growth rate in Algeria.
- ✓ There is an impact relationship for each of the money supply, the rediscount rate and the exchange rate on economic growth in Algeria in the short term.
- ✓

Objective of the study: This study aims to know the magnitude of the impact of monetary policy on the rate of economic growth in Algeria, especially since many studies have indicated and highlighted the variation in the impact of monetary policy tools on different macroeconomic variables, there are many studies that have concluded that monetary policy variables can have a positive impact on economic growth, and this in economies that are characterized by rapid movement and dynamism, whereas there are other studies according to which the realization of monetary reforms cannot have a positive impact, in particular in the long term, unless it is not accompanied by reforms in other economic fields and this in particular in developing countries, we will therefore try through this study to identify the impact that monetary policy can have on economic growth in Algeria, especially out after the reforms started by Algeria since the 90s of the last century until today.

Study methodology: In order to answer the question of the problem and to get to know the different aspects of the subject and to test the validity of the hypotheses, the deductive descriptive approach was used with regard to the theoretical side, in order to discuss the basic concepts of monetary policy and the relationship it brings to economic growth, as well as to discuss some similar studies that have dealt with this subject in certain aspects, and the analytical method has also been invoked in the axis application of this study, where quantitative methods were used as analytical tools using one of the econometric methods represented in the autoregressive distributed lags ARDL model and this to test the effect of the Monetary Policy tools on economic growth over the study period from 1990 to 2020.

Study Axes: This study included three main areas:

- ✓ **The first axis:** basic concepts of the study variables.
- ✓ **The second axis:** presenting some previous studies that dealt with the relationship between monetary policy and economic growth.
- ✓ **The third axis:** the econometric study of the impact of monetary policy on economic growth.

1. Basic concepts of the study variables:

1.1 Economic growth:

The subject of economic growth has captured the attention of many interested in economic affairs, be they researchers, organizations or governments, and is considered the ultimate goal that all countries of the world want. to achieve, developed countries seek to continually raise the standard of living of their individuals and maximize their benefits and achieve the highest level of well-being for the majority of classes of society, while developing countries work to find the best possible policies and strategies to rid poverty or reduce its levels. Many scholars in economics, through their studies and research have determined the most important factors and elements that determine and explain economic growth, especially in light of developments in the

world is constantly aware. Over time, the concepts and theories that helped to explain the economic growth of previous periods have changed and the definition of the concept of it has become dependent on multiple and diverse variables.

Raymond Barr sees economic growth as "the increase in disposable wealth and population", and according to **François Perot**, growth is seen as "the increase that occurs over one or more long periods of time for a positive indicator in a country" (Ismail Muhammad Qana, 2012, p 7).

Samuelson. a.P sees Real Net National Product as the main indicator of economic growth because its data is available and easy to obtain according to him. Thus, economic growth is defined as "the relative increase in net national product" (Belmokadem Mustapha, 1994, p09). Therefore, we can be said that economic growth occurs in the case of:

- ✓ The movement and transfer of production possibilities from one country to another (Tlemceni Hanan, 2021, p04).
- ✓ The increase should be in the average per capita income and not only in the total income. The increase in average national income per capita requires that the rate of increase in national income be greater than the rate of increase in population (Dhaif Ahmed, 2015, p10).
- ✓ The increase should be real and not nominal, so if the rate of increase in the average national income per capita is less than the rate of increase in the price level (inflation), this increase is nominal and not real (increase in the la value of production is solely the result of high prices).
- ✓ The continuous and stable increase in economic activity, because the increase in the average real per capita share of national product should not take place through emergency events, such as the state receiving support from abroad due to emergency conditions or an increase in the price of materials issued by the government as a result of global emergency conditions.

From the above, it is clear to us that economic growth is closely related to the average rate of GDP per capita at which the living standards of countries are high, and the growth rate of national income must be higher than the rate of population growth because if the latter is greater than the rate of national income, it will not There is an increase in GDP per capita, and economic growth is measured at an annual rate called the economic growth rate and this rate can be nominal or real, depending on the value of GDP used, nominal (GDPN) or real (GDPR) and the relationship between the nominal economic growth rate and the real economic growth rate can be written:

$$\text{Economic growth rate} = \text{national income growth rate} - \text{population growth rate}$$

As mentioned earlier, the increase in the average per capita rate of GDP should be real and not just monetary, thus the rate of economic growth can be measured by the following formula:

$$\text{Real economic growth rate} = \text{nominal economic growth rate} - \text{inflation rate}$$

1.2 Money supply:

The question of the money supply is one of the most important economic topics, which has captured the attention of many thinkers at the theoretical and applied levels because of the prominent and effective role that this mass plays in achieving economic stability, it affects many macro-economic variables such as GDP and inflation, because of this, the monetary authorities of various countries attach great importance to the money supply and the regulation of its

issuance in accordance with the established economic objectives, which obliges the monetary authority to follow it and control the factors that may affect it.

The money supply is the purchasing power of individuals, also called the availability of money, that is, the liquid assets of the economic sector that depend on the exchange of services and goods, an increase in the money supply leads to the emergence of economic inflation, while a decrease in the supply leads to the emergence of unemployment, deflation and inactivity in the ability to produce, The money supply means the amount of money available in a specific period of time, which is usually determined by the monetary authorities, or the monetary quantity represented by means of payment of all kinds (Belazzouz, 2017, p49), and accordingly it is possible to distinguish between three basic concepts that determine the money supply:

- ✓ **Narrow money supply (M1):** It is known as the total means of payment and includes money outside banks, in addition, demand deposits, which are all monetary assets with very high liquidity (Stanley, Campbell Sean, 2018 , p291).
- ✓ **Broad money supply (M2):** Known as special domestic liquidity, it includes narrow money supply (M1) as well as term and short-term savings deposits in banks and cash deposits. savings from savings funds, which are less liquid than (M1). These assets are used directly in transactions, but can easily be exchanged for cash, which can then be used in transactions, (Williamsson, 2018, p465).
- ✓ **Domestic liquidity (M3):** Domestic liquidity (M3): It includes the broad money supply M2, in addition to government deposits with banks such as bonds and treasury bills, which are less liquid than the private domestic liquidity M3, and some countries may resort to identifying and monitoring broader measures. Cash (M4), (M5, etc.) may include money market assets, long-term Treasuries and other financial assets (Leslie Lipschitz, 2019, p19), Accordingly, the money supply consists of paper money issued by the central bank, in addition to the additional money issued by the treasury or the central bank, and the deposit money created at the level of commercial banks.

1.3 Rediscount rate:

Commercial banks resort to borrowing from the central bank for their monetary needs. The process of borrowing is usually done either with collateral or by discounting securities in exchange for which the central bank obtains an interest rate it determines called the discount or rediscount rate, which is the rate of interest paid by commercial banks to increase their central bank cash reserves. The rediscount rate is one of the indirect tools of the monetary policy conducted by the central bank. It is a percentage that the central bank takes in return for its rediscounting of commercial paper offered by banks at discount, and also called the bank price, the process of rediscounting is a form of refinancing carried out by the Central Bank to provide liquidity to commercial banks (Abdul-Majid, 2003p87), this tool is used to influence the ability of commercial banks to extend credit in accordance with prevailing economic conditions. In the event of a recession, for example, the central bank lowers the discount rate, which encourages commercial banks to rediscount their commercial paper with the central bank. Thus, commercial banks have additional funds which allow them to grant more of loans, so the volume of bank credit increases and the money supply increases. While in the event of inflation the central bank increases the discount rate to increase the cost of credit on commercial banks and therefore on the customers of these banks, which reduces the volume of bank credit and reduces the money supply (Subhi, 1998, p196).

Also, the effectiveness of the discount rate policy is directly linked to the degree of dependence of commercial banks on the Central Bank as a source of financing for their financial needs, and to the degree of sensitivity of the demand for credit in relation to its cost (Subhi, previous reference, p. 221). Despite the importance of rediscount rate policy in influencing the

ability of commercial banks to extend credit to the non-banking public, this tool sometimes fails for the following reasons (Abdul Qadir et al., 2019, p 295):

- ✓ Commercial banks keep additional cash reserves that allow them to expand the lending process and extend credit to the public.
- ✓ Commercial banks have other sources of liquidity on which they depend, including branches of foreign banks that operate in the country.
- ✓ Commercial banks resort to selling the securities they hold on the financial market when they need to use them to finance their lending operations.

1.4 Exchange rate:

The effect of the exchange rate on economic activity is generally considered controversial in research. While the traditional theory indicates that the depreciation of the local currency can stimulate economic activity by shifting expenditure from foreign goods with the increase in their relative prices towards local goods (2014 M. B, Wanjau). Applied studies show variations in outcomes and there is no consistent positive impact on all economies after local currency devaluation (2018 al and N, Shokry), and to manage the exchange rate monetary authorities need to follow a methodology that only allows for the fixing of exchange rates that allow for externally competitive domestic products only in the long term, it must also retain sufficient margin of flexibility in its exchange rate to be able to adjust the exchange rate when the country faces an external shock (Joakim. R, 2016).

Theoretical studies on the relationship between the exchange rate and economic growth show a divergence between economists. There is no consensus on the impact of exchange rate volatility on trade, exports and imports, and therefore on economic performance due to the difference in other determinants between different economies and the need to meet certain requirements such as the maturity of the national economy, the level of industrialization and the degree of elasticity of demand and supply for exports and imports, as some predict effects strong based on traditional economic models (Krugman 2015), while others point to limited changes in the trade balances of some economies due to exchange rate volatility.

And there are many definitions that have been provided by scholars and those interested in foreign trade, it is the means by which payments from another country are settled (Chip, 2011, p. 20), the exchange rate can also be defined as the number of units of a certain currency that have to be paid to get one unit of another currency (Qara Ibrahim, 2014, p12), however, exchange rate can take many forms and formulas whose methods of measurement and economic interpretation differ, there is the nominal exchange rate, which is determined by the monetary authorities, and it is the official exchange rate that enters into international trade, there is also the real exchange rate, which is the ratio of the level of world prices of traded goods and services to local prices in a common currency, and which serves as an indicator to measure the extent of a country's external competitiveness, Quant at the effective exchange rate, this is a measurement of the exchange rate of a particular country in relation to a determined monetary zone, i.e. in relation to the currencies of the main trading partners of this country (Tlemceni Hanan, previous reference, p.3), the exchange rate is constantly changing and these changes are called deterioration or improvement, and improvement means the rise in price of local currency against foreign currency, while deterioration means the fall in price of local currency against to the foreign currency, and therefore rising exchange rate is improvement and falling exchange rate is deterioration (Al Taher Latrash, 2003, p96).

2. Some previous studies that discussed the relationship between monetary policy and economic growth:

The follower of the economic field and according to Arab and foreign studies sees that there is a division on the effectiveness of monetary policy and fiscal policy in economic activity, For example, supporters of the monetary school, led by Friedman, consider that monetary policy

is more effective in economic activity than fiscal policy, but the Keynesians see the opposite and this concerns theoretical studies. While in applied studies there is also some divergence of views in terms of the impact of monetary policy on economic growth, and according to these studies and research three results can be drawn, part of the studies which concluded a positive impact of monetary policy components on economic growth, and other part of studies found any negative impact of monetary policy tools on economic growth, and third part of studies concluded that the policy monetary policy cannot have a direct impact on economic growth. For example, the supporters of the monetary school consider that monetary policy has an effective impact on various economic activities, whether this policy is deflationary or inflationary, and according to them, They always believe that the intervention of the State in the economic activity through fiscal policy to achieve full utilization of the elements of production and then achieve economic equilibrium, this objective will not be achieved but on the contrary, this intervention may lead to a deepening of the imbalance, that is why monetary policy occupies the first place in economic policy, since the changes that affect economic activities according to the changes that occur in the quantity of money are more effective and more important than the effects resulting from fiscal policy (public expenditure policy).

2.1 Study by Friedman and Schwartz 1963:

According to Professor Yassad Abdel-Rahman (Yassad Abdel-Rahman, 2013, p13), Friedman and Schwartz have provided important evidence to support the view that change in the money supply (monetary policy) has a large impact on the economy and the proof is based on the evolution of the historical record of the United States of America, and through the equivalent standard models, Friedman assumed that the money supply and its growth rate have a strong impact on money income and its growth rate, Friedman and Schwartz believe that there is a causal relationship between the money supply and economic activity over the business cycle, where it is noted that the money supply increases during periods of economic booms and decreases during periods of economic downturn, and in other deflationary conditions Friedman noted that there is an increase in the money supply, and hence the peak in the growth rate of the money supply precedes the peak of the business cycle, and that the lowest point in the rate of money growth precedes the lowest point in economic activity in the business cycle, Friedman and Schwartz also concluded that although there is a strong relationship and clear between the money supply and economic activity over the business cycle, the relationship is not complete and the imperfection may result from insufficient indicators of economic activity or from statistical errors in the measurement of money supply monetary, It has also been recognized that the inadequacy of the relationship can only be attributed to the existence of a weak relationship between the money supply and economic activity, and it is believed that changes in the rate of growth of money can cause the cyclical behavior of the economy, on the other hand, the behavior of the money supply can be the result of the cyclical behavior of the economy and to determine the direction of causality Friedman and Schwartz presented their test of the evolution of history in order to verify the conditions which cause the variation of the money supply, They concluded that the variation of the money supply is not due to the variation of the economic activity, therefore, Friedman and Schwartz believe that the causal relationship runs from money supply to economic activity, and that a fundamental change in the growth rate of money supply causes a fundamental change in the growth rate of money income, They claim that the growth rate of the money supply in the long run will be expressed in the different rates of change in prices, and on the contrary, the growth rate of the money supply in the short run will be affected by the growth rates of the price and production.

2.2 Yassad Abdel Rahman's 2014 study:

This study was to test the impact of monetary policy on economic activity in Algeria in the period between 1990 and 2013, which was characterized by extraordinary circumstances

with radical reforms of the monetary and financial system from the year 1990, the date of the publication of Law No. 90-10 relating to money and credit, and the study period was imbued with the impact of the global financial crisis of 2008.

This study was based on the econometric statistical approach in order to measure the impact of monetary policy on economic activity and to compare it to fiscal policy, using a multi-parameter linear model which uses annual data, we also rely in the study on the dynamic model, where the relationship between the economic activity variable and the monetary policy variables, represented by the broad concept of money supply, the exchange rate variable and the rate of inflation, in addition to a dummy variable which represents the financial crisis and the inclusion of the random error element which represents the elements not included in the model and the fixed element in the model represents the minimum level of activity to currency neutrality and according to data issued by government agencies for the period from 1990 to the start of the reforms and the year 2013.

This study showed the optimal incarnation of monetary policy and its impact on Algerian economic activity for the period 1990 to 2013, this is the period that experienced several structural reforms, as well as internal crises and external crises (2008), the analytical and econometric study proved that the money supply in Algeria as a mechanism for transferring monetary impact and influence on economic activity and the study also showed a long-term equilibrium relationship term between GDP as dependent variable and independent explanatory monetary variables such as broad money supply, inflation rate, exchange rate, government spending. It is identical to Friedman's critical theory, The study also found a direct relationship between fiscal policy and GDP, which is identical to Keynesian theory, and the study also clarified a negative relationship between financial crisis and economic activity, which is consistent with economic theory, ie, the financial crisis negatively affects the level of economic activity. The study also showed in the short term that the elasticity coefficient of each of the independent variables shows the expected signal according to economic theory, positive for the fiscal and monetary policy variable and negative for the error correction variable, Although that all estimated parameters are characterized by good statistical significance, as the researcher finally concludes on the need for coordination between other policies, monetary policy not being subject to treatment for all diseases that affect fluctuations of economic activity. It is recognized that instability in the economy can result from sources other than mismanagement of the money supply, but it is believed that relying on a good monetary base can eliminate the greatest source of turbulence, that is the random variations in the money supply.

3. Econometric study of the impact of monetary policy on economic growth:

3. 1 Study Methodology: After the theoretical aspect of the basic concepts of monetary policy variables and economic growth and the relationship of these variables to the latter has been discussed, we will try in this study to know the effectiveness of monetary variables. The reforms adopted by the Algerian authorities during the period 1990-2020, and if they are valid for economic growth, therefore, through this study, the effect of monetary policy tools on economic growth will be tested using the autoregressive model of the lag time deviation, which is considered one of the best and most appropriate models, which is considered One of the best and most appropriate models, with a sample size of 31 views (1990-2020), and the focus was on this period because monetary policy did not receive much attention even after the publication of the Money and Credit Act in 1990.

3. 2 Description of the model and definition of study variables:

To answer our problem, which is to test the effect of monetary policy tools on economic growth in the long and short term and to test the validity of the proposed hypotheses, the autoregressive model of delayed time lag (autoregressive distributed lag) called (ARDL) model, which is included in the economic models for the co-integration test, from According to the Bound test

approach, this model is considered among the best co-integration test models in the case of time series with small sample, compared to other methods such as **Engel Granger** method or **Johansen Cointegration** test method.

The ARDL model gives efficient results, because this model estimates and measures the joint integration relationship between the variables regardless of the degree of stability of the time series whether they are integrated of degree (0) or degree (1) provided that they are not integrated from the degree (2), moreover this model works to separate the effect of the short term from the long term and through it it is possible to determine the relation of integration between the dependent variable and the short-term and long-term independent variables in a single equation, and also gives the size of the effect that the independent variables have on the dependent variable (Muhammad Dahmani Darwish, 2012, p12).

And based on what has been presented by economic theory and in the light of some previous studies testing the impact of monetary policy on economic growth and taking into account the particularities of the Algerian economy, three variables have been proposed that can be considered among the most important tools of monetary policy that can exert an influence on economic growth, and accordingly it can be formulated our study model is the following:

$$GDP = f(M_2, NEXR, NDR) \dots \dots \dots (1).$$

And through the equation No (1), the ARDL model will be estimated according to the following formula:

$$GDP_t = a + B_1 GDP_{t-1} + B_2 M2_{t-1} + B_3 NEXR_{t-1} + B_4 NDR_{t-1} + \sum_{i=1}^p \alpha_1 \Delta GDP_t - p + \sum_{i=1}^p \alpha_2 \Delta M2_t - p + \sum_{i=1}^p \alpha_3 \Delta NEXR_t - p + \sum_{i=1}^p \alpha_4 \Delta NDR_t - p + \mu_t.$$

Where:

Δ : the first difference of the variable, p: represents the number of lags contained in the model, B1, B2, B3, B4: are the parameters of the long term relationship, a: represents the constant term, $\alpha_1, \alpha_2, \alpha_3, \alpha_4$: represents the parameters of the short term relationship (error correction), i: represents the trend of time. As for the variables of the study can be defined briefly as follows:

GDP: economic growth rate (%).

M2: Money supply growth rate (%).

NEXR: the nominal exchange rate of the dinar against the US dollar.

NDR: rediscount rate (%).

Before we start estimating the model, we need to do some tests in order to know the validity of the data used in the model, as follows:

- Study of the stationarity of time series (unit root test):

The degree of stability of the time series is tested according to the augmented Dickey Fuller test at the level and at the first difference and the following table presents the results of this test:

Table 1: Time series stability test

variables	level		first Difference		Decision
	constant	constant and trend	constant	constant and trend	
GDP	-1.616 (0.4619)	- 1.582 (0.7761)	-5.891 *** (0.000)	- 6.442 *** (0.0001)	I(1)
M2	-4.334 *** (0.0019)	5.354 *** (0.0008)	/	/	I(0)
NEXR	1.264 (0.8775)	-0.9779 (0.7481)	-3.9114 *** (0.0057)	-3.8487 ** (0.0280)	I(1)
NDR	-0.7192 (0.8269)	-1.518 (0.8004)	-0.4315 *** (0.0015)	-4.892 *** (0.0103)	I(1)

Source : Prepared by researchers based on the results (Eviews09).

Assuming the null hypothesis that the time series will not be constant, i.e. the series has a unit root, and the alternative hypothesis that the series will be constant and based on Mackinnon 1996 values according to the SCI standard, ** *, **, * indicates that the null hypothesis is rejected At the level of 1%, 5%, 10% respectively, by the results of Table No. (1), we can say that each series for: GDP, NEXR, NDR is a constant series of the first difference, while the series of money supply Stable at the level, therefore the results of the Dickey Fuller test showed that the conditions for using the ARDL model are available and there is no second-order integral series.

- bound test Cointégration approach:

According to this test, the null hypothesis which states that there is no long-term equilibrium relationship between the model variables (no co-integration) and the tested hypothesis is as follows:

$$H_0 : B_1=B_2=B_3=B_4=.....=B_{K+1}=0 .$$

$$H1 : B1 \neq B2 \neq B3 \neq B4 \neq \neq BK+1 \neq 0 \text{ (the alternative hypothesis).}$$

And the realization of this test consists in comparing the calculated Fisher value calculated ($F_{\text{statistic}}$) with the upper and lower limits of the critical values fixed by (pesaran et al 2001).

- ($F_{\text{statistic}}$) is greater than the upper limit of the critical values, we reject the null hypothesis which states that there is no long-term equilibrium relationship.

- ($F_{\text{statistic}}$) is lower than the minimum critical values, we accept the null hypothesis which says that there is no long-term equilibrium relationship, and the following table shows the limit approach test for the existence of a long-term equilibrium relationship.

Table 2: Bound test cointegration

Critical values	Maximum	Minimum	$F_{\text{statistic}}$	Résult
level 1%	4.66	3.63	5.403265	There is a long-term equilibrium relationship
level 5%	3.67	2.76		
level 10%	3.2	2.37		

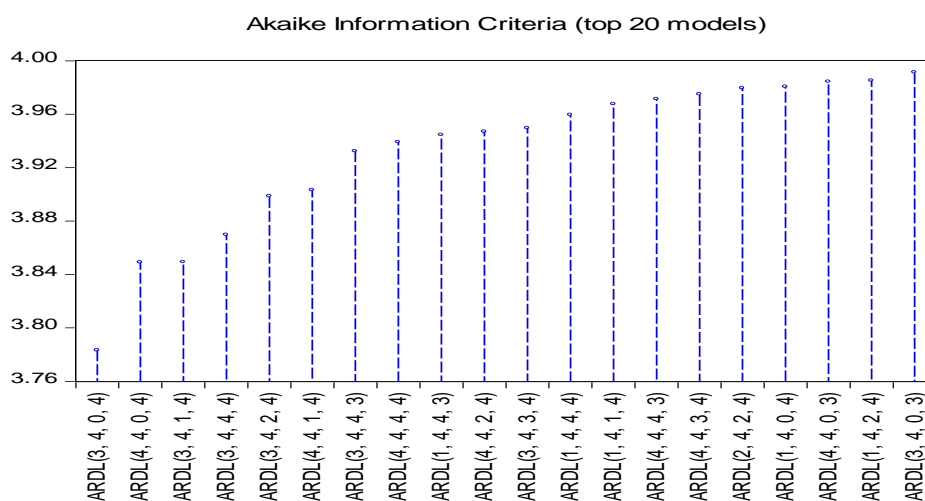
Source : Prepared by researchers based on the results (Eviews09).

According to the results presented in the table above, it can be said that the null hypothesis which states that there is no long-term equilibrium relationship between the variables of the model is rejected because the value $F_{\text{statistic}}$ which has reached 5.403265 is above the upper limit value set by Pesaran at the significance level 1% and 5%, This means that GDP is co-integrated with its determinants of monetary policy tools, which means that the variables behave similarly in the long term.

- Optimal slowdown test:

The following figure represents the optimal deceleration periods for the chosen model and based on Akaike's information criteria. The ARDL model (3.4.0.4) shows that it is optimal according to the outputs (from Evewes09):

Figure 1 : Optimal slowdown test



Source : Prepared by researchers based on the results (Eviews09)

3.3 Estimation of long term equilibrium relationship model and error correction model (short term):

✓ **The long term equilibrium relationship model:**

After confirming that there is an equilibrium relationship between the long-term model variables under the ARDL model, we can estimate this relationship by obtaining the parameter estimates and the long-term equilibrium relationship, the results of table n° (3) shows this as follows:

Table 3: Estimations of long-term parameters

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
M2	0.307529	0.264874	1.161038	0.2682
NEXR	-1.279881	0.972176	-1.316512	0.2126
NDR	-0.178867	0.144945	-1.234030	0.2408
C	15.668715	12.539138	1.249585	0.2353

Source : Prepared by researchers based on the results (Eviews09)

Through the results presented in the table above, it can be said that it was identical to the economic theory, because the money supply was not statistically significant ($\text{prob} = 0.6282 > 0.05$) and this observation is consistent with economic theory that supports the theory of monetary neutrality in long-term economic activity, moreover, the relationship between money supply and economic growth is a direct relationship (positive sign), and it is consistent with the theory economic, because the increase in the money supply on the market would stimulate consumption, especially by families, and would encourage investment by businessmen and institutions, which has a positive impact on economic growth. An increase in the money supply of 1% leads to an increase in growth of 0.3%.

While the exchange rate variable is inversely proportional to economic growth (negative sign), it differs according to economic theory, this difference is explained by the nature of the Algerian economy as a fragile and unproductive economy that has not the advantage of a diversified and competitive economy, as it depends heavily on hydrocarbons as the main source of foreign exchange, as well as the increase in the difference between the value of the dinar and that of the foreign currency (the American dollar) increased and continued throughout the period of study which had repercussions on economic growth or rather on economic activity, the rise in the exchange rate leads to an increase in costs in general and a rise in the prices of imported raw materials which leads to a rise in the prices of goods and products, and consequently a weak demand for them at the international and local level, which causes a reduction in the volume of non-hydrocarbon exports, which increases the volume of imports of these goods exchange and economic growth can also be explained by the fact that a large part of Algeria's hard currency income is lost due to the different currencies in which commercial transactions are negotiated through the export in US dollars and import in Euros (Hanan Tlemceni, 2021, p21), the increase in the exchange rate by 1% leads to a decrease in economic growth by 1.27%, and this is what has made the exchange rate for the study period not significant in the long term.

As for the rediscount rate, its relationship with economic growth is negative, which is in line with economic theory, because the high rediscount rate would increase the cost of loans practiced by the Central Bank to commercial banks, which limits the margin of these banks to grant various loans to individuals and institutions, all this will lead to a drop in investment and consumption, which would limit the increase in production, and the increase in the rediscount rate by 1% leads a decline in economic growth of 0.17%.

The results of the long term estimation are presented in the following equation:

$$\text{GDP} = 15.668715 + 0.307529 * \text{M2} - 1.279881 * \text{NEXR} - 0.178867 * \text{NDR}$$

✓ **Error correction model (short term):**

In this error correction model (ECM), we will try to test the short-term equilibrium relationship by estimating the short-term parameters, where the model variables appear as the first difference with the coefficient of error correction for a single delay period with a negative value less than one(1), and the following table shows the error correction model results as follows:

Table 4: Estimation of the error correction model

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-0.549473	0.184855	-2.972460	0.0116
D(GDP(-2))	-0.605152	0.210740	-2.871557	0.0140
D(M2)	-0.112408	0.031172	-3.606005	0.0036

D(M2(-1))	-0.241475	0.048610	-4.967588	0.0003
D(M2(-2))	-0.176027	0.043008	-4.092929	0.0015
D(M2(-3))	-0.098346	0.028002	-3.512118	0.0043
D(NEXR)	-0.545900	0.426506	-1.279935	0.2248
D(NDR)	-0.064635	0.043624	-1.481631	0.1642
D(NDR(-1))	0.155641	0.046851	3.322069	0.0061
D(NDR(-2))	0.150768	0.049216	3.063361	0.0098
D(NDR(-3))	0.121791	0.047237	2.578272	0.0242
CointEq(-1)	-0.518026	0.092149	-5.621595	0.0001

Source : Prepared by researchers based on the results (Eviews09)

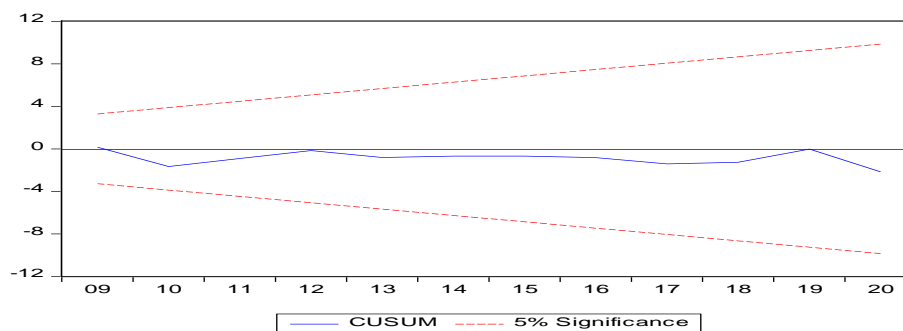
According to the results presented in Table No (4), the value of the error correction coefficient was negative and less than one and statistically significant at the threshold of 1%, this proves the accuracy of the equilibrium relationship long-term from a statistical point of view, where the error correction parameter measures the speed of return to the long-term equilibrium position and the value of this coefficient is approximately (-0.5180), in other words, when economic growth imbalances occur in the short term, they are corrected or adjusted at a rate of 51.80% in each period to reach the long-term equilibrium position, on the other hand, the results showed that the money supply is inversely proportional to economic growth in the short term and it is significant, but its effect, contrary to the relationship which was positive in the long term, this result can be accepted from an economic point of view , because the currency has an impact on economic activity in the short term, but it is neutral in the long term, whereas the relationship of exchange rate and discount rate was an inverse relationship with economic growth in the short term and insignificant in both cases.

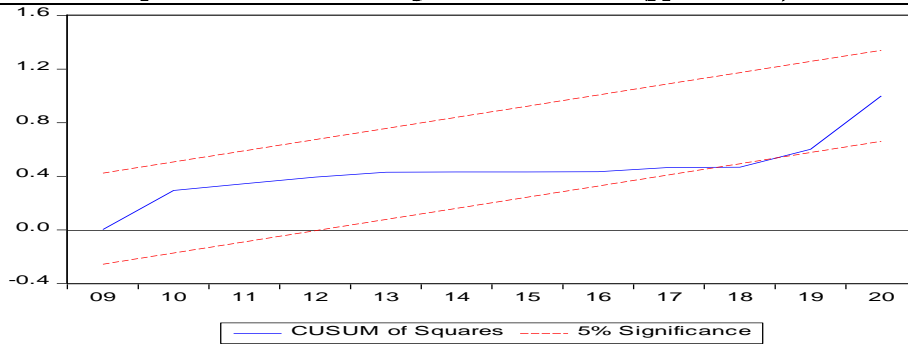
3.4 Test of structural stability of the parameters of the model:

In order to know the validity of the data used in this model and that it is free from structural changes, we will use the cumulative sum of recursive residuals (CUSUM), or the cumulative sum of squares of recursive residuals (CUSUM of Squares) , which are two tests that show the stability and consistency of the parameters in the short term, where there is stability in the parameters of the ARDL model if the condition of the graph of the two previous tests is fulfilled within the limits of the critical region at the level of 5%.

In the graph below we notice that the cumulative sum of residuals (CUSUM) for the estimated model lies within the lines of the critical region, which means that the model parameters are stable at the 5% level, while we notions that the CUSUM of Squares crosses one of the lines of the critical region, but quickly returns and settles in the critical region, indicating the presence of harmony and stability in the results of the long-term and short-term model, and the following figure illustrates this:

Figure 2: Structural stability test of model parameters





Source : Prepared by researchers based on the results (Eviews09)

3.5 Model diagnostic tests:

Through the table below, we can say that the model does not suffer from the problem of instability of the variance, nor from the problem of a normal distribution and this according to the test of ARCH and the test of Jaque Bera and the table following shows:

Table 5: Standard model evaluation

Test	probabilité	statistique
Test ARCH pour l'hétérogénéité de la variance	0,3171	1,00707
Test de Jarque Bera pour la normalité des résidus	0,941622	0,120302

Source : Prepared by researchers based on the results (Eviews09).

As for the autocorrelation of errors according to the table below, we note that the residuals do not move away from zero during the slowdown periods from 1 to 4 and that according to the AC standard, and we also note that the probability values (prob) are greater than the critical value 5%, which means that the model does not suffer from error autocorrelation, as shown in the following table:

Table 6: Autocorrelation of errors

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*	
. * .	. * .	1	0.164	0.164	0.8135	0.367
. .	. .	2	-0.005	-0.033	0.8142	0.666
. * .	. * .	3	-0.120	-0.117	1.2824	0.733
. .	. .	4	0.001	0.041	1.2824	0.864

Source : Prepared by researchers based on the results (Eviews09).

4. Conclusion:

Through this research paper we have tried to show the magnitude of the impact of monetary policy tools on economic growth in Algeria, where we have addressed in this study the basic concepts of the most important components of the monetary policy, which are the rate of change in the money supply in its broad concept M2, and the nominal exchange rate and the rediscount rate, we also discussed in this research some previous studies that supported the idea of the importance of monetary policy in its impact on economic activity, especially in the long run, on a practical level, the relationship between monetary policy tools and economic growth was modelled through the econometric study, which included data over an extended period

between 1990 and 2020, using the Autoregressive Distributed Lag Model (ARDL). Through this study, we arrived at a set of results, which were as follows:

- ✓ There is an impact of monetary policy tools on economic activity more effective compared to the impact of fiscal policy and this is what supporters of the monetary school argue.
- ✓ There is a long and short term co-integrating relationship between monetary policy tools and economic growth according to the econometric study
- ✓ There is a direct relationship between the growth rate of money supply and economic growth in the long term, which is not important and is consistent with economic theory, but this relationship is reversed in the short term and it is important and this result is in the short term due to the specificity of the Algerian economy during the study period according to the circumstances that it went through The country in the nineties and its claims to the Algerian economy until the beginning of the third millennium.
- ✓ There is an inverse relationship between economic growth and the exchange rate in the short and long term which is contrary to economic theory, but is compatible with some studies and this is due to the exclusivity of the economy Algerian.
- ✓ There is an inverse relationship between the discount rate and economic growth in the long term, which is not important and consistent with economic theory, but this relationship is a direct relationship between the discount rate and economic growth in the short term in the slowdown period (t-1.) and (t-2) and (t-3).

Through the results of our research we can be said that the hypotheses of this study are:

The first hypothesis: It was not correct because the monetary policy tools do not all have a positive impact on economic growth in Algeria in the long term, the money supply alone has a positive impact and this according to the results of the study for the period studied.

The second hypothesis: It was correct because the results of the econometric study showed that money supply, discount rate and exchange rate are related to economic growth in short term and were statistically significant in the case of money supply and discount rate, while this relationship was not significant in the case of the exchange rate.

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