The Impact of Monetary Policy on Economic Activity in Algeria during the Period (1980-2019): An ARDL Bounds Test Approach

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أثر السياسة النقدية على النشاط الاقتصادي في الجزائر خلال الفترة (1980-2019): باستخدام نموذج الانحدار الذاتي للفجوات الزمنية الموزعة المتباطئة

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Abstract:

The main goal of this research is to study the impact of monetary policy on economic growth in Algeria using annual data from 1980 to 2019. The application of the ARDL model has revealed that there is a long-term relationship between monetary policy instruments and economic activity. Moreover, the findings show that the impact of real money on real PIB in Algeria is greater than the impact of real interest rates and real reinvestment rates. According to the results of this study, the Algerian central bank should reconsider using monetary policy to stimulate economic growth by employing the most effective instruments, such as interest rates and exchange rates, rather than increasing monetary mass. Also, to avoid the negative consequences of hyperinflation and to maintain long-term economic stability and growth.

Keywords: Monetary Policy, Economic Acticity, Autoregressive Distributed Lag (ARDL).

Jel Classification Codes: E52; A10; C22.

ملخص:

تهدف هذه الدراسة الى استقصاء أثر السياسة النقدية على النمو الاقتصادي باستخدام بيانات السلاسل الزمنية السنوية من 1980-2019 في الجزائر. أظهر تطبيق نموذج الانحدار الذاتي للفجوات الزمنية الموزعة المتباطئة أن هناك علاقة طويلة الأجل بين أدوات السياسة النقدية والنشاط الاقتصادي. بالإضافة إلى ذلك، تظهر النتائج أن تأثير عرض النقود الحقيقي على الناتج المحلي الإجمالي الحقيقي في الجزائر كان أعلى من تأثير كل من سعر الفائدة الحقيقي ومعدل وإعادة الخصم. وتوصي هذه الدراسة إلى أن البنك المركزي الجزائري بحاجة إلى إعادة النظر في تطبيق السياسة النقدية لتعزيز التنمية الاقتصادية من خلال استخدام الأداة الأكثر فعالية، مثل سعر الفائدة وسعر الصرف بدلا من زيادة عرض النقود، وذلك لتجنب التأثير السلبي للتضخم المفرط من أجل الحفاظ على الاستقرار الاقتصادي على المدى الطويل من جهة، وزيادة معدلات النمو الاقتصادي من جهة أخرى.

الكلمات المفتاحية: سياسة نقدية ؛ نشاط اقتصادي ؛ نموذج الانحدار الذاتي للفجوات الزمنية الموزعة المتباطئة.

تصنيف JEL : E52؛ A10؛ C22.

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I- Introduction :

Countries adopt various policies in order to achieve their main economic goals. Perhaps the central banks are one of the most important players helping to reach the desired stations, through their monetary policy that aims to maintain some economic indicators at healthy levels.

Among these indicators is inflation, or the increase in the prices of goods and services, which, if left unchecked, will lead to a decrease in the purchasing value of the currency, and thus burden citizens with more burdens, not to mention the downward pressures that this poses on consumer spending, which is one of the locomotives of the economy.

Monetary policy means how central banks manage liquidity, which may consist of credit, cash, checks, or mutual funds, with the aim of promoting economic growth. In general, this policy aims to manage the money supply to achieve the state's macroeconomic goals, such as controlling inflation, controlling consumption, and paying the growth.

Monetary policy is one of the main factors in managing macroeconomics in an open economy to stimulate economic stability and achieve economic development through its impact on relevant macroeconomic variables. This effect is evident through creating job opportunities and trying to reduce unemployment rates, stabilizing the general level of prices, the growth of gross domestic product, and achieving balance in the balance of payments in developing countries. (Anowor & Okorie, 2016; Pecious, 2014).

The method of monetary policy management by the Central Bank and its independence in choosing the appropriate monetary tools that are in line with the objectives of the macroeconomics plays an important role in the impact of monetary policy on economic development and change in overall economic activity (Alavinasab, 2016).

Obtaining accurate information on the effectiveness of applying economic policy to the macro economy is the focus of the policy maker for the successful implementation of any economic policy. In general, the government and policy makers always target the intermediate variables, which are the short-term interest rate, money supply, and the exchange rate, which are the most powerful tool for monetary policy, and they seek to achieve sustainable growth of production (Fasanya, 2013).

In 1990, with the emergence of the Money and Credit Law in Algeria, where monetary policy was talked about, price stability was established as the ultimate goal of monetary policy. However, at the same time, the authorities initiated a series of economic reforms as well as a fiscal policy aimed at achieving a satisfactory growth rate, which had to be constrained by absorbing structural excess liquidity in the banking system and slowing credit expansion (Bneziane, 2019). The objective of this paper is to study the role of monetary policy in achieving the desired levels of economic growth to come up with appropriate recommendations that may help policy makers to evaluate and improve the performance of monetary policy in Algeria.

This paper analyzes the effect of monetary policy on economic activity in Algeria through an examination of the impact of monetary policy instruments on real GDP. The research problem can formulated in the question:

What is the impact of changing monetary policy instruments on economic activity in Algeria?

To answer this question, the paper tests the following four hypotheses:

1- There is a long run relationship between the tools of monetary policy and economic activity in Algeria.
2- There is a positive effect of the money supply on economic activity in Algeria
3- There is a positive effect of Real Interest Rate on economic activity in Algeria.
4- There is a positive effect of Re-discount Rate on economic activity in Algeria.

1. Theoretical framework and previous studies:

Economists use several definitions of monetary policy, and these definitions differ in the economic literature. According to Einzig (1954): "Monetary policy includes all monetary decisions and measures regardless of whether the objectives are monetary or non-monetary, and monetary decisions which aim to influence the monetary system. ». Patat (1987) also defines monetary policy as "the action used to control the money supply by the central bank as a tool to achieve economic policy objectives."

The importance of monetary policy lies in achieving the important goal of economies, which is to maintain monetary and economic stability by maintaining the stability of the general level of prices and the stability of the local currency exchange rate. Monetary policy promotes economic growth and thus economic development as well. In addition, monetary policy maintains the safety of banks, and contributes to achieving the required balance of payments (Obeid, 2017).

According to Glahe (1977), The relationship of monetary policy with economic growth and the price level has received great attention from various schools of economic thought. The Keynesian school assumed that monetary policy represented only by the interest rate and investment tool affects income, but a number of economists have taken it as a limited view, for example. The pioneers of New-Keynesian theory testify that the basis of monetary policy is changes in interest rates caused by changes in the money supply in the money market. According to this theory, the initial effect of monetary policy will be on the capital goods industry, and these changes lead to changes in consumption and income through the investment multiplier.

As for the monetary school, the money supply depends mainly on the assumption that individuals want to save a certain percentage of their income, it believes that the change in the money supply is most closely related to monetary policy. Through the ability of monetary policy to change the level of individual savings, individuals will attempt to return to the same level of disposable income required. Thus, it may lead to a direct change in the behavior of the individual at the level of aggregate demand and prices. Also, monetary policy directly affects not only investment expenditures, as the New Keynesian theory claims, but also total expenditures (Obeid, 2017).

Several studies investigated the relationship between the monetary policy and the economic activity or economic growth. Friedman & Schwartz (1973) They analyzed historical data for the United States of America and proved the impact of a change in the money supply on the economy. According to the analyzes of both Friedman and Schwartz, it was found that there is a causal relationship between money supply and economic activity, and that the money supply rises in periods of economic prosperity and vice versa, in addition to the fact that the peak of the rate of money supply precedes the peak of the economic cycle. This study concluded that the change in money supply did not cause any change in economic activity, while the causal relationship moves from money supply to economic activity. Moreover, they emphasized that the growth rate of the money supply for long periods will manifest itself in a different rate of price change.

The study of Chari et al. (1995) used the growth in money supply to measure the correlation between inflation and economic growth, with the aim of comparing monetary policies between countries. And this study found that there is an inverse relationship between inflation and economic growth, where the high rate of inflation by 15% led to a decrease in the economic growth rate between 0.2 - 0.7%, and it also concluded that monetary policy contributes to determining inflation.

The study of Levine & Renelt (1992) concluded that have achieved faster growth rates are the countries that have had an annual inflation rate of 12.34% per year, while those countries that grew more slowly had 31.13% annual inflation rate.

Balogun (2007) examined the relationship between monetary policy and economic growth in West African countries and relied on the following variables: money supply, rediscount and credit rate for the private and government sectors, and the exchange rate. The generalized least square (GLS) method was also used. The study concluded that monetary policy was a source of stagnation because it harms the real domestic production of these countries

Bhuiyan (2008) applied the structural VAR model for Canada to determine the effects of the monetary policy shock. The study used the overnight target as a monetary policy instrument on monthly data for the period 1994-2007 and concluded that the transmission of the monetary policy shock to real output depends on both the rate exchange rate and interest rate.

Berument and Dincer (2008) studied the effects of monetary policy for turkey the monetary policy is measured by using the spread between the Central Bank's interbank interest rate and the depreciation rate of the domestic currency. A VAR type of model is used to identify monetary policy covering the period 05:1986 -10:2000. The results suggest that tight monetary policy has a transitory effect on output but a permanent effect on prices. This specification is free of some puzzles such as the price puzzle and the liquidity puzzle that hampered some of the previous studies.

The study of Nouri and Samimi (2011) examined the impact of monetary policy on the growth of the Iranian economy using the OLS method, where monetary policy was measured by money supply, and the results showed a positive relationship between money supply and economic growth in Iran.

The study of Obeid & Awad (2017), aims to measure the impact of monetary policy tools on the performance of the Jordanian economy, using quarterly data covering the period (2005-2015), and the vector error correction model (VECM) was used. The results showed that there are long- and short-term positive effects of monetary policy tools on GDP growth real in Jordan.

Bouchetara & Bendahmane (2017) studied the impact of monetary policy on economic growth in Algeria using the OLS method, and they relied on annual data during the period from 1990 to 2012. The study concluded that there is a relationship between monetary policy and economic growth, as the growth of the money supply had a significant impact on the gross domestic product in Algeria..

Benziane (2019) investigated the role of monetary policy in financing economic activity in Algeria using quarterly data during the period 1990-2017. The VAR model was adopted and the results of the study showed the negligible impact of credit and interest rate on GDP. On the other hand, there was a more significant positive effect of real money supply. The results of this study can be explained by the modest contribution of the financial system to economic growth to the excess liquidity and poor development of the financial system, the emerging Algerian capital markets, the lengthy administrative procedures, and the lack of competition in the banking sector.

2. Study model and data:

To explain the effect of monetary policy instruments on economic activity in Algeria during the period (1980-2019); it is required to find the proposed model that relies on the real GDP as a dependent variable and on three independent variables (real m2, real interest rate, re-discount rate), we clarify these variables as follows:

- **Real gross domestic product** (RGDP) as a variable representing economic activity. Is the total monetary or market value of all the finished goods and services produced within a country's borders in a specific time period. As a broad measure of overall domestic production, it functions as a comprehensive scorecard of a given country's economic health. Real gross domestic product (Real GDP) is It equals economic output adjusted for the effects of inflation. Thus, real GDP is a more accurate indicator of long-term national economic performance, and is often referred to as constant-price GDP, inflation-corrected GDP.

In terms of the instruments used by the monetary authorities for finance the economic development, the study relied on the following variables:

- **Money supply in real terms** (RM2) Money supply is defined as cash in circulation plus money in bank accounts. Money supply does not include any other form of financial wealth, such as stocks or financial investments, and does not include credit instruments, such as mortgages, financial loans. Other definitions of money supply is the balance: the total currencies and liquid financial instruments that are in circulation in a particular country's economy. Money supply in its broadest sense includes all the components of the narrow concept of money (M1), in addition

to savings deposits in banks and post offices, as it is symbolized by the symbol (M2), M1 includes cash and checking deposits In this study, we used the real money supply (RM2).

- **The real interest rate** (RIR) as a tool of monetary policy is an interest rate that has been adjusted to remove the effects of inflation to reflect the real cost of funds to the borrower and the real yield to the lender or to an investor. The real interest rate reflects the rate of time-preference for current goods over future goods. The real interest rate of an investment was calculated as the difference between the nominal interest rate and the inflation rate.
- **The re-discount rate** (RDR) It is one of the quantitative tools of monetary policy, and it is defined as the price that commercial banks concede to the Central Bank in exchange for re-discounting their commercial papers. The relationship between the rediscount rate and the interest rate on loans is a direct correlation that explains the policy of the Central Bank to follow the direction it deems appropriate, and this policy takes one of two directions:
  - ✓ **Contractionary monetary policy (stagnation)**: If the economy is in a recession, the rediscounting rate is reduced, which leads to a reduction in the discount rate, which gives commercial banks the ability to expand the granting of credit, and the economy moves to a recovery state that contributes to addressing stagnation.
  - ✓ **Expansionary monetary policy (inflationary condition)**: If the economy suffers from a state of inflation, the re-discount rate is raised, which leads to raising the discount rate, which limits the ability of commercial banks to grant credit, and the economy moves to a state of deflation that contributes to addressing the recession .The model specification: following the previous empirical studies, it is possible to specify our empirical model in the following manner:

$$RGDP_t = \alpha_0 + \alpha_1 RM2_t + \alpha_2 RIR_t + \alpha_3 RDR_t + e_t \ldots\ldots(1)$$

Where, α_0 is the constant and : α_1, α_2, α_3 are the coefficients to be estimated and e_t is a normally distributed error term with zero mean and variance equal to 0.

The data have been extracted from central bank of Algeria and the World Bank; we used annual data during the period 1980-2019.

II– Methods and Materials:

1. Methodology:

We relied on the auto regressive distibuted lag approch (ARDL) method to test the hypotheses of the problem posed about the impact of changing monetary policy instruments on economic activity in Algeria during the period (1980-2019).

The methodology used is the autoregressive distributed lag (ARDL) approach to cointegration proposed by Pesaran et al. (2001). The ARDL bounds cointegration technique has been selected to determine the long run and short run relationships between monetary policy and the economic activity. This method was chosen after verifying the availability of the necessary conditions and after conducting several tests.

First, as discussed by Pesaran et al. (2001), the ARDL models yield consistent estimates of the long run coefficients that are asymptotically normal irrespective of whether the underlying regressors are I(1) or I(0).

Second, this technique generally provides unbiased estimates of the long run model and valid t-statistics even when some of the regressors are endogenous (Harris and Sollis, 2003). Inder (1993) and Pesaran (1997) have shown that the inclusion of the dynamics may help correct the endogeneity bias.

Third, given the size of the sample and the number parameters to be estimated the bound approach appears more appealing than the Johansen cointegration technique, which would have required the estimation of a system of equations and thus a considerable loss in degree of freedom.

The procedures to carry out the ARDL approach to cointegration technique includes the determination of the long run relationships among the variables used in the models and the estimation of the coefficients of the long and short run relationships.

To estimate the ARDL model is to test for the presence of long run relationships among the variables by using the Bounds F-Test. To implement the bound test procedure, equation (1) is modeled as a conditional ARDL error correction model (ECM) as follows:

$$\Delta RGDP_t=\alpha_0+\sum_{i=0}^{p}\beta_i\,\Delta RGDP_{t-i}+\sum_{i=0}^{p}\gamma_i\,\Delta RM2_{t-i}+\sum_{i=0}^{p}\delta_i\Delta RIR_{t-i}+\sum_{i=0}^{p}\sigma_i\Delta RDR_{t-i}+\lambda_1 RGDP_{t-1}+\lambda_2 RM2_{t-1}+\lambda_3 RIR_{t-1}+\lambda_4 RDR_{t-1}+\varepsilon_t \ldots\ldots\ldots(2)$$

The ARDL model testing procedure starts with conducting the bound test for the null hypothesis of no cointegration. The calculated F-statistic is compared with the critical value tabulated by Pesaran et al. (2001). If the test statistics exceeds the upper critical value, the null hypothesis of no long-run relationship can be rejected regardless of whether the underplaying order of integration of the variables is zero or one. Similarly, if the test statistic falls below a lower critical value, the null hypothesis is not rejected. However, if the test statistic falls between the two bounds, the result is inconclusive. When the order of integration of the variables is known and all the variables are I (1), the decision is made on the upper bound. Similarly, if all the variables are I (0), then the decision is made on the lower bound. The ARDL methods estimates (p+1)k number of regression in order to obtain optimal lag length for each variable, where 'p' is the maximum number of lag to be used and 'k' is the number of regressors in equation.

In the second step, when the long run relationship is estimated using the selected ARDL model and long run relationship among variables is found, there exists an error correction relationship.

Therefore, in the third step, the error correction model is estimated. The error correction model result indicates the speed of adjustment back to the long run equilibrium after a short run disturbance. The standard error correction model (ECM) involves estimation of the following equation:

$$\Delta RGDP_t=\alpha_0+\sum_{i=0}^{p}\beta_i\,\Delta RGDP_{t-i}+\sum_{i=0}^{p}\gamma_i\,\Delta RM2_{t-i}+\sum_{i=0}^{p}\delta_i\Delta RIR_{t-i}+\sum_{i=0}^{p}\sigma_i\Delta RDR_{t-i}+\psi_t ECM_{t-1}+\gamma_t \ldots\ldots\ldots\ldots\ldots(3)$$

ECMt-1 is the error correction term and its coefficient ψt is the speed of adjustment. Other coefficients in the model are the short run dynamics that cause the model to converge to equilibrium. These methodologies will be applied to avoid spurious results. Here, the estimated coefficient is expected to be negative and is interpreted as a speed of adjustment for the explained variable towards the equilibrium.

III- Results and discussion :

Through this study, the annual time series data for the period 1980 - 2019 will be used for the real GDP (as a dependent variable), and real M2, real interest rate and re-discount rate (as an independents variables). Therefore, the study period was determined, and selected based on the availability of statistical data, and statistical program will be used to analyze and measure the impact of monetary policy on economic activity represented in Eviews 10.

1. Unit root test

In presence study, we have used time series data, therefore, checking for stationarity technique needs to apply to check whether all series stationarity or not. This study employs the Augmented Dickey- Fuller (ADF) (1981) test as test of unit root to check the stationarity of the series in order to avoid spurious regression problem.

The ADF unit root test confirm the stationarity of the real interest rate (RIR) at the level, but we rejected the unit root null hypothesis for the variables: real money supply (RM2), re-discount rate (RDR) and real gross domestic product (RGDP), so they are stationarity in the first differences (table 1). We conclude that, the real interest rate is integrated of order zero I(0), but the real money supply and re-discount rate are integrated and the real gross domestic product are integrated of order one I(1).

2. Estimating model

It is possible to deploy the ARDL to determine whether there exists a stable long run relationship among these variables RGDP, RM2, RIR and RDR in Algeria. The ARDL procedure

starts with determining of an appropriate lag order (p) in equation (2). For this purpose, we used the Akaike Information Criterion (AIC) indicating that the optimal ARDL (1,2,3,0), the results are given in the table (2).

The construction of the co-integration bounds test entails the evaluation of F-statistics against the critical values; in this case, we use the one generated by Narayan (2005) due to the short period covered by the data. The Bounds F-test is shown in the table (3). The table (3) compares the computed F statistic of the model with the bounds. The findings approves that the computed F-statistic is greater than the upper bound critical value at 5% significance level (F-statistic=4.19566> l(1)= 4.08 at 5%). The null hypothesis of no cointegration is, therefore rejected. Hence, the results confirm stable long run cointegration relationship between RGDP per capita and RM2, RIR, RDR.

Meanwhile, we conducted several diagnostic and stability tests to check for the robustness of the ARDL model. The tests results were successful, The Ramsey RESET stability test, and ARCH and LM tests were also passed successfully. The stability of the long-run coefficients together with the short run dynamics is investigated. Following Pesaran and Pesaran (1997), the CUSUM and CUSUMSQ (Brown, Durbin, and Evans, 1975) tests were applied.

In accordance with Pesaran and Pesaran (2009), who stresses the need to analyze the stability of the long-run coefficients in conjunction with the short-run dynamic model, the cumulative of the recursive residuals (CUSUM) as well as the cumulative sum of squares of recursive residual (CUSUMQ) were investigated empirically. This is graphically represented in Figures: 1 (A), and further emphasized in Figure 1 (B), which portray the plots of CUSUM and CUSUMQ test statistics as resting neatly within the boundaries at 5% significant level. Hence, Both plots show no evidence of any significant structural instability.

Then, the long-run equation (2) was estimated using the optimal ARDL (p1,p2,p3,p4) order according to the Akaike Information Criterion. The results presented in Table (5) indicate the existence of a stable long run relationship among RGDP, RM2 and RDR in Algeria, Thus, the first hypothesis is accepted.

Then, we conclude that both of change in interest rate, and rediscount rate positively affects the real GDP, This confirms the validity of the third and fourth hypothesis, these results were consistent with a study (Obeid and Awad, 2017), but the impact of re-discount rate is non-significant.

While the real money supply has a significant negative impact, this finding was inconsistent with the study of (Benziane, 2019). And with this, we reject the second hypothesis.

It is possible to investigate the short run dynamics of the present model with the Error Correction Model (ECM). The short-run coefficients estimates obtained from the ECM version of ARDL model are given in Table (6). The ECM coefficient shows how quickly/slowly variables return to equilibrium. The error correction term CEt-1, which measures the speed of adjustment to restore equilibrium in the dynamic model, appear with negative sign and is statistically significant at 1% level, indicating that long run equilibrium can be attained. which implies that the deviation from the long-term equilibrium is corrected by 58 percent over each year at 1 percent level of significance, The negative sign confirms the convergence of equilibrium from short-run to long-run equilibrium.

IV- Conclusion:

The main interest of this study is to examine the impact of monetary policy on economic activity in Algeria. These hypotheses were tested by utilizing an ARDL approach. Our results suggest that there is a stable long run relationship among the four variables, on which our analysis is based.

The results show that the real interest rate and the re-discount rate affects positively the real of GDP, while the effect of real money supply is negative. This can be explained by the fact that the increase in the money supply in Algeria leads to a rise in the general level of prices and due to the inflexibility of the production device, as we consider Algeria a consumer country (there is no production in exchange for an increase in the money supply) and thus the GDP decreases.

In addition, the results show that the influence of money supply in Algeria on the economic activity is higher than the influence of the real interest rate and re-discount rate.

In fact, monetary policy in Algeria is characterized by strong liquidity absorptions and leaks outside the banking system, the informal sector is estimated at between 30% and 40% of the economy, which limits the efficiency of money supply channel.

Although, the re-discount rate is the direct instrument of monetary policy. The Bank of Algeria raised the discount rate from 7.5% in 1989 to 10.5% in 1990, then to 11.5% in 1991, and in 2000 to 7.5%, and the rate of re-deduction has stabilized at 04% since 2014, because the situation in Algeria began to know a kind of financial and monetary stability.

As for the interest rates on commercial bank deposits, they were liberalized in May 1990, but the interest rates on borrowing from commercial banks remained subject to a maximum rate of 20% annually.

As a result, these two types of interest rates remained negative in real terms during the period 1993-1994. As it did not reflect the rising inflationary pressures arising from the loosening of demand management policies to a large extent during the period between 1992-1993, an important step was taken in the framework of the reform program in 1994 when the ceiling on lending rates from commercial banks to the public was raised.

The interest rate on deposits and on borrowing from commercial banks. This procedure was canceled in December 1995, and in the end the liberalization of interest rates, with the decline in inflation rates thanks to more stringent demand management policies, led to the emergence of positive real interest rates since the beginning of 1996, and the withdrawal rates also increased. The bank overdraft to the Bank of Algeria increased to 24% since 1994 instead of 20% in October 1991.

Besides, this study came out with the following recommendations:

- The Central Bank of Algeria should continue to use monetary policy tools in order to achieve the monetary policy objectives set by the Central Bank, including supporting economic growth in Algeria, and the economic and political conditions surrounding the North African region must be taken into consideration.
- It is very important to coordinate between monetary and fiscal policies in support of Algeria's economy.
- The central bank of Algeria needs to reconsider to apply on monetary policy to boost economic growth by employ most effective instrument, as interest rate and the exchange rate rather than purely increase of money supply. Due to avoid negative impact of hyperinflation in order to maintain the economic stability and economic growth in the long run.
- Strengthening monetary markets to activate monetary policy tools and Granting more independence to the central bank in terms of monetary policy without state intervention.
- Continue granting loans and expanding investments to achieve economic growth outside the hydrocarbon sector.
- Working on activating the monetary market through a coherent banking system capable of providing appropriate channels for monetary policy tools in order to achieve the set goals.

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- Appendices:

Table (1): Unit Root Test Results

Variables	ADF at level	Critical value	ADF at first difference	Critical value	Results
RGDP	-2.92	-3.53	-6.78	-1.94	I(1)
RM2	-1.05	-1.94	-4.30	-1.94	I(1)
RIR	-4.21	-3.52	---	---	I(0)
RDR	-2.54	-3.94	-2.14	-1.95	I(1)

Source: Prepared by researchers based on the outputs of the E-Views10 program

Table (2): Results of model lag-selection for ARDL, the long-run Relationship of monetary policy and economic development

LogL	AIC*	SC	HQ	Adj-R-sq	Specification
-1127.827	59.885	60.316	60.038	0.7340	ARDL(1,2,3,0)

Note. =Akaike Information Criterion.

Source: Prepared by researchers based on the outputs of the E-Views10 program

Table (3): Results of the Bounds Test

Test statistic		Bounds	Level of significance Finite sample n=40			Level of significance Finite sample n=35			Decision
F-statistic	4.19566	Critical Value	10%	5%	1%	10%	5%	1%	F-statistic > I(1) at 5%
Value	---	I(0)	2.592	3.1	4.31	2.618	3.164	4.428	Lower bound
K	3	I(1)	3.454	4.08	4.66	3.532	4.194	5.816	Upper bound

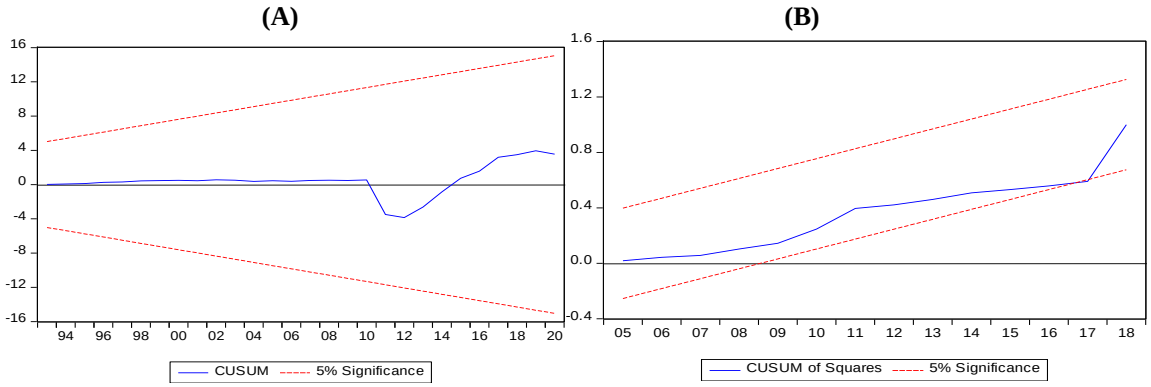
Source: Prepared by researchers based on the outputs of the E-Views10 program

Table (4): Results of the diagnostic test for ARDL model

Tests	LM-Test	Heteroskedasticity Test ARCH	Ramsey's RESET Test
Value of J-B	---	---	---
F-statistic	0.223576	0.430267	3.329875
Prob-F	(0.8012)	(0. 5161)	(0.0791)

Source: Prepared by researchers based on the outputs of the E-Views10 program

Figure (1) : Plot of Cumulative Sum of Recursive Residuals



Source: Prepared by researchers based on the outputs of the E-Views10 program

Table (5): Estimated long run coefficients using the ARDL approach

Variables	Coefficient	Std.Error	Pro
RM2	-234.0435	81.45161	0.0077
RIR	2.54	1.38	0.0766
RDR	1.83	2.26	0.5468
C	1.43	1.46	0.0000

Source: Prepared by researchers based on the outputs of the E-Views10 program

Table (6): Correction Representation for the select ARDL Model (1,2,3,0)

Variables	Coefficients	Prob
C	8.31	0.0000
RGDP (-1) *	-0.58	0.0002
RM2(-1)	-136.23	0.0256
RIR(-1)	1.48	0.0000
RDR**	8.01	0.0000
D(RM2)	77.37	0.4442
D(RM2(-1))	189.90	0.0789
D(RDR)	4.36	0.0000
D(RIR(-1))	-1.40	0.0000
D(RIR(-2))	-1.95	0.0000
Coin Eq(-1)	-0.58	0.0000

R-squared: 0.79 D-W: 1.85 Adjusted R-squared: 0.73
*** p-value incompatible with t-Bounds distribution.**
**** Variable interpreted as Z = Z(-1) + D(Z).**

Source: Prepared by researchers based on the outputs of the E-Views10 program

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