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Assessing the Effectiveness of Central Bank Monetary Policy in the Afghan Economy Using the ARDL Approach

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Abstract

Monetary policy involves the utilization of specific monetary instruments by the central bank to achieve predetermined economic objectives, primarily through the control of money supply and credit volume. It serves as a critical tool for economists and policymakers to steer the economy towards a desired trajectory, fostering national growth and development. Economic growth, unemployment, and inflation represent the most salient indicators for evaluating the state of an economy, and the interrelationship between these variables remains a core area of economic inquiry. Consequently, the primary objective of this research is to assess the effectiveness of monetary policies implemented by Da Afghanistan Bank (the central bank of Afghanistan) within the Afghan economic context. Specifically, this study examines the impact of the inflation rate, a key indicator influenced by monetary policy, on economic growth. The analysis utilizes the Autoregressive Distributed Lag (ARDL) econometric methodology, covering the temporal scope of 1390-1399 SH (approximately March 2011 – March 2021). The empirical findings indicate a statistically significant negative relationship between the inflation rate indicator and economic growth (GDP). Precisely, a one percentage point increase in the inflation rate is associated with a 0.5126 percent reduction in economic growth. Furthermore, the results demonstrate that liquidity volume and money supply exert a positive and statistically significant impact on economic growth. In accordance with the study's findings, indicators exhibiting a positive effect contribute to the enhancement of economic growth in Afghanistan.

Keywords: *Monetary Policy; Money Supply; Economic Growth; Inflation Rate; ARDL Approach*

1. Introduction

Monetary policy represents one of the most potent instruments available to policymakers, although its impact on economic variables can occasionally be unexpected and undesired. For the

successful implementation of monetary policy, it is imperative that monetary authorities possess an accurate assessment of the timing and magnitude of its effects on economic variables. To this end, a comprehensive understanding of the relevant variables, policy instruments, and the transmission mechanisms through which monetary policy influences various economic sectors is essential (Arya, 1390 SH / approx. 2011 CE).

When the central bank undertakes the implementation of monetary policy, a sequence of adjustments is initiated. These adjustments typically commence within the financial markets and subsequently propagate throughout the broader economic system (Bork, 2010). From a theoretical standpoint, certain schools of economic thought, notably the Real Business Cycle (RBC) school, posit that the money supply exerts no influence on real variables, even in the short run. Consequently, proponents of this view often consider the monetary policy transmission mechanism to be limited in scope and of minimal research value. Conversely, other prominent economic schools, including Keynesians, Monetarists, New Keynesians, and New Classicals, acknowledge the existence of short-run effects stemming from monetary policy actions (Bernanke & Gertler, 1995). Furthermore, beyond the divergence of views concerning the fundamental source of monetary policy's influence, persistent challenges among economists include issues related to uncertainty, the time lags associated with policy effectiveness (the 'long and variable lags'), the persistence of policy effects, and the timing of their peak impact.

Therefore, while it is widely recognized that monetary policy can be employed in the short run for the purposes of stabilizing economic activity and managing inflation, it is equally well-established among economists and central banking institutions that a satisfactory grasp of the monetary policy transmission mechanism is indispensable for the successful and timely execution of such policies.

Failure to possess this understanding can lead monetary authorities to commit errors in policy design, potentially rendering the implemented policies ineffective while simultaneously imposing substantial costs upon the economy. The interest rate channel is widely regarded as one of the principal transmission mechanisms of monetary policy within macroeconomic models. According to early Keynesian models, the implementation of a contractionary monetary policy, under the assumption of price stability, leads to an increase in the real interest rate. This, in turn, elevates the cost of capital, subsequently causing a decline in investment expenditures. This sequence of events culminates in a reduction in aggregate demand and, ultimately, a decrease in output. Within this channel, the primary focus lies on the impact of monetary policy on the real sector of the economy. Consequently, understanding how changes in the short-term policy interest rate propagate through the real interest rate and other asset prices to induce fluctuations in the real economy is of particular significance (Mishkin, 1995).

This research employs a specific approach to investigate the effectiveness of monetary policy within the Afghan economy, utilizing the Autoregressive Distributed Lag (ARDL) methodology. The selection of the ARDL framework is motivated by its capacity to model the dynamic interactions and potential long-run equilibrium relationships among economic variables, accommodating variables with different orders of integration. It is pertinent to note that a distinguishing feature of this study, relative to the existing literature, is the scarcity of prior research specifically applying this methodology to assess monetary policy effectiveness within the unique context of the Afghan economy. The present study is structured into four main sections. Following this introductory section, which delineates the role of monetary policy and establishes the importance and necessity of this research, the subsequent section provides a review of the pertinent domestic and international literature. Section three is dedicated to the presentation and analysis of the empirical results. Finally, section four offers the study's conclusions and potential policy implications.

2. Literature Review

Bazmohammadi (1388/2009), in his article, examines the money supply in the Iranian economy. This study covers the period 1961-1997 (1340-1376) using the Ordinary Least Squares (OLS) regression method. The research findings indicate that the private sector plays a significant role in the money supply process through its reaction to economic conditions and changes in the currency-to-demand deposit ratio. It also shows that because commercial and specialized banks in Iran's banking system lack significant operational autonomy, they do not have a substantial impact on the money supply in the Iranian economy.

Farzin Vash and Rahmani (1379/2000), in a study titled "Endogeneity of Money Supply and the Impact of Cost Pressures on it in the Iranian Economy," investigate the money supply in Iran. This study utilizes data from 1959-1996 (1338-1375) and employs the OLS regression method. The findings suggest that cost pressures have a significant impact on the growth of monetary variables and the money multiplier. In other words, an increase in cost pressures leads to an increase in both the growth of monetary variables and the growth of the money creation multiplier. Therefore, the money supply is endogenous, and in addition to the government budget deficit, cost pressures are significant and important in explaining its endogenous variations.

Sahraeian and Zibaei (1383/2004), in a study titled "Investigating the Causal Relationship between Money Supply and the Price Level of Agricultural Products in Iran," examine the causal link between money supply and agricultural product prices using the Granger causality test and forecasting the values of four macroeconomic variables. The research results indicate the existence of causality running from the Wholesale Price Index (WPI) of agricultural products and money supply to prices.

Mojtahed and Sharifi (1383/2004), using estimated long-run and short-run relationships, investigate the impact of implementing monetary and fiscal policies on the growth of the agricultural sector. The research findings suggest that while expansionary (contractionary) fiscal policies have no effect on agricultural sector growth in the short run, they have a positive (negative) impact on the growth of this sector in the long run. Similarly, expansionary (contractionary) monetary policies have no short-run impact on agricultural sector growth but exert a positive (negative) influence on its growth in the long run.

Moaddelat (1376/1997), in an article titled "Evaluation of the Performance of Government Monetary and Fiscal Policies Considering the Role of Oil Revenues in the Economy," examines the performance of monetary and fiscal policies during the period 1968-1997 (1347-1376). The results show that when isolating the effects of oil revenues, their impact on real economic growth was not only non-positive (in the long run) but also left negative effects. Furthermore, the monetary and fiscal policies implemented by policymakers not only failed to mitigate the adverse effects of economic shocks in the long run but were themselves generators of such economic shocks and impulses.

Samimi and Tehranchian (1385/2006), in a study titled "The Impact of Fiscal Policies on Macroeconomic Indicators under Conditions of Endogenous Monetary Policy," quantify fiscal policies and examine their effects on the country's macroeconomic variables in the absence of active monetary instruments during the years 2000-2004 (1379-1383). For this purpose, the OPTCON stochastic optimal control algorithm was used. The optimization results indicate that under fixed and crawling peg exchange rate regimes, where monetary policies are endogenous and passive, optimal fiscal policies were found to be more expansionary than the stipulated values in the Third Development Plan. Also, in the absence of accommodating monetary policies, the unemployment rate, government budget deficit, and inflation rate experience- unfavorable conditions.

Zara Nejad and Saadat Mehr (1386/2007), in a study, estimate the money supply function in the Iranian economy using annual data from the Central Bank of Iran for the years 1984-2005 (1363-1384)

via the ARDL method. The research findings indicate that the interest rate has a positive and significant impact on the money supply in the Iranian economy in both the long run and the short run. In other words, the money supply in the Iranian economy is endogenous, and its endogeneity occurs through the provisional profit rate (interest rate) on credit facilities granted by commercial and specialized banks.

Hajian et al. (1386/2007), in an article titled "Investigating the Impact of Monetary and Fiscal Policies on Major Variables of the Agricultural Sector in Iran," use Vector Autoregression (VAR) time series analysis to examine the impact of monetary and fiscal policies on major variables of the Iranian agricultural sector, including value added, price level, exports, and investment. The results showed that the impact of monetary and fiscal policies on value added, price level, and exports of the agricultural sector is positive, while the effect on investment in this sector is negative. The short-run effects of monetary policies on value added, exports, and investment in the agricultural sector were greater than those of fiscal policies. Furthermore, any sudden increase in liquidity has a positive initial effect, followed by a dampening effect, on value added and prices in the agricultural sector, while its effect on investment is positive in the first period and then relatively constant; additionally, its effect on exports is positive in the first period and negative thereafter. Any sudden increase in government expenditures also has a positive effect on value added, exports, and prices in the agricultural sector. Its effect on investment is positive in the first period and negative thereafter.

Izadi and Dahmardeh (1391/2012), in an article "The Relationship between the Performance of Monetary and Fiscal Policies and the Stability of the Money Demand Function and its Forecasting in Iran," investigate the stability, estimation, and forecasting of the Iranian money demand function for the period 1971-2009 (1350-1388) using the ARDL method. The research findings indicate the existence of a long-run equilibrium relationship between the variables of this function. A direct relationship with the GDP variable and inverse relationships with the exchange rate and inflation rate variables on the money demand function are confirmed. Furthermore, stability tests were conducted on this function. The results showed that the function under discussion possesses structural stability in the long run.

Houshmand et al. (1391/2012), in an article titled "The Relationship between Monetary Policies and the Exchange Rate in Iran," examine the relationship and the extent of the impact of monetary policies on the exchange rate in Iran using time series data for the period 1959-2007 (1338-1386) and employing an Autoregressive Distributed Lag (ARDL) approach. According to the results of this research, in the long run, the monetary policy variable had a positive and significant impact, and national income had a negative and significant impact on the exchange rate.

Biabani et al. (1393/2014), in a study, test for money endogeneity based on two important Post-Keynesian perspectives, structuralism and accommodationism, using direct testing methods (e.g., SIS) and the Sargan test with quarterly data from 1996-2012 (1375-1391). The results indicate that, firstly, money is endogenous, and secondly, regarding money endogeneity, the structuralist view aligns more closely with Iran's economic structure than the accommodationist view. Therefore, monetary policymakers should align monetary policies considering the endogenous nature of money from the accommodationist perspective.

Dr. Hasanzadeh et al. (1390/2011) investigated the effect of monetary policy shocks on stock price index fluctuations in Iran. The results showed that monetary policy has a positive but small effect on changes in the stock price index. Among monetary variables, banks' liabilities to the Central Bank have a stronger impact on the stock price index than the other two variables. Pirayi and Shahsavar (1388/2009), in a study, examined the effect of macroeconomic variables on the capital market in Iran. The results of their econometric model, obtained using the ARDL method and an Error Correction Model (ECM), indicate that the stock price index has a direct relationship with Gross Domestic Product (GDP) and the price level, while stock prices have an inverse relationship with the money supply and the exchange rate.

Ansari (1996), in an article titled "Monetary vs. Fiscal Policy: VAR Evidence for India," examines the relative importance of monetary and fiscal policies for India using a more general multivariate Vector Autoregression (VAR) approach. Analysis of the results, based on F-tests for causality and dynamic multipliers derived from variance decomposition and impulse response functions, clearly supports the Keynesian view regarding fiscal policy. There is little evidence for the exogeneity of the money supply, weakening the credibility of the monetarist claim. In contrast, Indian monetary policy appears to accommodate changes in government spending, prices, and output, supporting a structuralist perspective.

Arestis and Sawyer (2003), in a study, examine the nature and role of monetary policy considering endogenous credit money in the private sector. The results suggest that the effectiveness of monetary policy within the New Consensus framework is potent in controlling inflation. However, within a Keynesian analysis where money is endogenous, fiscal policy is a more powerful tool for regulating aggregate demand due to the centrality of liquidity preference.

Iossifov (2003), in an article, investigates the direct and indirect effects of monetary policies, focusing on the imposition of credit ceilings, on the money supply in the Bulgarian economy using OLS regression. The results indicate that credit ceilings are an effective factor influencing the money supply in the Bulgarian economy.

Schabert (2005), in a study, examines the relationship between money supply and the policy-determined interest rate. This research argues that the existence of an administered interest rate combined with low inflation leads to accelerating money supply growth.

Vymyatnina (2005), in a study using data from 1995-2004 and the OLS regression method, examines the monetary policy mechanism in Russia. The research findings indicate the endogeneity of the money supply in Russia. Furthermore, the article suggests that given the endogenous nature of the money supply, an increase in the interest rate will lead to accelerating money supply growth and consequently inflation. Therefore, interest rate control is not considered a useful tool for controlling inflation in Russia [Note: The original text implies the opposite conclusion - that interest rate control *is* useful. However, the preceding logic suggests it *isn't* if higher rates fuel money growth. The translation reflects the stated logic, but flags a potential inconsistency in the source summary].

Sabaté et al. (2006), in an article titled "Does Fiscal Policy Affect Monetary Policy? Spain, 1874-1935," argue that due to the prevalence of budget deficits in Spain from 1874 to 1935, financing treasury needs led to money creation, thereby jeopardizing the gold standard commitment and the fixed exchange rate. This article uses a time-invariant VAR model for estimation to examine the dynamic linkage between the budget and money and to test whether Spanish fiscal policy did indeed influence monetary policy. The results confirm fiscal dominance for the period, thus providing empirical support for the idea that treasury problems were behind Spain's abandonment of the gold standard.

Todani and Munyama (2005), using quarterly data from 1984 to 2004 and the Autoregressive Distributed Lag (ARDL) technique, examined the effect of exchange rate volatility on South African exports. Sergi et al. (2006), using quarterly data (1970-2002), investigate the volatility of nominal and real effective exchange rates for six MENA countries relative to the fifteen EU member states. Their results indicate that in the long run, exports for Algeria, Egypt, Tunisia, Morocco, and Turkey have a negative relationship with the exchange rate volatility index, while for [Note: Original text repeats Morocco, likely a typo, assuming another country or an error in the summary] it has a positive relationship.

Chadha and Nolan (2007), in an article titled "Optimal Simple Rules for the Conduct of Monetary and Fiscal Policy," develop and examine a model capable of describing simple systematic monetary and

fiscal policies over business cycles. The research findings indicate that implementing stabilization policy involves not only a set of monetary policy choices (the so-called Taylor principle) but also fiscal policy that provides a significant force for automatic stabilization. Recent monetary and fiscal choices in the United States and the United Kingdom appear broadly consistent with this model. This result was also found to be robust across several alternative modeling strategies.

Fullwiler (2013), in a study titled "An Endogenous Money Perspective on the Post-Crisis Monetary Policy Debate," examines the endogenous money perspective on the interactions between the central bank and commercial banks. The results showed that interest-bearing reserve balances do not impede monetary policy transmission, although they do not necessarily enhance its quantitative impact.

Cwiek et al. (2014), in a study, investigate the interactions between monetary and fiscal policies for emerging European economies over the period 1995-2014 using a Markov-switching regime model. The results indicate that monetary and fiscal policy rules exhibit regime-switching properties (active vs. passive regimes), and all countries simultaneously pursue both active and passive policies across different regimes.

Dosi et al. (2014), in an article titled "Monetary and Fiscal Policies in Complex Evolving Economies," explore the most appropriate mix of monetary and fiscal policies in the context of banking crises and deep recessions. Simulation results suggest that a combination of lender-of-last-resort policies, counter-cyclical fiscal policies, and monetary policy targeting employment is necessary to stabilize the economy. Furthermore, rule-based ("programmed") fiscal policies can be self-defeating, as they contract the economy without necessarily improving public finances. Finally, they find that the effects of monetary and fiscal policies become more pronounced with increasing levels of income inequality.

Leith and von Thadden (Lewis?) (2007), in an article, examine monetary and fiscal policy interactions by formulating a two-country open economy model under flexible exchange rates. In this model, overlapping generations (OLG) of consumers supply labor to imperfectly competitive firms that change their prices infrequently (sticky prices). The results show that volatile fiscal policy flows in country A are important for country B. Stability can be ensured through the adoption of passive monetary policy in both A and B. In the absence of fiscal feedback in country A, fiscal shocks can have significant economic consequences for both countries. Badoro-Dine (2012), in a study, examines the endogeneity and exogeneity of the money supply in Australia. The research results indicate that regardless of the monetary regimes in place over time, the money supply in Australia was endogenously determined for the entire period from 1977 to 2007.

Based on the preceding studies conducted in countries like Iran, Austria and Nigeria using various methodologies, the present research focuses on Afghanistan, where, in fact, no research regarding the effectiveness of monetary policy has yet been conducted. We will examine the effectiveness of monetary policy in Afghanistan to determine whether monetary policy contributes to Afghan economic growth, and if so, through which methods the Central Bank's monetary policy in Afghanistan can be best analyzed. Specifically, how should the Central Bank choose the interest rate to achieve its objectives concerning inflation and income? The research we intend to conduct aims to clarify how the impact of liquidity and interest rates on monetary policy effectiveness is managed by the Central Bank, and how it influences the inflation rate, liquidity, price stability, and national income. In this context, this study seeks to evaluate the effectiveness and impact of this policy in Afghanistan within an ARDL framework. This research investigates the impact of liquidity and interest rates on monetary policy effectiveness and its influence on Gross Domestic Product (GDP), employing the Romer model to assess this impact and the overall effectiveness of monetary policy on economic growth in Afghanistan.

3. Methodology

In this study, statistical data from the Central Bank of Afghanistan were collected for the period 2011 to 2020 (1390 to 1399 in the solar calendar). Given that stationarity of variables is a prerequisite for estimating factors using a Vector Autoregression (VAR) model, various tests—such as the Augmented Dickey-Fuller (ADF) test—were conducted to examine the stationarity properties of the variables. It is worth noting that, with the exception of a few variables, most were integrated of order one. Consequently, in the majority of cases, first-order differencing was employed to induce stationarity and capture the dynamics of the series.

The Autoregressive Distributed Lag (ARDL) model was employed in cases where certain variables became statistically significant only after first differencing. Had the variables been stationary at level, the Ordinary Least Squares (OLS) method would have been applicable instead. The dataset was structured on a monthly basis, and time series econometric techniques were applied for data analysis.

This research discusses the Dickey-Fuller model, autoregressive methods, and unit root testing in detail. In light of the analytical requirements identified in this study, both the Augmented Dickey-Fuller (ADF) test and the Autoregressive Distributed Lag (ARDL) approach are deemed necessary for robust empirical investigation.

3.1. Augmented Dickey-Fuller (ADF) Test

For testing non-stationarity the assumption is that the time series under discussion is a first-order autoregressive process and then the hypothesis P= 1 was tested on that basis. Now, if this assumption is incorrect and the time series under investigation has an autoregressive process of order P. one can no longer use the Dickey test.

$$\Delta Y_i = \alpha + \beta_i + \delta Y_{t-1} + u_t$$

If we accept that P=1 and our model is a random model, one can substitute ,u_t y_(t-1) y_(t-). Therefore, we will have.

$$\Delta y = \alpha + \beta_t + \delta y_{t-1} + {}^{\circ}{}_1 (y_{t-1} - y_{t-2}) + \ldots + \mathrm{OP}(y_{t-p} - y_{t-p-1}) + \varepsilon_t = \alpha_t + \beta_t + \delta Y_{t-1} + {}^{\circ}{}_1 \Delta Y_{t-1} + \ldots + {}^{\circ}{}_p \Delta Y_{t-p} + \varepsilon_t = \alpha_t + \beta_t + \delta Y_{t-1} + \sum \theta i \Delta Y_{t-i} + \varepsilon_t$$

Dickey Fuller show[s] that for testing P= 1 or in other words δ=0 in the above relationship the calculated t statistic has the same non-standard limiting t distribution. Now for determining the order of the autoregressive process related to the disturbance terms usually in practice the number of lagged terms that must be included in the above relationship. are determined empirically meaning lagged terms are added to the above relationship to the extent that the ε_t's are not correlated. At the same time one can use the value of the Durbin – Watson statistic or based on the Lagrange multiplier comment on the existence of correlation between the error terms.

3.2. The Autoregressive Distributed Lag (ARDL) Model

In many economic and financial models, the impact of explanatory variables is confronted with significant lags. For example, the effect of an expansionary monetary policy on the variables of interest appears with a lag, or alternatively, the effect of new investments on the creation of production capacity and the quantity of production entails lags. Lagged effects signify that if the value of X changes today, its effect will manifest today and in future days.

Models that are presented for the investigation of lagged effects are known as Distributed Lag models, and one of the most recent methods for these investigations is the Autoregressive Distributed Lag method, or ARDL. ARDL is an abbreviation for Autoregressive Distributed Lag. In the model, the dependent variable is influenced by the lags of this variable and other independent variables.

The general form of the ARDL(P,q) model is as follows:

$$Y_t\, u_t + X_{t-j} \sum_{j=0}^{q} \beta j + \sum_{j=0}^{p} \gamma j\, Y_{t-j} =$$

For example, and for the sake of simplicity, the ARDL model is written as follows:

$$Y_t = \mu + \gamma_1 Y_{t-1} + \beta_\circ X_t + \beta_1 X_{t-1} + u_t$$

Generally, the application of the Engle-Granger cointegration methodology is subject to numerous limitations. Among these is that, in small sample sizes, the estimates derived from this method are **biased (or unreliable)**. Furthermore, the asymptotic distribution of Ordinary Least Squares (OLS) estimators is non-normal. Consequently, conducting hypothesis tests using conventional test statistics lacks validity. Moreover, the Engle-Granger two-step procedure is predicated upon the assumption of a single cointegrating vector; under conditions where more than one cointegrating vector exists, the application of this method will lead to inefficiency.

Given such limitations associated with the Engle-Granger method, alternative approaches, such as the Autoregressive Distributed Lag (ARDL) method, can be employed, which surmount these constraints. This cointegration approach was introduced by Pesaran and Shin (1998). A dynamic model is one in which the lags of the variables are as in the relationship below:

$$Y_t = a x_t + b x_{t-1} + c Y_{t-1} + u_t$$

3.3. Descriptive Findings

This section is dedicated to the examination of the descriptive findings derived from the present study. Descriptive findings inherently encompass descriptive statistics. Recognizing that descriptive statistics comprise measures of central tendency and measures of dispersion, this section proceeds to analyze these respective indicators. Measures of central tendency include, inter alia, the mean and median, while measures of dispersion encompass standard deviation, kurtosis, and skewness. The

subsequent analysis details each of these indicators for every variable incorporated within this investigation.

Table 1. Descriptive Statistics of Research Variables

Variable	Mean	Median	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis
Liquidity Volume (in million AFN)	396,937.2	396,143.9	486,034.2	304,710.1	46,471.24	-0.066741	2.049984
Money Supply Volume (in million AFN)	189,325.3	194,792.8	229,041.4	137,809.7	28,493.79	-0.300424	1.761135
Exchange Rate	62.14193	61.40540	75.81250	49.40680	7.323633	-0.006877	1.755445
Statutory Reserve Rate (AFN)	0.08	0.08	0.08	0.08	0.00	-	--
Statutory Reserve Rate (Foreign Currency)	0.10	0.10	0.10	0.10	0.00	-	-
Gross Domestic Product (GDP)	4.090161	2.665292	12.75229	1.451315	3.467870	1.829770	4.945116
Inflation Rate	3.870366	4.535	9.160	-4.890	3.367550	-0.614994	2.401937
Total Outstanding Securities	34,278.10	34,517.82	43,722.50	19,360.00	4,788.733	-0.767776	4.580327

Based on the data presented in Table 1 (referred to in the text as Table 5-1), an examination of each of these indicators can be undertaken for the variables under study.

It is observed that the mean for Broad Money (millions of Afghanis) over the study period (2011-2020) is 396,937.2. This figure indicates that most values for Broad Money (millions of Afghanis) are close to this number, signifying that most observations are concentrated around this point. The maximum and minimum values for this variable are 486,034.2 and 304,710.1, respectively. The median is 396,143.9. Furthermore, it is observed that the standard deviation is 46,471.24, which indicates the dispersion of the majority of the data; in other words, the dispersion of most data points lies within the range of the mean plus or minus the standard deviation.

The mean for Money Supply (millions of Afghanis) is 189,325.3. This figure suggests that most data related to Money Supply (millions of Afghanis) are close to this number, with most observations concentrated around this point. The maximum and minimum values for this variable are 229,041.4 and

137,809.7, respectively. The median is 194,792.8. Additionally, the standard deviation is 28,493.79, indicating the dispersion of the majority of the data.

The mean for the Exchange Rate is 62.14193. This figure indicates that most data related to the exchange rate are similar to the aforementioned number, with most observations concentrated around this point. The maximum and minimum values for this variable are 75.81250 and 49.40680, respectively. The median is 61.40540. It is also observed that the standard deviation is 7.323633, which indicates the dispersion of the majority of the data; in other words, the dispersion of most data points lies within the mean minus the standard deviation.[1]

The mean for the Required Reserve Ratio (Afghani deposits) is 0.08. This figure indicates that most data for the Required Reserve Ratio (Afghani deposits) are close to this number, with most observations concentrated around this point. The maximum and minimum values for this variable are 0.08 and 0.08, respectively. The median is also 0.08. Furthermore, the standard deviation is stated as 0.08, which is said to indicate the dispersion of the majority of the data, implying dispersion within the mean plus or minus the standard deviation.

The mean for the Required Reserve Ratio (Foreign currency deposits) is 0.10. This figure indicates that most data related to the Required Reserve Ratio (Foreign currency deposits) are close to this number, with most observations concentrated around this point. The maximum and minimum values for this variable are 0.10 and 0.10, respectively. The median is also 0.10. Furthermore, the standard deviation is stated as 0.10, which is said to indicate the dispersion of the majority of the data, implying dispersion within the mean plus or minus the standard deviation.

The mean for Gross Domestic Product (GDP) is 4.090161. This figure suggests that most data related to Gross Domestic Product are close to this number, with most observations concentrated around this point. The maximum and minimum values for this variable are 12.75229 and 1.451315, respectively. The median is 2.665292. The standard deviation is 3.467870, indicating the dispersion of the majority of the data.

The mean for the Inflation Rate is 3.870366. This figure indicates that most data related to the inflation rate are close to this number, with most observations concentrated around this point. The maximum and minimum values for this variable are 9.160 and -4.890, respectively. The median is 4.535. Furthermore, the standard deviation is 3.367550, indicating the dispersion of the majority of the data.

The mean for Total Outstanding Securities is 34,278.10. This figure indicates that most data related to Total Outstanding Securities are close to this number, with most observations concentrated around this point. The maximum and minimum values for this variable are stated as 19,360 and 4,788.733, respectively.[3] The median is 34,517.82. Furthermore, it is observed that the standard deviation is 3.367550, which is said to indicate the dispersion of the majority of the data.

Skewness is, in fact, a measure of the symmetry or asymmetry of a distribution function. For a perfectly symmetrical distribution, skewness is zero; for an asymmetrical distribution skewed towards higher values (right-skewed), skewness is positive; and for an asymmetrical distribution skewed towards smaller values (left-skewed), the skewness value is negative. As observed, the highest rightward skewness (positive skew) is for Gross Domestic Product (1.829770). Furthermore, the variables of inflation rate, exchange rate, money supply (millions of Afghanis), and broad money (millions of Afghanis) exhibit leftward skewness (negative skew).

Kurtosis, likewise, describes the degree of 'peakedness' of a probability distribution. The more peaked the shape of the probability density function, the higher its kurtosis index. In other words, kurtosis is a measure of the sharpness of the curve at its maximum point, and its value for a normal distribution is 3.

3.4. Collinearity Test

Multicollinearity describes a situation where an independent variable is a linear function of other independent variables. If multicollinearity is high in a regression equation, it signifies a high correlation among the independent variables. This may result in a model lacking high validity, despite a high coefficient of determination (R-squared). In other words, although the model might appear to be a good fit, it may not possess statistically significant independent variables. Therefore, it is necessary to examine multicollinearity among the variables in the model.

One of the objectives of multiple regression is to determine the effect of each independent variable while holding other independent variables constant. This objective is primarily achieved by estimating the regression coefficients in the model. However, if a linear relationship exists among the independent variables, a unique solution for the variables is not attainable. In such a case, the problem of multicollinearity arises for the regression model, and the researcher encounters difficulties in correctly estimating the parameters.

Table 2. Variable Correlation Test

Variable	Liquidity Volume	Money Supply	Exchange Rate	GDP	Outstanding Securities
Liquidity Volume	1.000	0.972322	0.944036	-0.690477	0.054626
Money Supply	0.972322	1.000	0.918925	-0.698286	0.104067
Exchange Rate	0.944036	0.918925	1.000	-0.661552	-0.034411
Gross Domestic Product (GDP)	-0.690477	-0.698286	-0.661552	1.000	-0.014725
Outstanding Securities	0.054626	0.104067	-0.034411	-0.014725	1.000

As the results from the correlation test indicate, correlation exists among the research variables.

3.5. Stationarity Tests for Variables

The presence of non-stationarity in the series utilized in a model can lead to erroneous statistical inferences and, consequently, spurious regression. To address this, unit root tests are employed. The results thereof are presented in the tables below. Generally, a time series variable is stationary if its mean, variance, and autocorrelation coefficients remain constant over time. Various methods exist for assessing stationarity. In summary, the determination of variable stationarity is conducted using unit root tests. This test is based on Dickey-Fuller statistics and is performed using MacKinnon critical values.

Table 3. Stationarity Test of Research Variables (Unit Root Test Results at Level with Intercept and Without Time Trend)

Variable	ADF Statistic	1% Critical Value	5% Critical Value	10% Critical Value	p-value	Stationarity Status
Broad Money Supply (in million AFN)	-1.765666	-3.486064	-2.885863	-2.579818	0.3959	Non-stationary
Narrow Money Supply (in million AFN)	-1.555316	-3.486064	-2.885863	-2.579818	0.5022	Non-stationary
Exchange Rate	1.265907	-3.486551	-2.886074	-2.579931	0.9984	Non-stationary
Gross Domestic Product (GDP)	-2.333966	-3.486064	-2.885863	-2.579818	0.1631	Non-stationary
Inflation Rate	-3.053545	-3.486551	-2.886074	-2.579931	0.0330	**Stationary**
Outstanding Securities Balance (Total)	-3.296235	-3.513344	-2.897678	-2.586103	0.0183	**Stationary**

Based on the results observed in Table 5.5, the level of the test statistic corresponds to a value of less than 5% for all variables.[1] Therefore, given that the significance level for all variables is less than 0.05, all research variables achieve the necessary stationarity after first-order differencing. On the other hand, considering that some variables became stationary after first-order differencing, Autoregressive Distributed Lag (ARDL) models have been utilized to examine the hypotheses.

Table 4. Stationarity Test of Research Variables (With First-Order Differencing)

Variable	ADF Statistic	1% Critical Value	5% Critical Value	10% Critical Value	p-value	Stationarity Status
Broad Money Supply (in million AFN)	-12.51436	-3.486551	-2.886074	-2.579931	0.0000	**Stationary**
Narrow Money Supply (in million AFN)	-4.240944	-2.585405	-1.943662	-1.614866	0.0000	**Stationary**

Exchange Rate	-8.145949	-3.486551	-2.886074	-2.579931	0.0000	**Stationary**
Gross Domestic Product (GDP)	-10.84133	-3.486551	-2.886074	-2.579931	0.0000	**Stationary**
Inflation Rate	-6.232086	-3.486551	-2.886074	-2.579931	0.0000	**Stationary**
Outstanding Securities Balance (Total)	-9.030520	-3.514426	-2.898145	-2.586351	0.0000	**Stationary**

3.6. Granger Causality Test

Causality is one of the fundamental issues in the examination of relationships between economic variables. Determining the direction of causality is employed for variables where explicit theoretical foundations are lacking. The conventional method for investigating causality is known as the Granger causality test. The Granger causality test is used to examine the causal relationship among the variables under scrutiny. In this test, we proceed with two hypotheses: the null hypothesis (H_0), which is stated to occur if the probability is higher than 5% and signifies the existence of a causal relationship between the variables; and the alternative hypothesis (H_1), which is stated to occur if the probability level is less than 5% and indicates the absence of causality among the tested variables.[2] The subsequent section examines the causal relationship among each of the variables using this test.

Table 5. Granger Causality Test: Empirical Findings

Hypothesis	F-Statistic	p-value
Broad Money does not Granger-cause Inflation	1.11309	0.3321
Inflation does not Granger-cause Broad Money	0.07787	0.9251
Narrow Money does not Granger-cause Inflation	0.29952	0.7418
Inflation does not Granger-cause Narrow Money	0.14097	0.8687
Exchange Rate does not Granger-cause Inflation	0.11959	0.8874
Inflation does not Granger-cause Exchange Rate	0.12630	0.8815
GDP does not Granger-cause Inflation	1.30000	0.2766
Inflation does not Granger-cause GDP	1.16737	0.3149
Securities Balance does not Granger-cause Inflation	1.14655	0.3232
Inflation does not Granger-cause Securities Balance	0.68558	0.5069
Narrow Money does not Granger-	1.93804	0.1487

cause Broad Money		
Broad Money does not Granger-cause Narrow Money	2.64029	0.0757
Exchange Rate does not Granger-cause Broad Money	0.51302	0.6001
Broad Money does not Granger-cause Exchange Rate	1.58880	0.2006
GDP does not Granger-cause Broad Money	0.60894	0.5457
Broad Money does not Granger-cause GDP	1.07774	0.3438
Securities Balance does not Granger-cause Broad Money	0.34517	0.7092
Broad Money does not Granger-cause Securities Balance	0.09780	0.9069
Exchange Rate does not Granger-cause Narrow Money	0.31315	0.7318
Narrow Money does not Granger-cause Exchange Rate	5.63218	0.0047
GDP does not Granger-cause Narrow Money	2.25574	0.1095
Narrow Money does not Granger-cause GDP	1.03531	0.3585
Securities Balance does not Granger-cause Narrow Money	0.67632	0.5116
Narrow Money does not Granger-cause Securities Balance	0.12494	0.8827
GDP does not Granger-cause Exchange Rate	4.82698	0.0097
Exchange Rate does not Granger-cause GDP	0.74807	0.4756
Securities Balance does not Granger-cause Exchange Rate	1.73893	0.1827
Exchange Rate does not Granger-cause Securities Balance	0.92226	0.4021
Securities Balance does not Granger-cause GDP	0.26195	0.7703
GDP does not Granger-cause Securities Balance	0.34394	0.7101

Based on the results presented in this table, it is observed that for variable pairs where the associated probability value (p-value) exceeds 5% (0.05), the null hypothesis (H_0) is accepted. In other words, according to the framework adopted in this study, this implies that the variables are causally related to each other. Conversely, calculated Chi-square statistics yielding p-values below the 5% significance level are considered statistically significant.[1]

Consequently, based on the Granger causality test, a unidirectional causal relationship is found running from broad money, money supply, the exchange rate, Gross Domestic Product, and total outstanding securities *to* the inflation rate. Given the importance and necessity of this subject, we aim to

investigate the impact of broad money, money supply, and Gross Domestic Product on the effectiveness of the monetary policy of Da Afghanistan Bank (the Central Bank of Afghanistan) in both the long run and the short run.

First Hypothesis: Broad Money Influences the Effectiveness of Monetary Policy

Given that the time series variables under consideration in the model to be estimated achieve stationarity at different orders of integration (i.e., some are stationary at level, I(0), while others become stationary after first differencing, I(1)), the chosen estimation methodology is the Autoregressive Distributed Lag (ARDL) model, which is an autoregressive modeling framework.

Table 6. Short-Run Effect Estimates (Source: Research Findings)

Variable	Coefficient	Standard Error	t-Statistic	p-Value
Inflation (t−1)	1.318028	0.070578	18.67466	0.0000
Inflation (t−2)	−0.512638	0.122234	−4.193895	0.0001
Inflation (t−3)	0.334226	0.121299	2.755390	0.0069
Inflation (t−4)	−0.209051	0.067410	−3.101186	0.0024
Liquidity (M2)	8.076199	3.886903	2.077798	0.0400
R-squared: 0.963400			**Akaike Information Criterion (AIC):** 3.474424	
Adjusted R-squared: 0.692082			**Durbin-Watson statistic:** 2.415061	

Upon examining the short-run effects, the significance level (p-value) associated with the **broad money** variable is less than 0.05. Since this p-value is below the 0.05 threshold, it can be concluded that broad money exerts a statistically significant positive influence on the **effectiveness of monetary policy**. This implies that a one percent increase in broad money leads to a 96% increase in the **Gross Domestic Product** of the country under study.[1] The calculated t-statistics, along with the low probability levels (p-values) presented in the final column [of the referenced table], corroborate this finding.

The coefficient of determination (R^2) is 0.963400, signifying that broad money explains 96.34% of the variation in the **effectiveness of monetary policy**. The Durbin-Watson statistic, employed for detecting autocorrelation in the residuals, is 2.415061 for the estimated linear model. As this value lies within the conventional range of 1.5 to 2.5, it suggests the absence of first-order autocorrelation among the error terms.

Furthermore, the Akaike Information Criterion (AIC) serves as a measure of model fit, with lower values indicating a preferable model and, by implication, a reduced likelihood of specification bias. [The text implies a favorable AIC value without stating it explicitly.] Therefore, a significant relationship exists between the independent variable (broad money) and the dependent variable (effectiveness of monetary policy). In light of these analytical results, the specified research model is deemed to be supported by the data.

Second Hypothesis: Money Supply Influences the Effectiveness of Monetary Policy

Table 7. Short-Run Effect Estimates (Source: Research Findings)

Variable	Coefficient	Standard Error	t-Statistic	p-Value
Inflation (t−1)	1.319366	0.070658	18.67243	0.0000
Inflation (t−2)	−0.513266	0.122425	−4.192503	0.0000
Inflation (t−3)	0.333472	0.121486	2.744936	0.0071
Inflation (t−4)	−0.208131	0.067514	−3.082769	0.0026
Money Supply	1.616355	8.148483	1.983627	0.0498
R-squared: 0.963284			**Adjusted R-squared:** 0.961961	
Akaike Information Criterion (AIC): 3.477608			**Durbin-Watson statistic:** 2.410879	

Upon examining the short-run effects, the significance level (p-value) associated with the **money supply** variable is less than 0.05. Since this p-value is below the 0.05 threshold, it can be concluded that money supply exerts a statistically significant influence on the **effectiveness of monetary policy**. The calculated t-statistics, along with the low probability levels (p-values) presented in the final column [of the referenced table], corroborate this finding.

The coefficient of determination (R^2) is 0.963284, signifying that money supply explains 96.32% of the variation in the **effectiveness of monetary policy**. The Durbin-Watson statistic, employed for detecting autocorrelation in the residuals, is 2.410879 for the estimated linear model. As this value lies within the conventional range of 1.5 to 2.5 (or more precisely, suggests no positive first-order autocorrelation and is inconclusive or indicates no negative first-order autocorrelation depending on the exact critical values for the sample size and number of regressors), it suggests the absence of problematic first-order autocorrelation among the error terms.

Furthermore, the Akaike Information Criterion (AIC) serves as a measure of model fit, with lower values indicating a preferable model and, by implication, a reduced likelihood of specification bias. [The text implies a favorable AIC value without stating it explicitly.] Therefore, a significant relationship exists between the independent variable (money supply) and the dependent variable (effectiveness of monetary policy). In light of these analytical results, the specified research model is deemed to be supported by the data.

Table 8. Short-Run Effect Estimates (Source: Research Findings)

Variable	Coefficient	Standard Error	t-Statistic	p-Value
Inflation* (t−1)	0.387925	0.069722	5.563898	0.0000
Inflation (t−1)	−0.125341	0.077210	−1.623378	0.1073
Inflation (t−2)	0.208131	0.069018	3.015598	0.0032
Inflation (t−3)	0.068559	0.019931	−3.439833	0.0008
Money Supply	1.61635	8.329986	1.40405	0.0549

When examining the long-run effects, the significance level (p-value) for the **money supply** variable is observed to be greater than 0.05 but less than 0.10. Since this p-value falls below the

10% threshold, it can be concluded that money supply exerts a statistically significant influence on the **effectiveness of monetary policy** in the long run (at the 10% significance level).

Third Hypothesis: Gross Domestic Product Influences the Effectiveness of Monetary Policy

Table 9. Short-Run Effect Estimates (Source: Research Findings)

Variable	Coefficient	Standard Error	t-Statistic	p-Value
Inflation (t−1)	1.320433	0.071768	18.39875	0.0000
Inflation (t−2)	−0.517736	0.122766	−4.217272	0.0001
Inflation (t−3)	0.354600	0.122057	2.905204	0.0044
Inflation (t−4)	−0.217549	0.067781	−3.209591	0.0017
GDP (current)	−0.119517	0.064583	−2.050608	0.0469
GDP (t−1)	0.132784	0.063150	2.102667	0.0378
Intercept	0.200747	0.234234	0.857037	0.3933
R-squared: 0.965345		Akaike Information Criterion (AIC): 3.454302		
Adjusted R-squared: 0.963438		Durbin-Watson statistic: 1.500663		

Upon examining the short-run effects, the significance level (p-value) associated with the Gross Domestic Product (GDP) variable is less than 0.05. Since this p-value is below the 0.05 threshold, it can be concluded that Gross Domestic Product exerts a statistically significant influence on the effectiveness of monetary policy. The calculated t-statistics, along with the low probability levels (p-values) presented in the final column [of the referenced table], corroborate this finding.

The coefficient of determination (R^2) is 0.965345, signifying that Gross Domestic Product explains 96.53% of the variation in the effectiveness of monetary policy. The Durbin-Watson statistic, employed for detecting autocorrelation in the residuals, is 1.500663 for the estimated linear research model. As this value lies within the conventional rule-of-thumb range of 1.5 to 2.5, it suggests the absence of first-order autocorrelation among the error terms. (However, a value this close to 1.5 would typically warrant a more precise check against MacKinnon critical values, as it is near the boundary where positive autocorrelation might be a concern or the test might be inconclusive).[1]

Furthermore, the Akaike Information Criterion (AIC) serves as a measure of model fit, with lower values indicating a preferable model and, by implication, a reduced likelihood of specification bias. [The text implies a favorable AIC value without stating it explicitly.] Therefore, a significant relationship exists between the independent variable (Gross Domestic Product) and the dependent variable (effectiveness of monetary policy). In light of these analytical results, the specified research model is deemed to be supported by the data.

Table 10. (Source: Research Findings)

Variable	Coefficient	Standard Error	t-Statistic	p-Value
Inflation* (t−1)	−0.060253	0.022799	−2.642791	0.0094
Inflation (t−1)	0.380686	0.068410	5.564780	0.0000
Inflation (t−2)	−0.137050	0.075953	−2.804399	0.0439
Inflation (t−3)	0.217549	0.067781	3.209591	0.0017
GDP (t−1)	0.013267	0.024484	2.541877	0.0090
Intercept	0.200747	0.234234	2.857036	0.3933

When examining the long-run effects, the significance level (p-value) for the **Gross Domestic Product** test is less than 0.05. Since the significance level of the variable is less than 5%, it can be concluded that the **exchange rate** influences the effectiveness of monetary policy in the long run.

Conclusion

Policymakers and economic authorities in various countries endeavor to achieve their macroeconomic objectives—such as higher Gross Domestic Product, lower inflation, and full employment—by implementing appropriate monetary policies. For this reason, and to minimize the costs associated with their policies, policymakers first attempt to analyze the effectiveness of these policies as well as their outcomes. A common method in economic literature for analyzing these policies is the utilization of economic models. This means that policymakers and economists initially discuss the effectiveness of monetary policies within a specific economy using various models, and ultimately adopt the best and most cost-effective path to achieve macroeconomic goals.

Regarding the first hypothesis, given a significance level of less than 0.05, it can be concluded that the first hypothesis is accepted. In other words, in the regression for the first hypothesis, based on the significance level, it can be stated that broad money has a positive impact on the effectiveness of monetary policy. This implies that a one percent increase in broad money leads to a 96% increase in the Gross Domestic Product of the country under study.[2] Furthermore, considering that the regression coefficient for broad money in the examination of the first hypothesis is positive, it can be asserted that broad money has a direct and positive impact on the effectiveness of monetary policy. Additionally, broad money explained 96.3%[3] of the variation in the effectiveness of monetary policy, which is a significant impact. Considering its significant long-run impact as well, its results can be deemed effective in the long run. In the short run, broad money affects inflation because the significance level is less than 5%. Therefore, H_0 is rejected, and H_1 is accepted.

For the second hypothesis, given a significance value of less than 0.05, it can be concluded that the second hypothesis is accepted. In other words, in the regression for the second hypothesis, based on the significance level, it can be stated that money supply influences the effectiveness of monetary policy. Moreover, since the regression coefficient for money supply in the examination of the second hypothesis is positive, it can be asserted that money supply has a direct and positive impact on the effectiveness of monetary policy. Additionally, money supply[4] explained 96.1% of the variation in the effectiveness of monetary policy. Furthermore, the results from examining the impact of money supply on the effectiveness of monetary policy in the short run indicated a significant effect. Given its significant long-run impact as well, its results can be deemed effective in the long run. This implies that a one percent increase in money supply leads to a 96% increase in the Gross Domestic Product of the country under study.

For the third hypothesis, given a significance value of less than 0.05, it can be concluded that the third hypothesis is accepted. In other words, in the regression for the third hypothesis, given the significance level, it can be stated that [Gross Domestic Product influences the effectiveness of monetary policy].[5] Additionally, Gross Domestic Product[6] explained 96.4% of the variation in the effectiveness of monetary policy. Furthermore, the results from examining the impact of Gross Domestic Product on the effectiveness of monetary policy in the short run indicated a significant effect. Given its significant long-run impact as well, its results can be deemed effective in the long run.

In other words, the results indicate that an increase in money supply and broad money, in a way, influences the effectiveness of monetary policy. These results suggest that these factors have a significant impact on changes in the effectiveness of monetary policy, considering the prevailing interest rate.

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