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ABSTRACT
This study analyze the effect of monetary policy. To address this objective this study employed ARDL and error correction model (ECM) based on annual data from 1993 to 2022. Granger causality test was also employed to check the direction of causal effects of one variable on the other variable. All required pre and post estimation test were performed and verified that the model was statistical viable. The study revealed that, In short run, deposit interest rate, reserve required amount and open market operation have positive and statistically significant effects on real GDP growth of Ethiopia, however, money supply have negative and statistically significant effects on real GDP growth of Ethiopia. In long run, money supply have positive and statistically significant effects on real GDP growth of Ethiopia, however, deposit interest rate and reserve required have negative and statistically significant effects on real GDP growth of Ethiopia. To sum up, in short run contractionary monetary policy was promising and in long run expansionary monetary policy was favorable effect on economic growth. The Granger causality test result shows that there is bidirectional causality between monetary policy and economic growth; except there was unidirectional relationship between deposit interest rate and economic growth. Ultimately, this research suggests the following policy recommendation: for short-term economic enhancement, it is advisable for the government to opt for a contractionary monetary policy rather than an expansionary one. On the other hand, for long-term economic improvement, an expansionary monetary policy is more favorable than a contractionary one.

Key words: Monetary Policy; Economic Growth; ARDL, ECM, Ethiopia
INTRODUCTION
Developing countries often face challenges related to their macroeconomic performance, which refers to the overall behavior and trends in the economy at a national level (Sena et al., 2021). When the macroeconomic performance becomes unstable, it can have significant repercussions on various aspects of the country’s economic and social well-being (African Development Bank, 2023). The effects of an unstable macroeconomic performance in developing countries can be wide-ranging (Ufoeze et al., 2018). Instability in macroeconomic performance often leads to economic volatility, characterized by fluctuations in key economic indicators such as GDP growth, inflation rates, exchange rates, and interest rates. These fluctuations can create uncertainty and make it difficult for businesses to plan and make investment decisions (Goodwin et al., 2022). Moreover, it can lead to reduced consumer spending and lower business confidence, further exacerbating economic (Sena et al., 2021).

Instable macroeconomic performance can lead to higher unemployment rates in developing countries. Economic downturns may force businesses to downsize or close down altogether, resulting in job losses (Kamaan & Nyamongo, 2014). Additionally, reduced investment and economic activity can limit job creation opportunities, especially in sectors that are highly dependent on stable macroeconomic conditions. Consequently, unemployment rates rise, leading to an increase in poverty levels (Goodwin et al., 2022).

Macroeconomic instability tends to have a disproportionate impact on different segments of society, often exacerbating income inequality within developing countries (National Bank of Ethiopia, 2022). The poor and vulnerable populations are particularly susceptible to the negative consequences of economic volatility, as they have limited access to financial resources and social safety nets. The poor and vulnerable populations are particularly susceptible to the negative consequences of economic volatility, as they have limited access to financial resources and social safety nets. Instability can widen the income gap between the rich and the poor, leading to social tensions and a less inclusive society. Instability can widen the income gap between the rich and the poor, leading to social tensions and a less inclusive society (Akpunonu & Orajaka, 2021).

In general, weak macroeconomic performance in developing countries can contribute to social unrest and political instability. Economic downturns often lead to job losses, rising prices, and reduced living standards for the population. These adverse conditions can fuel discontent among
citizens, leading to protests, strikes, or even political upheaval. Political instability further hampers economic growth prospects as it creates an uncertain business environment and deters investment (Hawitibo, 2023).

Notwithstanding, stable macroeconomic performance in developing countries is the promotion of economic growth. When a country maintains a stable macroeconomic environment, it attracts foreign investments, encourages domestic investments, and fosters entrepreneurship (Abille & Mpuure, 2020). This, in turn, leads to increased productivity, higher employment rates, and overall economic expansion and finally its create conducive environment for the overall livelihood improvement of the communities (Beyene & Kotosc, 2020).

The government of Ethiopia has implemented various policies to attract foreign investment, boost agricultural productivity, and develop key sectors such as manufacturing and services (World Bank, 2023a). In addition, Ethiopia has been implementing various monetary policy reforms aimed at promoting macroeconomic stability, enhancing financial sector development, and supporting the country’s overall economic growth, for example Exchange Rate Reforms in 2017; Inflation Targeting Framework, 2014; minimum saving deposit rate in 2022 and others (African Development Bank, 2023; National Bank of Ethiopia, 2022; World Bank, 2023b).

In such a way, Ethiopia has experienced significant economic growth over the past few decades. With a population exceeding 110 million, it is one of Africa’s fastest-growing economies. However, such economics has been up and down growth rate overtime for instant 10.4% in 2014, 8% in 2015; 9% in 2018; 6.1% in 2016 and 7.5 in 2022(National Bank of Ethiopia, 2022) There is also unstable macroeconomics performance like inflation, unemployment. Ethiopia’s latest inflation outturn as of June 2023 shows a year-on-year headline inflation rate of 29.3 percent(African Development Bank, 2023; National Bank of Ethiopia, 2023). According to the (World Bank, 2023a), Ethiopia’s unemployment rate was estimated to be around 20% in 2022.

In a line with this, different social, political and macroeconomic policies factors were responsible for such volatile economic growth rate and economics instability in Ethiopia. For instant, monetary policy is one of macroeconomic policies factors; therefore, it is crucial to assess the degree to which monetary policy influences the economic growth of Ethiopia in both the short-term and long-term contexts for policymakers to design effective strategies.
Several empirical studies have been conducted by various researchers to investigate the impact of monetary policy on the economic growth of Ethiopia. These studies include the works of (Abdeta, 2021; Benti, 2014; Beyene & Kotosc, 2020; Ewunetu, 2020; Girma, 2020; Hunibachew, 2021; T. Tadesse & Melaku, 2019; Taye, 2015; Woldesemayat, 2020; Yenus, 2018) specifically focused on the effects of monetary policy variables on Ethiopia’s economic growth.

However, these studies focused on analyzing the impact of monetary policy on economic growth using only broad money supply and interest rates as the chosen monetary policy variables or instruments. While these variables are certainly important indicators, they might not encompass the entire array of monetary policy tools and their corresponding effects. This limitation could result in overlooking other critical monetary policy instruments, such as reserve requirements and open market operations.

Monetary policy is inherently multifaceted, and relying solely on two variables oversimplifies the intricate nature of its mechanisms. This oversimplification may lead to neglecting the comprehensive range of ways in which monetary policy influences economic growth. Consequently, it could result in biased or incomplete conclusions regarding the true impact of monetary policy. Furthermore, such an analysis might fail to capture the nuanced dynamics that exist in specific regions or during particular time periods, providing a limited perspective on the overall relationship between monetary policy and economic growth.

Additionally, some studies integrate both monetary policy variables and additional potential controlling factors into their empirical models. However, crucial variables remain unaccounted for their analyses. The exclusion of important macroeconomic variables in an empirical growth model and the sole focus on monetary policy variables can undermine the reliability of the study’s findings regarding the impact of monetary policy on Ethiopia’s economic growth.

To conduct a more robust analysis, this study incorporate a broader set of monetary policy variables (broad money supply, deposit interest rate, lending interest rate, amount of reserve required, open market operations) and control for relevant macroeconomic factors (trade balance, gross capital formation, final consumption expenditure) to obtain a comprehensive understanding of the relationship between monetary policy and economic growth.
This study will make a significant contribution to empirical knowledge by utilizing the Superior Autoregressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran et al. (2001). Therefore, this research aims to investigate the effects of monetary policy on the economic growth of Ethiopia, specifically by addressing the short run and long run dynamic between monetary policy and economic growth in Ethiopia; by investigate the existence of causal relationships and its direction among monetary policy and economic growth in Ethiopia.

**METHODOLOGY OF THE STUDY**

This chapter presents source and types of data, theoretical framework and empirical model that was employed in this study to the impact of income inequality on economic growth: evidence from Ethiopia. It also discusses the statistical tools and necessary diagnostic tests using time series Autoregressive Distributed Lag Model (ARDL) and Error Correction Model (ECM) regression that will expected to be used in this study.

**Research Design**

This study employed quantitative analytical research approach. It involves testing the effects of variables whose data are expressed quantitatively. Hence in this study descriptive and inferential empirical study designs were used. The reason why the researcher used descriptive method is that to collect detailed description of existing phenomenon with the intent of employing data to justify current conditions and whether and whenever possible to draw conclusion from the facts that the researcher could discovered. The empirical study was used to support the descriptive statistics by statistical evidence.

**Data Source and Scope**

In this study time series data of 30 sample years from the period 1993 to 2022 drawn from secondary sources like: World development indicator database, Ethiopia statistical survey, IMF, World Economic Outlook, international monetary fund database and National Bank of Ethiopia will used. All monetary policy data like: amount of required reserve, broad money supply, deposit interest rate, lending interest rate, treasury bill sold (proxy for open market operation) and real gross domestic product (RGDP) data emanated from national bank of Ethiopia. Whereas gross capital formation, trade balance, final consumption expenditure data collected from world development indicator data base. This study is used secondary data mainly drawn from World
Development Indicators, and national bank of Ethiopia, online databases. The data from international organizations was collected from their respective databases.

**Method of Data Analysis**
The study employed both descriptive and econometric analysis methods. To assess the trends economic growth (RGDP) and monetary policy (amount of required reserve, broad money supply, deposit interest rate, lending interest rate, Treasury bill sold) during the study period, the study used tools of descriptive statistical such as trend graphs. Regarding the econometric model, this study employed two econometric approaches, which are Autoregressive Distributed Lag Model (ARDL) and Error Correction Model (ECM).

**Econometric Model Specifications**
To explore the impact of monetary policy on the economic growth of Ethiopia over both short and long-term horizons, this study employed the Autoregressive Distributed Lag Model (ARDL) approach introduced by Pesaran et al. (2001) for co-integration analysis. The choice of ARDL was motivated by its distinct advantages over alternative co-integration methods proposed by Johansen and Juselius (1990). Once the order of the ARDL model was established, the single reduced equation was estimated using the Ordinary Least Squares (OLS) method. Notably, this approach does not necessitate the variables to have the same order of integration, making the bound test effective for regressors that are purely I(0), purely I(1), fractionally integrated, or mutually co-integrated. Furthermore, the ARDL technique is well-suited for small or finite sample sizes and yields unbiased estimates of long-term effects, even in the presence of endogeneity in certain explanatory variables, as highlighted by (Pesaran et al., 2001)

Standard ARDL model presented as below equation 1

$$ARDL(p,q): Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \beta_3 Y_{t-3} + \ldots + \beta_p Y_{t-p} + \delta_1 X_t + \delta_2 X_{t-1} + \delta_3 X_{t-2} + \ldots + \delta_q X_{t-q} + \varepsilon_t$$

Equation 1

In compact form, it can be written as equation 2

$$ARDL(p, q): Y_t = \beta_0 + \sum_{i=1}^{p} \beta_i Y_{t-i} + \sum_{i=1}^{q} \delta_i X_{t-i} + \varepsilon_t$$

Equation 2

Where: lagged Y’s constitute autoregressive part; lagged X’s constitute distribute part; p is autoregressive lags term; q is distribute lags term.
In order to examine the effect of money supply on economic growth, The Keynesian aggregate demand function was served as a platform on which the empirical model was formulated. So, an unrestricted error correction representation of the ARDL framework of Equation presented below equation 3.

\[
\Delta \ln{RGDP}_t = \beta_0 + \beta_1 \ln{RGDP}_{t-1} + \beta_2 \ln{m2}_{t-1} + \beta_3 Dint_{t-1} + \beta_4 \ln{Lint}_{t-1} + \beta_5 \ln{RR}_{t-1} \\
+ \beta_6 \ln{Omo}_{t-1} + \beta_7 \ln{con}_{t-1} + \beta_8 \ln{icapf}_{t-1} + \beta_9 \ln{Trd}_{t-1} \\
+ \sum_{i=1}^{p} \delta_{1i} \Delta \ln{RGDP}_{t-1} + \sum_{i=1}^{p} \delta_{2i} \Delta \ln{m2}_{t-1} + \sum_{i=1}^{p} \delta_{3i} \Delta Dint_{t-1} + \sum_{i=1}^{p} \delta_{4i} \Delta \ln{Lint}_{t-1} \\
+ \sum_{i=1}^{p} \delta_{5i} \Delta \ln{RR}_{t-1} + \sum_{i=1}^{p} \delta_{6i} \Delta \ln{Omo}_{t-1} + \sum_{i=1}^{p} \delta_{7i} \Delta \ln{con}_{t-1} \\
+ \sum_{i=1}^{p} \delta_{8i} \Delta \ln{icapf}_{t-1} + \sum_{i=1}^{p} \delta_{9i} \Delta \ln{Trd}_{t-1} + \cup_i - - - - - - - - - - - - - - - - - - - - - - - - - - - Equation 3
\]

Where: Δ denotes the first difference operator; \(\beta_0\) is constant term is the lag length; \(\cup_i\) is the white noise residual; \(\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, and \beta_9\) is characterize the coefficient of the short run dynamics of the model whereas, \(\delta_{1i}, \delta_{2i}, \delta_{3i}, \delta_{4i}, \delta_{5i}, \delta_{6i}, \delta_{7i}, \delta_{8i}, and \delta_{9i}\) is coefficients show the long run relationship.

To assess the presence of a long-term relationship among the variables of interest, specifically examining co-integration between economic performance and all explanatory variables, a bound test was conducted. The approach utilized the critical values proposed by Pesaran et al. (2001). These critical values consist of a lower bound, assuming all variables are I(0), and an upper bound, assuming all variables are I(1). If the computed F-statistic value exceeds the upper bound critical value, the null hypothesis (H0) is rejected in favor of the alternative hypothesis, indicating the existence of co-integration among the variables. Conversely, if the sample F-statistic falls below the lower bound critical value, H0 is not rejected, leading to the conclusion that there is no co-integration among the variables. If the sample F-statistic lies between the lower and upper critical values, the outcome is inconclusive. In such cases, one can explore the statistical significance of the speed of adjustment coefficient, where a significant coefficient would imply the existence of co-integration among the variables.

Thus, to test the null hypothesis of no co-integration relationship among the variables as below

\[
H_0: \beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_9 = 0
\]
Against the alternative hypothesis of the existence of co-integrating relationship between the variables

\[ H_1: \beta_0 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_7 \neq \beta_9 \neq 0 \]

After performing bound co-integration test and the bound test verified that if there is co-integration in the model; the error correction version of ARDL model as follow equation 4

\[
\Delta \ln RGDP_t = \beta_0 + \sum_{i=1}^{p} \delta_{i1} \Delta \ln RGDP_{t-1} + \sum_{i=1}^{p} \delta_{i2} \Delta \ln m2_{t-1} + \sum_{i=1}^{p} \delta_{i3} \Delta D_{t-1} \\
+ \sum_{i=1}^{p} \delta_{i4} \Delta L{nt}_{t-1} + \sum_{i=1}^{p} \delta_{i5} \Delta lnnR_{t-1} + \sum_{i=1}^{p} \delta_{i6} \Delta lnOmo_{t-1} + \sum_{i=1}^{p} \delta_{i7} \Delta lncon_{t-1} \\
+ \sum_{i=1}^{p} \delta_{i8} \Delta ln{cap}f_{t-1} + \sum_{i=1}^{p} \delta_{i9} \Delta Tr{db}_{t-1} + \gamma \text{ECM}_{t-1} + \epsilon_t
\]

Equation 4

Where: \( \gamma \text{ECM}_{t-1} \) is the error correction model term is required to be both negative and statistically significant, serving as an indicator of the rate at which adjustments take place towards the long-run equilibrium in response to a short-run shock.

**Definition and Measurement of Variables**

Real Gross Domestic Product (lnRGDP) is dependent variable and a measure of the total economic output of a country, adjusted for inflation or deflation. It represents the value of all goods and services produced within a country's borders over a specific period, usually expressed in constant prices to eliminate the effects of inflation. Real GDP provides a more accurate reflection of an economy's actual growth by removing the impact of price changes on the nominal GDP. In this study the broad money was entered in to the model in the form billion birr.

Broad money (lnM2) is an independent monetary policy variable and serves as a classification for quantifying the circulating money in an economy. It is recognized as the most comprehensive approach for determining a country's money supply, incorporating narrow money and other assets readily convertible into cash for the purchase of goods and services. Decrease in money supply will be expected to reduce economic growth and increase in money supply will be expected to boost economic growth. In this study the broad money was entered in to the model in the form billion birr.
Deposit interest rate (Dint), it is an independent monetary policy variable and often referred to simply as an "interest rate," is the percentage of interest that a financial institution, such as a bank, pays to depositors for keeping their money in a savings account, certificate of deposit (CD), or other types of deposit accounts. It represents the return or compensation that depositors receive for entrusting their funds to the financial institution. The higher level of deposit interest rate will reduced economic growth through dipping investment and vise versa. In this study the deposit interest rate was entered in to the model in the form of percentage.

Lending interest rate (Lint), it is an independent monetary policy variable and often referred to as the "interest rate on loans" or simply the "loan rate," is the percentage of interest that a financial institution charges borrowers for the use of borrowed funds. It represents the cost of borrowing money and is applied to various types of loans, including personal loans, mortgages, business loans, and other credit products. The higher level of lending interest rate will reduced economic growth through dipping investment and vise versa. In this study the lending interest rate was entered in to the model in the form of percentage.

Reserve required (lnRR); it is an independent monetary policy variable. The Central Bank may mandate that Deposit Money Banks retain a portion (either individually or in combination) of their deposit liabilities, referred to as reserves, in the form of vault cash or deposits with the Central Bank. The utilization of fractional reserves serves the purpose of restricting the extent of loans that banks can extend to the domestic economy, thereby assisting in regulating the overall money supply. This mechanism enables the Central Bank to manage and control the liquidity levels in the economy. The underlying assumption is to maintain a stable relationship between banks' reserve holdings and the amount of credit they offer to the public. The control over reserve requirements lies directly with the Central Bank, as these requirements are established and adjusted in accordance with the bank's regulations. Increase reserve required amount will decrease the economic growth and vise versa. In this study the required reserve was entered in to the model in the form billion birr.

Open Market Operation (lnOmo) it is an independent monetary policy variable and defined as the selling and purchasing of bonds or securities issued by the governments. It is one of the major monetary policy instruments used by countries for the development of money markets. The financial system, the national economy and the improvement of financial intermediation among
market participants are smoothen by selling and buying of these instruments. Open market operation in this study was proxy by treasury bill sold in billion birr in this study. Increasing required reserves can reduce the liquidity available to banks for lending. This can lead to a decrease in the amount of credit extended to businesses and consumers, potentially slowing down investment and consumption, which are essential components of economic growth.

Final consumption expenditure (lncon): Final Consumption Expenditure refers to the total value of goods and services consumed by households, firm and government for their direct satisfaction of wants and needs during a specific period. It represents the end use of these goods and services by the ultimate consumers. Consumer spending represents a significant portion of aggregate demand in an economy. When households increase their consumption expenditure, it stimulates demand for goods and services, which, in turn, can lead to increased production and economic activity. In this study the final consumption expenditure was entered in to the model in the form billion birr.

Gross capital formation (lncap): Gross Capital Formation, also known as "gross fixed capital formation" or "investment," refers to the total value of new physical assets, such as machinery, equipment, buildings, and infrastructure, that are produced within an economy over a specific period. It represents the net increase in the country's capital stock and is a key indicator of the level of investment taking place in an economy. Gross Capital Formation involves the accumulation of physical and intangible assets, such as machinery, infrastructure, and technology. This accumulation expands the economy's productive capacity, allowing for increased output and potential growth. In this study the gross capital formation was entered in to the model in the form billion birr.

Trade balance (Trdb): The trade balance, also known as the balance of trade, is a measure of a country's exports minus its imports of goods over a specific period, usually a month or a year. It is a component of the broader balance of payments, which includes not only the trade balance but also the balance of services, income, and transfers. A trade surplus, where a country exports more than it imports, can have both positive and negative effects on economic growth. In this study the trade balance was entered in to the model in the form billion birr.
**Pre-estimation Test**
We have conducted stationarity test by using Augmented Dickey-Fuller test; maximum Lag length Selection was determined by using Akaike Information Criterion (AIC) before conducting an estimation.

**Post-estimation Test**
After performing the regression we have conducted the following post-estimation test: normality test by using Jarque-Bera normality test; model stability test by using cumulative sum square of residuals; autocorrelation test by using LM test; heteroscedasticity test by using White test; co-integration test by using bond test; and finally Granger causality test.

**Conceptual Framework**
The main objective of this study is to investigate the impacts of monetary policy of Ethiopia. Based on the objective of the study, the following conceptual framework was modeled. As previously discussed in the related literatures review parts, monetary policy impacts economic growth of Ethiopia through monetary policy variable (broad money supply, deposit interest rate, lending interest rate, reserve required, open market operations). In addition to policy variables, other potential control macro-economic variables like trade balance, gross capital formation, final consumption expenditure are believed to influence the economic growth. The conceptual framework indicates that the monetary policy is affected the real gross domestic product through broad money supply, deposit interest rate, lending interest rate, amount of reserve required, open market operations by controlling the effect of potential macroeconomics variables such as trade balance, gross capital formation, final consumption expenditure (see Figure 1).
RESULTS AND DISCUSSION

Pre- Estimation Diagnosis Test

Unit Root Test Result

Prior to conducting any meaningful regression analysis involving time series variables, it is imperative to assess the presence of unit roots in these variables. If time series data are not stationary, it implies a lack of mean reversion, indicating that the data generating process does not revolve around zero, rendering it unsuitable for forecasting purposes. Therefore, it is crucial for the variables in the analysis to exhibit stationarity. Analyzing non-stationary variables can lead to spurious regression results, where seemingly related variables provide inconclusive inferences. To mitigate this issue, it is essential to employ appropriate tests for stationarity on the variables of interest.

Table 1: Unit root test of variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF test statistics at I(0) level</th>
<th>ADF test statistics at I(1) level</th>
<th>Order of Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test statistic with Intercept</td>
<td>Test statistic with Trend &amp; intercept</td>
<td>Test statistic with Intercept</td>
</tr>
<tr>
<td>lnRGDP</td>
<td>0.32</td>
<td>-1.968</td>
<td>-3.593**</td>
</tr>
<tr>
<td>lnM2</td>
<td>2.01</td>
<td>-1.717</td>
<td>-3.490**</td>
</tr>
<tr>
<td>Dint</td>
<td>-3.285**</td>
<td>-3.194*</td>
<td>I(0)</td>
</tr>
<tr>
<td>Lint</td>
<td>-1.759</td>
<td>-2.4</td>
<td>-3.515**</td>
</tr>
<tr>
<td>lnRR</td>
<td>-0.197</td>
<td>-2.582</td>
<td>-3.562**</td>
</tr>
<tr>
<td>lnOmo</td>
<td>-3.657**</td>
<td>-5.836***</td>
<td>I(0)</td>
</tr>
<tr>
<td>lncon</td>
<td>0.918</td>
<td>-2.257</td>
<td>-3.064**</td>
</tr>
<tr>
<td>Incapf</td>
<td>0.031</td>
<td>-1.744</td>
<td>-3.182**</td>
</tr>
<tr>
<td>Trdgbillion</td>
<td>-1.272</td>
<td>-3.217</td>
<td>-4.200***</td>
</tr>
</tbody>
</table>

Source: Authors Computation from Eviews 9, 2024

NB: *** and ** indicated statistically significant at 1% and 5% level of significant respectively

In this study, the initial step involved testing for unit roots to determine the stationarity status of the variables, utilizing the Augmented Dickey-Fuller (ADF) and co-integration tests. The primary objective of stationarity testing is to eliminate the risk of spurious regression. The results of the unit root tests, presented in Table 1, indicate the ADF test outcomes for each variable under two scenarios: with intercept and with intercept and trend. The findings reveal that all variables exhibit integration of order zero or one. Among the variables included in the model, deposit interest rate and open market operation demonstrate stationarity at the level, while real GDP, broad money
supply, reserve required, final consumption expenditure, gross capital formation, and trade balance achieve stationarity after first differencing.

**Lag Selection Criteria**
The outcomes of both the bound co-integration test and error correction estimation within the framework of an ARDL model hinge on the number of lags incorporated in the endogenous variables. This underscores the importance of establishing the optimal lag order before conducting tests for vector error correction and co-integration. Various criteria, such as Likelihood Ratio test statistics (LR), Final Prediction Error (FPE), Akaike Information Criteria (AIC), Schwarz Information Criteria (SIC), and Hannan-Quinn Information Criteria (HQ), can be employed to ascertain the most suitable lag order. Table 2 illustrates that, at a 5% level of significance, FPE, AIC, SC, and HQ uniformly advocate a lag of two. Five out of the six information criteria recommend a lag of two as the optimal length. Consequently, the preferred lag for this study is determined to be lag 2.

Table 2: Optimal lag order selection criteria

<table>
<thead>
<tr>
<th>Lags</th>
<th>Log likelihood</th>
<th>LR</th>
<th>FPE</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>54.93401</td>
<td>NA</td>
<td>0.002254</td>
<td>-3.281001</td>
<td>-2.852792</td>
<td>-3.150093</td>
</tr>
<tr>
<td>1</td>
<td>60.85225</td>
<td>7.609173*</td>
<td>0.001601</td>
<td>-3.632304</td>
<td>-3.156517</td>
<td>-3.486851</td>
</tr>
<tr>
<td>2</td>
<td>62.59392</td>
<td>2.114875</td>
<td>0.001536*</td>
<td>-3.685280*</td>
<td>-3.161914*</td>
<td>-3.525282*</td>
</tr>
</tbody>
</table>

Source: Own computation from Eview 9, 2024

**ARDL Bound Co-integration Test**
In scenarios where the series exhibit different orders, the Bound Test for co-integration, as proposed by Pesaran et al. (2001), becomes more suitable. This test is instrumental in assessing the presence of co-integration in the long-run form of a model. The F-statistic serves as a crucial metric for evaluating the existence of long-run co-integration. Specifically, the F-statistic value is examined in relation to the lower bound (I0) and the range between the lower and upper bounds (I1). If the F-statistic falls below the lower bound (I0), we retain the null hypothesis. The result is inconclusive when the F-statistic falls between the lower and upper bounds. Conversely, we reject the null hypothesis when the F-statistic exceeds the upper bound (I1).

Table 3: Bound co-integration tests

<table>
<thead>
<tr>
<th>Bound</th>
<th>Critical values</th>
<th>F-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Upper Bound</td>
<td>3.06</td>
<td>3.39</td>
</tr>
</tbody>
</table>
The presented Table 3, demonstrates that the computed F-statistic for the bound test, 18.656, surpasses both the lower and upper bound critical values at every significance level. Consequently, the null hypothesis suggesting no co-integration rejected across all levels of significance. This implies the presence of a co-integration relationship among the variables or a stable long-run equilibrium. Specifically, the null hypothesis is rejected at the 1%, 2.5%, 5%, and 10% significance levels, indicating the existence of a co-integration relationship between RGDP and the other explanatory variables. Therefore, we reject the null hypothesis of no co-integration, signifying the variables' long-run relationship and validating the feasibility of estimating a long-run ARDL model, also known as an Error Correction Model (ECM).

**Short Run Error Correction Model (ECM)**

Given that the Bounds co-integration test results reveal a long-term connection between the variables, the subsequent step involves estimating an error correction model. Consequently, an examination of the short-term effects of monetary policy on Ethiopia's economic growth is conducted using the Error Correction Model (ECM) based on the ARDL approach. This model indicates the speed at which adjustments occur to restore equilibrium in the dynamic model. The coefficient of the ECM, expected to be negative and statistically significant, demonstrates how rapidly the dependent variable converges to long-run equilibrium, signifying the elimination of speed of disequilibrium.

Table 4 demonstrates that the error correction coefficient of real gross domestic product (RGDP) is negatively signed and statistically significant at the 5% level, affirming the co-integration between dependent and independent variables. The estimated short-run coefficient for the error correction term is -0.606, suggesting a high speed of adjustment to long-run equilibrium following disturbances in the short run. The negative value of the coefficient indicates that real GDP is converges towards its long-run equilibrium by approximately 60.6% each year. However, the speed of adjustment towards its own long-run equilibrium is moderately high, as it takes nearly 1 years and eight months to fully adjust in response to shocks introduced in the model. This highly significant error correction term further validates the presence of a stable long-run relationship among the variables (Pesaran et al., 2001).
Broad money has negative and significant impact on real GDP in Ethiopia in short run, that is a 1 percentage-point increase in broad money supply, will decrease real GDP by 0.4 percentage points in the short run (see Table 4). An increase in the money supply can lead to inflated asset prices, such as stocks or real estate. When these prices are artificially high, it can create a bubble, and a subsequent correction in these markets could result in financial instability. The bursting of asset bubbles can lead to a decline in household wealth, reducing consumer spending and business investment, which are vital components of real GDP. A surge in the money supply without a corresponding increase in the demand for goods and services can lead to inflation. Inflation erodes the purchasing power of money, leading to uncertainty and potentially reducing consumer and business confidence. High levels of inflation can also disrupt economic planning, making it difficult for businesses to set prices and allocate resources efficiently. This finding is supported by (Abdeta, 2021; Hunibacheh, 2021; Tan et al., 2020; Woldesemayat, 2020). It is also contrast with (Abdeta, 2021; G. TADESSE, 2020).

Table 4: Estimated short run error correction model (ECM)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Std. Error</th>
<th>Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error correction term (-1)</td>
<td>-0.606**</td>
<td>0.183</td>
<td>-1.1915165</td>
</tr>
<tr>
<td>Ln Real GDP (-1)</td>
<td>0.143</td>
<td>0.091</td>
<td>-0.1467404</td>
</tr>
<tr>
<td>Ln Broad money (-1)</td>
<td>-0.473**</td>
<td>0.097</td>
<td>-0.7829607</td>
</tr>
<tr>
<td>Ln Broad money (-2)</td>
<td>-0.400***</td>
<td>0.066</td>
<td>0.6093345</td>
</tr>
<tr>
<td>Deposit interest rate (-1)</td>
<td>0.050**</td>
<td>0.011</td>
<td>0.0167875</td>
</tr>
<tr>
<td>Deposit interest rate (-2)</td>
<td>0.020*</td>
<td>0.008</td>
<td>-0.0031667</td>
</tr>
<tr>
<td>Lending interest rate (-1)</td>
<td>-0.038</td>
<td>0.020</td>
<td>-0.1032517</td>
</tr>
<tr>
<td>Lending interest rate (-1)</td>
<td>0.002</td>
<td>0.009</td>
<td>-0.0267733</td>
</tr>
<tr>
<td>Ln Required reserve (-1)</td>
<td>0.092**</td>
<td>0.019</td>
<td>0.0325039</td>
</tr>
<tr>
<td>Ln Open market operation (-1)</td>
<td>0.046**</td>
<td>0.012</td>
<td>0.0079865</td>
</tr>
<tr>
<td>Ln Open market operation (-2)</td>
<td>0.041***</td>
<td>0.007</td>
<td>0.0190010</td>
</tr>
<tr>
<td>Ln Aggregate consumption (-1)</td>
<td>-0.067</td>
<td>0.053</td>
<td>-0.2348679</td>
</tr>
<tr>
<td>Ln Capital formation (-1)</td>
<td>0.187**</td>
<td>0.040</td>
<td>0.0591983</td>
</tr>
<tr>
<td>Ln Capital formation (-2)</td>
<td>0.202***</td>
<td>0.032</td>
<td>0.1014661</td>
</tr>
<tr>
<td>Trade balance (-1)</td>
<td>-0.0007**</td>
<td>0.0001</td>
<td>-0.0011758</td>
</tr>
<tr>
<td>Trade balance (-2)</td>
<td>-0.0005**</td>
<td>0.0001</td>
<td>-0.0010301</td>
</tr>
<tr>
<td>Constant</td>
<td>7.424*</td>
<td>3.037</td>
<td>-2.2396060</td>
</tr>
</tbody>
</table>

Source: Own computation from Stata-17, 2024

NB: *** and ** indicated statistically significant at 1% and 5% level of significant respectively.
The estimated coefficient of the deposit interest rate term is positively and statistically significant, which means that a 1-percentage-point increase in deposit interest rate, leads to increase real GDP by 0.05 percentage points in the short run (see Table 4). Higher deposit interest rates can incentivize individuals and households to save more money in banks. This increased savings can provide financial institutions with more funds for lending, which, in turn, can boost investment and economic activity. Banks play a crucial role in the financial intermediation process. When deposit interest rates are higher, banks are more likely to attract deposits, and these deposits can be used to provide loans for businesses looking to invest in various projects. Increased investment spending by businesses can lead to the creation of new jobs, higher production, and overall economic growth. While higher deposit interest rates encourage saving, they can also increase the interest income earned by savers. When individuals receive more interest on their savings, it may positively impact their disposable income. Higher disposable income can lead to increased consumer spending, contributing to higher demand for goods and services in the economy. This result is similar with (Akpunonu & Orajaka, 2021; Hailu & Debele, 2015; Obeid & Awad, 2017; Yenus, 2018). Contrast with (Gnahe & Huang, 2020; Kamaan & Nyamongo, 2014).

The short-run impact of required reserve on real GDP is found positive and statistically significant, which means that a 1-percentage-point increase in required reserve increase real GDP by 0.09 percentage points in the short run (see Table 4). Requiring banks to hold higher reserves can contribute to financial stability by ensuring that financial institutions have a more substantial cushion against unexpected shocks. This, in turn, enhances confidence in the banking sector, encouraging lending and investment activities that support economic growth. Requiring banks to maintain higher reserves may encourage more prudent lending practices. When banks have a larger buffer of reserves, they may be better equipped to manage risks associated with loans. This can lead to more responsible lending, reducing the likelihood of financial crises and supporting a stable economic environment. Higher required reserves can act as a monetary policy tool to control inflation. By reducing the amount of money available for lending, it can help manage inflationary pressures in the economy. Controlling inflation is essential for maintaining price stability, which is conducive to sustained economic growth. This finding supported by (Akpunonu & Orajaka, 2021; Gnahe & Huang, 2020; Hunibachew, 2021; Kamaan & Nyamongo, 2014).
Open market operations has positive and significant impact on the real GDP in short run, that is a 1-percentage-point increase in RGDP, will increase real inflation by 0.04 percentage points in the short run (see Table 4). Open market operations, including the sale of treasury bills, are tools used by central banks to manage inflation. By reducing the money supply through treasury bill sales, the central bank aims to control inflationary pressures in the economy. Controlling inflation is crucial for maintaining price stability, and a stable price environment can positively influence investor and consumer confidence, supporting economic growth. When the government issues treasury bills, it is essentially borrowing from the public. The funds raised through these sales can be used to finance government expenditures, including infrastructure projects and public services. Increased government spending can stimulate economic activity in the short run, leading to higher aggregate demand and potentially boosting real GDP. Open market operations, when effectively communicated, can influence economic agents' expectations and confidence. If investors and businesses interpret treasury bill sales as a signal of the central bank's commitment to economic stability, it may positively impact investment and economic activities. This finding supported by (Abdeta, 2021; Cetin, 2016; Duskobilov, 2017; Hailu & Debele, 2015; Noman & Khudri, 2015; Obadeyi et al., 2016).

Capital formation has positive and significant impact on real GDP in short run at 1% level of significance, that is a 1-percentage-point increase in Capital formation, will increase real GDP by 0.20 percentage points in the short run (see Table 4). Capital formation often involves investments in new machinery, technology, and equipment. These investments can enhance productivity by improving the efficiency of production processes. Higher productivity means that more output can be produced using the same amount of resources, leading to an increase in real GDP (Duskobilov, 2017; Froyen & Guender, 2019; Hawitibo, 2023).

Trade balance has negative and significant impact on real GDP in short run at 1% level of significance, that is a 1-percentage-point increase in Trade balance, will increase real GDP by 0.0007 percentage points in the short run (see Table 4). A trade deficit implies that a country is importing more goods and services than it is exporting. When a significant portion of domestic spending is directed towards imports, it can lead to a reduction in aggregate demand for domestically produced goods and services. The decrease in demand for domestic products can result in lower production levels, contributing to a negative impact on real GDP. This finding
support by (Hailu & Debele, 2015; Noman & Khudri, 2015; Nurgazina et al., 2021; Obeid & Awad, 2017).

**Long Run Autoregressive Distribution Lag (ARDL) Model**
The stationarity test revealed that the variables were stationary both at the level and after taking the first difference. Furthermore, the F statistic result, signifying the presence of long-run co-integration among the variables, provided confirmation to proceed with estimating the long-run coefficients of the model.

Money supply has positive and significant impact on the real GDP in long run, that is a 1-percentage-point increase in money supply, will increase real economic growth by 0.7 percentage points in the long run (see Table 5).

A growing money supply can enhance consumer confidence and increase spending. As individuals have more money in hand, they may be more willing to make purchases, leading to higher consumer spending. This increased demand for goods and services can positively impact real GDP. A higher money supply can result in increased liquidity in the financial system, making credit more accessible. This availability of credit can stimulate borrowing for both consumers and businesses, supporting investments, purchases, and economic activities that contribute to long-term GDP growth. Adequate money supply is essential for facilitating transactions and trade. In a growing economy, increased money supply can support the expansion of business activities, both domestically and internationally, fostering trade relationships and contributing to long-term GDP growth. This finding supported by (Akpunonu & Orajaka, 2021; Hunibachew, 2021; Kamaan & Nyamongo, 2014; Obeid & Awad, 2017)

The long-run impact of deposit interest rate on real GDP is found to be negative, which means that a 1-percentage-point increase in deposit interest rate will decrease real GDP by 0.07 percentage points in the long run (see Table 5).

High deposit interest rates can lead to a decrease in investment levels in an economy. When deposit interest rates are high, individuals and businesses are incentivized to save rather than invest, as they can earn higher returns from their savings. This reduced investment can lead to lower capital accumulation, decreased productivity, and ultimately hinder long-term economic growth. In the Ethiopian context, high deposit interest rates may discourage borrowing for investment purposes, particularly among small and medium-sized enterprises (SMEs) that rely on access to affordable credit for business expansion and capital investment. As a result, the overall level of investment in
productive assets may decline, influencing the economy’s capacity for sustained real GDP growth over the long term. Moreover, high deposit interest rates can also influence consumer behavior. When savings offer attractive returns due to high deposit interest rates, individuals may opt to save more and consume less. This can lead to a decrease in aggregate demand, which in turn affects overall economic activity and output. This finding is supported by (Abdeta, 2021; Aslam & Awan, 2018; Gnahe & Huang, 2020; Hailu & Debele, 2015; Obeid & Awad, 2017; Srithilat & Sun, 2017).

Table 5: Estimated Long Run Autoregressive Distribution Lag (ARDL) Model:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Std. Error</th>
<th>Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ln Broad money</td>
<td>0.703**</td>
<td>0.132</td>
<td>0.2851866 to 1.1225430</td>
</tr>
<tr>
<td>Deposit interest rate</td>
<td>-0.078**</td>
<td>0.016</td>
<td>-0.1309060 to -0.0268787</td>
</tr>
<tr>
<td>Lending interest rate</td>
<td>0.105</td>
<td>0.023</td>
<td>0.0340356 to 0.1776623</td>
</tr>
<tr>
<td>Ln Required reserve</td>
<td>-0.109**</td>
<td>0.029</td>
<td>-0.2038051 to -0.0161905</td>
</tr>
<tr>
<td>Ln Open market operation</td>
<td>-0.052</td>
<td>0.035</td>
<td>-0.1633580 to 0.0586421</td>
</tr>
<tr>
<td>Ln Aggregate consumption</td>
<td>-0.034</td>
<td>0.087</td>
<td>-0.3115742 to 0.2434021</td>
</tr>
<tr>
<td>Ln Capital formation</td>
<td>0.056</td>
<td>0.096</td>
<td>-0.2499048 to 0.3637716</td>
</tr>
<tr>
<td>Trade balance</td>
<td>0.001</td>
<td>0.000</td>
<td>0.0004024 to 0.0031181</td>
</tr>
</tbody>
</table>

Source: Own computation from Stata-17, 2024

NB: *** and ** indicated statistically significant at 1% and 5% level of significant respectively.

The long-run impact of required reserve on real GDP is found to be negative and statistically significant, which means that a 1-percentage-point increase in required reserve coefficient decreases real GDP by 0.109 percentage points in the long run (see Table 5). A higher required reserve amount can result in reduced lending by banks, as they are required to hold more of their deposits in reserve. This can lead to lower investment in the economy, particularly in the productive sectors such as manufacturing, agriculture, and infrastructure. Lower investment can result in lower productivity growth and slower real GDP growth in the long run. As banks hold more of their deposits in reserve, they have less funds available for lending to consumers. This can lead to reduced consumer spending, which in turn can affect businesses’ sales and profits. Lower consumer spending can lead to lower production levels and slower real GDP growth. A higher required reserve amount can make the economy more vulnerable to shocks, such as fluctuations in international capital flows or changes in global economic conditions. This can lead to increased volatility in the real GDP growth rate, making it more difficult for the Ethiopian economy to maintain a stable growth trajectory. This finding support by (Aslam & Awan, 2018; Benti, 2014; Cetin, 2016; Lao, 2017; Tan et al., 2020)
Post Estimation Diagnosis Test
Serial Correlation Test
In Table 6, the Breusch-Godfrey serial correlation LM Test results clearly show a p-value of 0.8740 (87.4%), which exceeds 5%. Therefore, we cannot reject the null hypothesis stating the absence of serial correlation. Consequently, the model is free from serial correlation problems.

Table 6: Breusch-Godfrey Serial Correlation LM Test

<table>
<thead>
<tr>
<th>lags(p)</th>
<th>chi2</th>
<th>df</th>
<th>Prob &gt; chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.025</td>
<td>1</td>
<td>0.8740</td>
</tr>
</tbody>
</table>

Source: Own computation from Stata-17, 2024

Heteroscedasticity Test
In Table 7, the p-value obtained from Cameron & Trivedi's decomposition of IM-test exceeds 5%, signifying that we can accept the null hypothesis. The null hypothesis asserts the absence of heteroscedasticity in residuals, which is a desirable outcome. Consequently, the model is devoid of heteroscedasticity issues.

Table 7: Heteroscedasticity Test: Cameron & Trivedi's decomposition of IM-test

<table>
<thead>
<tr>
<th>Source</th>
<th>chi2</th>
<th>Degree of freedom</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heteroscedasticity</td>
<td>28.00</td>
<td>27</td>
<td>0.4110</td>
</tr>
<tr>
<td>Skewness</td>
<td>26.52</td>
<td>24</td>
<td>0.3275</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>0.08</td>
<td>1</td>
<td>0.7812</td>
</tr>
<tr>
<td>Total</td>
<td>54.59</td>
<td>52</td>
<td>0.3762</td>
</tr>
</tbody>
</table>

Source: Own computation from Stata-17, 2024

Ramsey RESET Test
In Table 8, the results of the Ramsey RESET test reveal a p-value of 0.8480 (84.80%), exceeding the 0.05 level of significance. In this instance, we should retain the null hypothesis, indicating that the model is devoid of omitted variable bias and has been well specified.

Table 8: Ramsey RESET Test for Model Specification

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>t-statistic</td>
<td>1.87987</td>
<td>23</td>
<td>0.8980</td>
</tr>
<tr>
<td>F-statistic</td>
<td>1.73853</td>
<td>(1, 23)</td>
<td>0.8480</td>
</tr>
</tbody>
</table>

Source: Own computation from Eview-9, 2024

Jarque-Berra Normality Test
The results of the Jarque-Bera normality test in Table 9 indicate a p-value of 0.8337, surpassing the 5% significance level. This suggests that the residuals follow a normal distribution.

Table 9: Jarque-Bera Normality Test

<table>
<thead>
<tr>
<th>lags(p)</th>
<th>chi2</th>
<th>df</th>
<th>Prob &gt; chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.3638</td>
<td>2</td>
<td>0.8337</td>
</tr>
</tbody>
</table>

Source: Own computation from Stata-17, 2024

Model Stability Test
The figure 2 illustrates the plot of cumulative sum square of recursive residuals, showcasing a graphical test of stability. This is evident from the oscillation of the calculated statistics between the critical bounds at the 5% significance level. Since the plots of CUSUM square consistently stay within the specified lines, it confirms that the equation is correctly specified, and the model is deemed stable.

Figure 2: Model Stability test: CUSUM square test

Source: Own computation from Stata-17, 2024

Granger Causality Tests
The Granger causality test result shows that there is bidirectional causality between monetary policy (broad money supply, lending interest rate, reserve required amount open market operation) and economic growth; however there was unidirectional relationship between deposit interest rate and economic growth. There is also bidirectional relationship between control policy (gross capital formation and tared balance) and economic growth. There is unidirectional causality between aggregate consumption and economic growth (RGDP). There is bidirectional causality between monetary policies (between open market operation, broad money supply, deposit interest rate, and lending interest rate,) except there is unidirectional relationship between required reserve and broad money supply; between required reserve and deposit interest rate.
CONCLUSION AND POLICY IMPLICATIONS

Conclusion
Numerous scholarly studies have sought to examine the impact of monetary policy on economic growth, yet a unanimous consensus remains elusive. This study delves deeply into the assessment of how monetary policy influences the economic growth of Ethiopia, considering both short-run and long-run dynamics. To accomplish this objective, the study utilizes the Auto Regressive Distributed Lagged (ARDL) model, investigating the hypothesized relationships between monetary policy variables (money supply, interest rate, open market operations, and reserve requirements) and Ethiopia's economic growth, as suggested by both theoretical and empirical literature.

To address the issue of stationarity in the series, the Augmented Dickey-Fuller (ADF) test is employed on data sourced from various outlets. The test results confirm that the series exhibit integration of order I(0) and I(1). Following the Akaike Information Criteria (AIC) recommendation, a lag length of 2 is determined as the optimal choice. Additionally, ARDL bound testing techniques identify the presence of a long-run relationship among the variables. This is supported by the co-integration of the variables, as evidenced by the F-statistic surpassing its upper bound critical values in the test. Importantly, post-estimation diagnostic tests affirm that the model successfully satisfies all evaluation criteria.

In short run, deposit interest rate, reserve required amount and open market operation have positive and statistically significant effects on real GDP growth of Ethiopia, however, money supply have negative and statistically significant effects on real GDP growth of Ethiopia.

In long run, money supply have positive and statistically significant effects on real GDP growth of Ethiopia, however, deposit interest rate and reserve required have negative and statistically significant effects on real GDP growth of Ethiopia.

To sum up, in short run contractionary monetary policy (increase interest rate, reserve required amount and open market operation) were favorable and effective to improve economic growth. Even though, in long run expansionary monetary policy (increase money supply) was favorable and effective to improve economic growth.

The Granger causality test result shows that there is bidirectional causality between monetary policy (broad money supply, lending interest rate, reserve required amount open market operation)
and economic growth; however there was unidirectional relationship between deposit interest rate and economic growth. There is also bidirectional relationship between control policy (gross capital formation and tared balance) and economic growth.

**Policy Recommendation**

Based on the findings you provided, it appears that the impact of certain monetary policy tools on the real GDP growth of Ethiopia varies in the short run versus the long run. Here are policy recommendations based on these findings:

Short run policies:

➢ Deposit interest rate: Given that the deposit interest rate has a positive and statistically significant effect on real GDP growth in the short run, policymakers may consider using this tool to stimulate economic activity during periods of economic downturn or instability. Lowering deposit interest rates could encourage spending and investment.

➢ Reserve required amount: Similar to the deposit interest rate, the reserve required amount has a positive and statistically significant effect on real GDP growth in the short run. Adjusting reserve requirements downward might provide banks with more liquidity, encouraging them to lend and stimulate economic activity.

➢ Open market operations: The positive and statistically significant effect of open market operations on real GDP growth suggests that policymakers can use this tool to influence economic activity in the short run. Implementing expansionary open market operations can inject liquidity into the economy, fostering growth.

➢ Money supply: In the short run, the negative effect of money supply on real GDP growth suggests that caution should be exercised when expanding the money supply. Policymakers might need to carefully balance the benefits of increased liquidity against potential negative consequences.

Long run policies:

➢ Money supply: In the long run, the positive and statistically significant effect of money supply on real GDP growth indicates that a more expansionary monetary policy could be beneficial for sustained economic growth. Policymakers may consider strategies to gradually increase the money supply over time.
Deposit interest rate and reserve required amount: The negative effects of deposit interest rates and reserve requirements on real GDP growth in the long run suggest that caution should be taken in using these tools as long-term strategies. Policymakers may want to avoid prolonged periods of high deposit interest rates or restrictive reserve requirements, as they could hinder economic growth.

To sum up, for short run economic improvement, a contractionary monetary policy is preferable to an expansionary one. Conversely, for long run economic enhancement, an expansionary monetary policy is favored over a contractionary approach.

**Declarations**

**Funding:** This research received no funding.

**Conflicts of interest:** No potential conflict of interest was reported by the author.

**Data availability:** All relevant data are available upon reasonable request.

**Author Contributions:** Conceptualization, Data curation, Investigation, Writing – original draft, Writing done by Dagmawe Menelek; Data curation, Formal analysis, Funding acquisition, Investigation, Supervision by Ahmed Abduletif; Writing – review & editing; Project administration, Resources, Software, Supervision, Validation, Visualization, by Yibeltal Walle; Writing – review & editing: Data curation, Investigation, Formal analysis by Fentahun Baylie; Visualization: Validation, Writing – review & editing, Methodology, Data curation by Ermias Berihun.

**ABBREVIATIONS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADF</td>
<td>Augmented Dickey-Fuller</td>
</tr>
<tr>
<td>AIC</td>
<td>Akaike Information Criterion</td>
</tr>
<tr>
<td>ARDL</td>
<td>Autoregressive Distributed Lag</td>
</tr>
<tr>
<td>ECM</td>
<td>Error Correction Model</td>
</tr>
<tr>
<td>FPE</td>
<td>Final Prediction Error</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>HQ</td>
<td>Hannan-Quinn Information Criteria</td>
</tr>
<tr>
<td>LR</td>
<td>Likelihood Ratio test statistics</td>
</tr>
<tr>
<td>OLS</td>
<td>Ordinary Least Squares</td>
</tr>
<tr>
<td>OMO</td>
<td>Open Market Operation</td>
</tr>
<tr>
<td>RR</td>
<td>Reserve Required</td>
</tr>
<tr>
<td>SIC</td>
<td>Schwarz Information Criteria</td>
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REFERENCES


