

MAKERERE



UNIVERSITY

IMPACT OF MONETARY POLICY ON THE ECONOMIC GROWTH OF UGANDA

BY

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DECLARATION

I, **Tumukunde Susan**, declare to the best of my knowledge that the study titled "Impact of Monetary Policy on Economic Growth in Uganda" is my dissertation and represents my effort and original work and it has never been submitted to any other institution for any award.

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(Signature)

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APPROVAL

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DEDICATION

I dedicate this dissertation to my father and friends for their endless support and encouragement.

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I am grateful to the Almighty God for the knowledge and spiritual guidance. My heartfelt thanks go to my supervisor Dr. Muwanga John for the relentless support, words of wisdom and guidance throughout. I also express my sincere appreciation to my father for his constant support and encouragement during my studies. I extend my gratitude to the College of business and Management Sciences for their patience and assistance. Finally, I acknowledge the moral support of my fellow students, who have been a source of encouragement throughout the program. May God bless you all.

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ABSTRACT

Monetary policy tools such as interest rates and money supply play a vital role in maintaining economic stability and promoting growth. This study examines the impact of monetary policy on economic growth in Uganda, focusing on the period from 1993 to 2023. The specific objectives of the study were: (i) to investigate the trend of monetary policy and economic growth during the study period, (ii) to examine the long-run impact of interest rate changes on Uganda's economic growth, and (iii) to analyze the short-run impact of money supply on economic growth. Data for the study were obtained from the Bank of Uganda and the World Bank. The research applied three levels of analysis: univariate, bivariate, and multivariate. Univariate analysis involved descriptive statistics to summarize key variables, while bivariate analysis used Pearson correlation to evaluate the relationships between pairs of variables, including GDP, interest rates, and money supply.

At the multivariate level, the study employed the Augmented Dickey-Fuller and Phillips-Perron tests to ensure the stationarity of the time series data. Johansen cointegration tests were conducted to identify long-term equilibrium relationships, and Granger causality tests explored causal links between monetary policy and economic growth. The Autoregressive Distributive Lag model was then used to analyze both long-run and short-run dynamics.

Descriptive statistics showed that GDP growth and money supply were near-symmetrically distributed, but GDP growth deviated from normality, requiring robust analytical methods. Pairwise correlations revealed a strong positive link between money supply and GDP growth, while the relationship with interest rates was weak and negative. Stationarity tests confirmed non-stationarity, necessitating advanced models like ARDL, which found money supply to have a significant long-term positive impact on GDP growth. Cointegration analysis showed no evidence of a long-run equilibrium among the variables, emphasizing short-term dynamics. Granger causality indicated a mutual influence between GDP growth and money supply, with interest rates playing a limited role. Overall, the study concluded that money supply is a critical driver of GDP growth, while interest rates had minimal influence, suggesting monetary policy should prioritize money supply management to stimulate economic growth.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Monetary policy tools such as interest rates, money supply, and inflation control are crucial for maintaining economic stability and fostering growth. Understanding the relationship between these tools and economic growth is essential for developing effective economic policies, particularly in developing countries like Uganda. This study aims to investigate the impact of monetary policy on economic growth in Uganda, drawing on both theoretical frameworks and empirical evidence.

1.2 Background of the Study

1.2.1 Global Perspective

Globally, the role of monetary policy in economic growth has been extensively studied and documented. In developed economies, central banks such as the Federal Reserve in the United States and the European Central Bank use sophisticated monetary policy tools to manage economic cycles, stimulate growth, and control inflation. For example, León and González (2022) found that expansive monetary policy dynamizes economic growth after the Major Recession, but has no significant effect on inflation. Also, Amaral et al. (2022) expansionist monetary policy positively impacts economic growth in the short term but affects inflation in the long term. This makes it completely difficult to understand the long-term impact that it has on economic growth. This was supported by Twinoburyo and Odhiambo (2018) who asserted that monetary policy matters for growth both in the short run and long run, mainly in financially developed economies with fairly independent central banks. In addition, high interest rates can dampen inflation but may also increase borrowing costs, affecting consumer spending and investment levels, and thereby influencing economic growth (Bhattarai, 2011). Similarly, in the UK, the depreciation of the Sterling pound has been shown to enhance international competitiveness and contribute

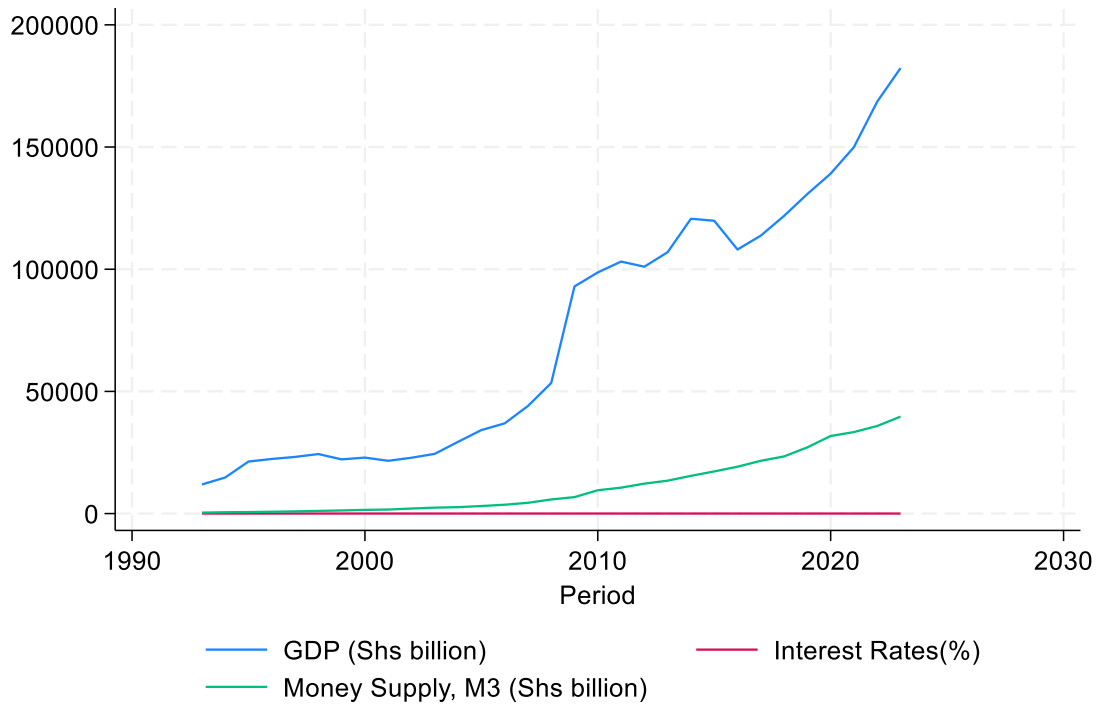
to economic growth, though inflation resulting from money growth and higher interest rates can negatively impact growth (Bhattarai, 2011).

1.2.2 Regional Perspective

In sub-Saharan Africa, the effectiveness of monetary policy varies due to differences in economic structures, financial market development, and institutional capacities. For example, some scholars argue that contractionary monetary policy in sub-Saharan African countries leads to reduced investment and slower economic growth (Ndikumana, 2016). Similarly, Modugu and Dempere (2022) stressed that contractionary monetary policies like increasing monetary policy rates lead to credit contraction in Sub-Saharan African countries, albeit with a weak effect. Also, Fiador and Biekpe (2015) noted that contractionary monetary policy in sub-Saharan Africa leads to an easing of exchange market pressure, potentially hindering economic growth. Nigeria found that while broad money supply positively impacts economic growth in the long run, inflation and interest rates can negatively affect growth, especially in the short run (Gatawa et al., 2017). This highlights the need for a balanced approach to monetary policy that considers both growth and inflation control. In South Africa, the impact of money supply on economic growth and inflation was analyzed using Markov-switching dynamic regression models. The study found that an increase in money supply could lead to a decrease in GDP growth under certain conditions, illustrating the complex dynamics between monetary policy and economic performance (Buthelezi, 2023). This implies that in Sub-Saharan Africa, successive rises in monetary policies tend to reduce investment and slow down economic growth due to higher borrowing costs Ndikumana (2016); they lead to credit contraction, although the effect might be weak Modugu and Dempere (2022); and they help ease pressure on the exchange market, which stabilizes the national currency, but this stabilization can potentially hinder economic growth by reducing domestic spending and investment (Fiador & Biekpe, 2015).

1.2.3 National Perspective (Uganda)

Uganda has undertaken significant economic reforms since the early 1990s, transitioning from direct controls to more market-oriented policies. The adoption of inflation targeting in 2011 was aimed at controlling inflation while promoting economic growth. Empirical studies on Uganda's monetary policy indicate that money supply has a significant positive impact on economic growth both in the short run and long run, while interest rates have a positive impact on growth only in the short run (Twinoburyo & Odhiambo, 2017). Uganda's economic management, including monetary policy, has led to high growth rates, low inflation, and steadfast growth in money supply and private sector credit since the early 1990s, but challenges remain (Nyorekwa & Odhiambo, 2014). Monetary policy positively impacts economic growth in Uganda, with money supply having a long-term positive impact and interest rates having a short-term positive impact (Twinoburyo & Odhiambo, 2018). Despite these efforts, challenges such as fiscal dominance, shallow financial markets, and external economic shocks continue to affect the efficacy of monetary policy. Further, since the adoption of IMF/WB structural adjustment programs in the 1990s, Uganda has shifted from direct controls to base money targeting, and more recently, to inflation targeting, which has led to better economic management but still faces significant hurdles (Twinoburyo & Odhiambo, 2017). Below is a graph showing the trend of monetary policies (money supply and interest rates) on economic growth in Uganda over the period of 1990 to 2030.



GDP exhibits a sharp increase starting around 2010, with significant growth continuing to 2025. The Money Supply (M3) also shows a steady increase but at a slower rate compared to GDP. Interest Rates remain relatively stable throughout the entire period, with little to no visible change. When monetary policy factors lag economic growth, it suggests that the central bank may not be adjusting money supply or interest rates in line with the expanding economy. This can lead to inflationary pressures, economic imbalances, and difficulties in stabilizing growth or controlling inflation in the future

1.3 Purpose of the Study

The main purpose of this study was to analyze the impact of monetary policy on economic growth in Uganda.

1.4 Specific Objectives

- i). To investigate the trend of monetary policy and economic growth over the period 1993-2023.

- ii). To examine the long-run impact of interest rate changes on the economic growth of Uganda.
- iii). To analyze the short-run impact of money supply on Uganda's economic growth.

1.5 Research Hypotheses

- i) There is no significant trend in the monetary policy and economic growth of Uganda over the period 1993-2023.
- ii) Interest rate changes have no significant long-run impact on the economic growth of Uganda.
- iii) Money supply has no significant short-run impact on the economic growth of Uganda.

1.6 Scope of the Study

This study covers the period from 1993 to 2023, encompassing various monetary policy regimes adopted by Uganda. It includes an analysis of key monetary policy tools such as interest rates, money supply, and inflation rates, focusing on their macroeconomic impact on Uganda's economic growth.

1.7 Significance of the Study

Understanding the relationship between monetary policy and economic growth in Uganda is crucial for policymakers, economists, and financial institutions. The findings of this study will provide valuable insights into how monetary policy can be optimized to enhance economic growth. It will also contribute to the existing body of knowledge on monetary economics in developing countries, offering recommendations for improving monetary policy frameworks.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review of this study. It covers the theoretical discussions, the empirical literature, and the chapter summary as follows.

2.2 Theoretical Literature Review

2.2.1 Irving Fisher's Quantity Theory of Money (QTM)

The classical monetary theory, famously associated with Irving Fisher's Quantity Theory of Money (QTM), is the first well-known theory of monetary policy. It establishes the foundational relationship between monetary policy (money) and economic variables. In this theory, both the velocity of money and output are considered constant, implying that any increase in the money supply will eventually lead to a proportional increase in prices, as described by the quantity theory. According to this view, long-term growth is influenced only by real factors, and the money supply exhibits neutrality in both the short run and long run (Gali, 2008; Mankiw and Taylor, 2007). Keynes, however, rejected the quantity theory on both theoretical grounds and as a practical policy tool, arguing that the velocity of money is not constant and can be unstable. The QTM also assumes no trade-off between inflation and output (Keynes, 1936). Keynesian economics posits that prices are inflexible, and the money supply adjusts quickly. In this framework, money demand is endogenous, influenced by income and interest rates, as outlined in the liquidity preference theory. This theory also suggests a positive relationship between output and interest rates, depicted by the liquidity preference-money supply relationship, known as the LM curve. The basic IS-LM model assumes a fixed price level, which limits its use to analyzing output in the short run rather than inflation (Hicks, 1937).

2.2.2 The Liquidity Preference Theory

The liquidity preference theory integrates money demand with the amount of money supplied by the central bank to establish the equilibrium level of money. This equilibrium characterizes the interest rate as a monetary phenomenon. In this theory, the money supply is considered exogenous, meaning any increase in it will result in a lower interest rate, aligning the quantity of money demanded with the supply. Lower interest rates positively affect the marginal efficiency of capital and investment, which in turn leads to an expansion in output. However, the Hicksian IS/LM interpretation of Keynes's general theory has been empirically challenged (Robinson, 1962; Leijonhufvud, 1968; Backhouse and Bateman, 2011). Keynes expressed doubt about the efficacy of monetary policy in situations where the economy is trapped in a liquidity trap and when financial markets are uncertain. He supported a greater emphasis on fiscal policy. The notion of an exogenous money supply, present in both classical and Keynesian theories, has been questioned and dismissed by subsequent modern theories (Romer, 2006). Additionally, prolonged low interest rates in Keynesian theory are believed to lead to distortions, such as unsustainable asset price bubbles (Schwartz, 2009).

2.2.3 The Monetarist Theory

The monetarist theory emerged in the 1950s, building on the Quantity Theory of Money (QTM) and maintaining that the velocity of money is generally stable, which suggests that nominal income largely depends on the money supply (Friedman and Schwartz, 1963; Friedman 1968, 1970). Monetarists recognized the trade-off between inflation and output but revised the Phillips curve to focus on real wages instead of nominal wages (Gottschalk, 2005). Equilibrium in the labor market is achieved at the natural rate, with the assumption of sticky wages. These nominal rigidities in wages and prices mean that monetary policy can influence real income in the short run (stabilization); an increase in the money supply temporarily boosts real output (GDP) and employment but has no long-term impact due to the offsetting effect of rising prices. In the long run, increasing the money supply is inflationary, leading to the assumption of long-run monetary neutrality. Recent literature provides considerable evidence supporting this view (see Bernanke and Mihov, 1998;

Bullard, 1999; Nogueira, 2009). Monetarism has faced challenges due to technological advancements and the instability of the money-demand function (White, 2013). It also assumes an exogenous money supply, a notion that has been disputed both theoretically and empirically (Romer, 2006). The idea of a constant velocity of money has also been questioned (Mishkin, 2007). The empirical literature has further challenged the concept of long-run neutrality: Evans (1996) argues that money is not neutral in the long run if it is not neutral in the short run, particularly when growth is endogenous. However, if growth is exogenous, long-run neutrality is observed.

2.3 Empirical Literature Review

The empirical literature covers the monetary policy transmission mechanism in Uganda, studies showing the relationship between the interest rate and economic growth, money supply and economic growth, and inflation on economic growth as follows.

2.3.1 Monetary Policy Transmission Mechanisms in Uganda

To implement monetary policy effectively, it is essential to accurately assess both the speed and magnitude of policy changes as they affect various parts of the economy. This necessitates a deep understanding of the mechanisms through which monetary policy influences economic activity. This study explores the connection between monetary policy and economic growth in Uganda. It aims to analyze the dynamic effects of monetary policy shocks using a structural vector autoregressive approach to determine the impact of monetary policy changes on economic growth. The impulse response analysis suggests that monetary policy does affect economic activity. However, its effectiveness is limited due to non-functional key transmission channels. Notably, the interest rate channel is weak, despite clear transmission of changes in the treasury bill rate to lending interest rates. The exchange rate and credit channels appear to be ineffective. Overall, the findings indicate that while monetary policy changes do impact economic activity, identifying the exact mechanism of transmission by the Bank of Uganda is challenging. This difficulty may stem from factors such as having multiple objectives instead of a single focus, extensive financial and structural reforms, and increased economic and financial globalization.

2.3.2 Interest rate on economic growth

Interest rates are a critical factor influencing economic growth across different countries and economic systems. This section reviews several key studies that have examined the relationship between interest rates and economic growth, highlighting the methodologies and findings in diverse contexts.

Panigrahi et al. (2020) investigated the Effects of Inflation, Interest, and Unemployment Rates on Economic Growth: Evidence from ASEAN Countries. They explored the long-run relationship between interest rates and GDP growth in ASEAN-5 countries (Malaysia, Indonesia, Thailand, Singapore, and the Philippines) from 1995 to 2018. Their study utilized secondary panel data from the World Bank database and employed the ARDL model. The study found that interest and inflation rates have a strong dynamic long-run linkage with economic growth in these countries. The findings suggest that changes in interest rates significantly impact economic growth trajectories in the ASEAN region.

Badiea et al. (2019) conducted research titled Real Interest Rate and Economic Growth: A Statistical Exploration for Transitory Economies. The study examined the impact of real interest rates on economic growth across 38 countries with varying levels of economic transition from 1996 to 2015. Utilizing a dynamic panel data technique based on the Generalized Method of Moments (n-step estimation), they found that real interest rates have a multi-fold inverse relationship with economic growth. The negative impact is mediated through factors such as investments, human capital, trade openness, and exchange rates, suggesting that higher real interest rates can hinder growth in transition economies.

Miloš (2022) explored the influence of interest rates on economic growth by analyzing secondary data. The study revealed that interest rates negatively affect economic growth, indicating that reducing interest rates does not necessarily lead to higher growth rates. This finding suggests that while lower interest rates might ease borrowing, they do not automatically translate into accelerated economic growth.

Hatmanu et al. (2020) investigated the impact of interest rate, exchange rate, and European business climate on economic growth in Romania: An ARDL Approach with Structural Breaks. Their study applied the Bound cointegration test and the ARDL model to assess short-run impacts. The findings indicated that in the short run, economic growth in Romania is negatively influenced by interest rates, whereas the exchange rate positively impacts growth. This highlights the short-term sensitivity of economic growth to interest rate changes in Romania.

Sameh Asim and Basel Mohammad (2023) examined the effect of the real interest rate on real economic growth in Jordan. Employing both descriptive and analytical methods with the ARDL approach, they found a statistically significant negative effect of the real interest rate on economic growth. Specifically, a 1% increase in the interest rate leads to a 0.97% decrease in real economic growth, underscoring the adverse impact of higher interest rates on economic activity in Jordan.

2.3.3 Money supply on economic growth

The relationship between money supply and economic growth has been a central theme in macroeconomic research, with various studies exploring its effects under different economic conditions. This section reviews key studies that have examined this relationship, highlighting methodologies and findings in diverse contexts.

Buthelezi (2023) explored the Impact of Money Supply in Different States of Inflation and Economic Growth in South Africa. The study employed Markov-switching dynamic regression (MSDRM) and time-varying parameter structural vector autoregression (TVP-VAR) to analyze the data. The findings indicated a 0.70% decrease in gross domestic product for a 1% increase in money supply in state 1 and a 0.35% impact on inflation in state 2. These results suggest a trade-off between using the money supply for economic growth and managing inflation.

Dinh Doan (2019) examined Money Supply and Inflation Impact on Economic Growth using the economic theories of Fisher and Friedman, alongside an econometric model. The study analyzed data from Vietnam and China from 2012 to 2016. The findings indicated

that a continuous increase in money supply leads to long-term inflation, which directly affects economic growth.

Santosh et al. (2023) conducted a study on the Impact of Money Supply and Inflation on Economic Growth in Nepal. Using the ARDL co-integration approach, the study determined the long-term relationship between variables. The results showed that the Consumer Price Index (CPI) is positively related to economic growth and has a strong impact in developing countries like Nepal, highlighting the importance of monetary policy in such economies.

Charisma et al. (2018) explored the Impact of Money Supply on Some Macroeconomic Variables in The Nigerian Economy. The study used the Augmented Dickey-Fuller test to ensure data stability, which was integrated at the first difference $I(1)$. The findings revealed that narrow money supply positively and significantly impacts inflation and real gross domestic product in Nigeria, suggesting that careful management of money supply is crucial for economic stability.

Javier de Oña García and Tuan Viet (2021) investigated The Impact of Money Supply on the Economy: A Panel Study on Selected Countries. The study utilized a panel of 217 countries from 1960 to 2020 and employed four different models. The empirical results supported the quantity theory of money, showing that money supply is negatively correlated with the GDP growth rate, while the lagged money growth rate is positively correlated with the GDP growth rate. This indicates complex dynamics in the relationship between money supply and economic growth over time.

2.3.4 Inflation on economic growth

The relationship between inflation and economic growth has been a key topic in macroeconomic research, with various studies examining how inflation influences economic outcomes across different contexts. This section reviews significant studies on this relationship, highlighting methodologies and findings from diverse economies.

Sequeira (2021) investigated Inflation, Economic Growth, and Education Expenditure using an endogenous growth model with cash-in-advance (CIA) constraints in several sectors, including education, horizontal R&D, vertical R&D, and manufacturing and consumption. The study analyzed both steady-state and transitional dynamics. It found that inflation negatively impacts economic growth in the long run due to cash requirements for household expenditures in education, suggesting that inflation can hinder investment in human capital.

Enzelina et al. (2022) investigated the effect of inflation on the rate of economic growth, utilizing regression models to analyze the data. The findings indicate that high inflation can slow down economic growth, while low and stable inflation can encourage it. This suggests that maintaining inflation at moderate levels can be beneficial for economic development.

Atigala et al. (2022) explored driving the pulse of the economy or the dilution effect: inflation impacting economic growth using the auto regressive distributed lag (ARDL) model as the estimation technique. The study found that inflation negatively impacts economic growth, with a 1% increase in inflation leading to a decrease in short-term growth by \$3,427.94 million and long-term growth by \$10,623.8 million. This highlights the detrimental effects of inflation on economic performance over different time horizons.

Stasys et al. (2022) examined the new approach to inflation phenomena to ensure sustainable economic growth through systematic literature reviews. The study found that inflation plays a crucial role in ensuring sustainable economic growth and developed a new analytical model to understand its main drivers. This research suggests that understanding and managing inflation is vital for long-term economic stability.

Panigrahi et al. (2020) studied effects of inflation, interest, and unemployment rates on economic growth: Evidence from ASEAN Countries. Using secondary panel data from the World Bank database, the study investigated the long-run relationship between inflation, interest rates, and GDP growth from 1995 to 2018 in ASEAN-5 countries (Malaysia, Indonesia, Thailand, Singapore, and the Philippines). The findings indicate a strong

dynamic long-run linkage between inflation rates and economic growth in these countries, highlighting the importance of inflation management in the ASEAN region.

Anup et al. (2023) explored the linkage between inflation and economic growth: Evidence from India using several econometric methods, including the Augmented Dickey-Fuller (ADF) unit root test, ARDL, Johansen co-integration, and Granger-causality test. The study found a positive link between inflation and economic growth in India, with a strong, inverse relationship between them. This indicates that inflation can both positively and negatively affect economic growth, depending on the context and magnitude.

2.4 Chapter Summary

The relationship between interest rates, money supply, inflation, and economic growth has been extensively studied across different contexts, revealing the complexities involved in how these factors interact. Panigrahi et al. (2020) demonstrated that in ASEAN countries, interest rates and inflation have a strong long-run linkage with economic growth. Badiea et al. (2019) found that real interest rates inversely affect growth in transitory economies, while Miloš (2022) confirmed the negative impact of interest rates on growth without necessarily stimulating higher growth rates. Hatmanu et al. (2020) showed that in Romania, economic growth is negatively influenced by interest rates, and Asim and Mohammad (2023) observed a significant negative impact of real interest rates on economic growth in Jordan. In terms of money supply, Buthelezi (2023) highlighted a trade-off between economic growth and inflation in South Africa, and Doan (2019) pointed out that an increase in money supply causes long-term inflation affecting growth. Santosh et al. (2023) and Charisma et al. (2018) confirmed that money supply impacts economic growth in Nepal and Nigeria, respectively, through inflationary dynamics. García and Viet (2021) supported the quantity theory of money, finding complex interactions between money supply and GDP growth. Regarding inflation, Sequeira (2021) showed a negative long-term relationship between inflation and growth due to educational spending constraints, while Enzelina et al. (2022) argued that high inflation hinders growth, and low, stable inflation supports it. Atigala et al. (2022) quantified the negative impacts of inflation on growth, whereas Stasys et al. (2022) emphasized the importance of inflation management

for sustainable growth. Anup et al. (2023) noted a dual relationship between inflation and growth in India, suggesting that inflation can have both positive and negative effects.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The study aims to assess the relationship between monetary policy and economic growth in Uganda. To achieve this, the study seeks to employ vector autoregression (VAR) techniques to analyze the monetary policy transmission mechanisms. The VAR model offers a flexible way of examining the dynamic relationships between multiple time series variables without imposing strict structural assumptions. This approach enables us to capture the effects of monetary policy changes on economic growth over time. The theoretical framework for this analysis is grounded in the Quantity Theory of Money, which posits a direct relationship between the money supply and economic output.

3.2 Data Source

The data used in this study are sourced from the Bank of Uganda, the Uganda Bureau of Statistics, and the World Bank. These sources provide comprehensive data on key economic indicators such as GDP, money supply (M2), interest rates, inflation rates, and exchange rates. The study covers a period from 1990 to 2020 to ensure a robust analysis of monetary policy effects over time.

3.3 Theoretical Framework

The theoretical framework underpinning this study is the Quantity Theory of Money, represented by the equation:

$$MV = PQ$$

where

- M is the money supply,
- V is the velocity of money,

- P is the price level, and

Q is the output (real GDP). According to this theory, changes in the money supply can directly affect the price level and economic output. The study hypothesizes that monetary policy, through its influence on the money supply, impacts Uganda's economic growth.

3.4 Empirical Strategy

The study conducted descriptive statistics to summarize the central tendencies and dispersions of key variables such as GDP, interest rates, and money supply, providing an initial understanding of the data. To assess the distribution of these variables, the study also conducted a normality test using the Shapiro-Wilk W test to determine whether the data followed a normal distribution. Next, a trend analysis was performed to observe the temporal movements of the monetary policy variables and GDP. The study further conducted a pairwise correlation analysis to explore the linear relationships between these variables. To ensure the stationarity of the data, the Augmented Dickey-Fuller (ADF) test was applied. Following this, a Johansen cointegration test was performed to identify any long-run equilibrium relationships among the variables. The study then used lag-order selection criteria to determine the optimal lag length for the model. Finally, the Vector Error Correction Model (VECM) was employed to analyze both the long-run and short-run dynamics between monetary policy factors and economic growth.

3.5 Data Analysis Techniques

The study performed analysis at three levels: univariate, bivariate, and multivariate. At the univariate level, descriptive statistics were undertaken to summarize and understand the central tendencies, dispersions, and distributions of individual variables such as GDP, interest rates, and money supply. At the bivariate level, Pearson correlation analysis was conducted to assess the strength and direction of linear relationships between pairs of variables. At the multivariate level, more advanced techniques were employed, starting with unit root tests (ADF and Phillips-Perron) to ensure stationarity of the time series data, followed by Johansen cointegration analysis to identify long-term equilibrium relationships among the variables. Additionally, Granger causality tests were conducted to

explore causal links between monetary policy variables and economic growth. The study then used lag-order selection criteria to determine the optimal lag length for the model. Finally, the Vector Error Correction Model (VECM) was employed to analyze both the long-run and short-run dynamics between monetary policy factors and economic growth

CHAPTER FOUR

PRESENTATION OF RESULTS

4.1 Introduction

This chapter covers the results of the study. It entails the summary of descriptive statistics, tests for normality, the trend of monetary policy and economic growth, pairwise correlation, unit root tests, the cointegration tests, and the VECM model as seen below.

4.2 Summary of descriptive statistics

The table below presents central tendency measures such as mean, median, minimum, and maximum values for monetary policy factors and economic growth. It also includes spread measures such as standard deviation, skewness, and kurtosis values to help understand the distribution of each variable.

Table 4. 1: Summary of descriptive statistics

Statistic	L.GDP (Shs billion)	L.Interest Rates (%)	L.Money Supply, M3 (Shs billion)
Mean	10.89444	3.035441	8.554653
Median	10.88612	3.031904	8.66315
Std. dev.	.8537669	.0880838	1.426528
Min	9.385606	2.901558	5.969226
Max	12.11346	3.263854	10.58856
Skewness	-.1244975	.604461	-.1852755
Kurtosis	1.441667	2.881031	1.721292

Source: Bank of Uganda. World Bank. All variables begin with L to represent the log-transformed series.

The mean logged GDP is 10.89, with a standard deviation of 0.854, indicating moderate variability in GDP over the observed period. The median logged GDP (10.886) is very close to the mean, suggesting the data is approximately symmetric. The skewness value of -0.124 further supports this symmetry, as it indicates a slight negative skew, though not significant enough to suggest a lack of normality. The kurtosis value of 1.441 indicates that

the distribution is flatter (platykurtic) compared to a normal distribution. This implies that the logged GDP data has lighter tails and fewer extreme values. Together, these statistics suggest that the logged GDP is well-behaved and approximately normally distributed, making it suitable for econometric modeling.

The mean logged interest rate is 3.035, with a median of 3.032, indicating a near balance in the distribution of interest rate data. The low standard deviation (0.088) shows minimal variation in interest rates over the period, reflecting a stable interest rate environment. The skewness value of 0.604 suggests a slight positive skew, indicating that there are some instances of higher interest rates pulling the distribution slightly to the right. The kurtosis value of 2.881 is close to 3, suggesting a distribution that approximates normality but with slightly heavier tails. This indicates that the logged interest rate data is relatively stable, with only minor deviations from a normal distribution.

The mean logged money supply is 8.555, with a standard deviation of 1.427, indicating moderate dispersion in the money supply data. The median value (8.663) is slightly higher than the mean, suggesting a very mild left skew in the distribution. This is confirmed by the skewness value of -0.185, which reflects a negligible negative skew. The kurtosis value of 1.721 indicates a platykurtic distribution, suggesting a flatter shape with lighter tails compared to a normal distribution. These statistics imply that the logged money supply data is reasonably symmetric and stable, with fewer extreme variations, making it reliable for analysis.

In summary, the descriptive statistics show that all three logged variables GDP, interest rates, and money supply exhibit relatively stable distributions, with minimal skewness and kurtosis values close to normality. This indicates that the log transformations were effective in stabilizing the variances and making the data suitable for further econometric analysis.

4.3 Shapiro–Wilk W test for normal data

The Shapiro–Wilk test evaluates whether the data for each variable follows a normal distribution. The null hypothesis (H_0) of the test assumes that the data is normally distributed. If the p-value ($\text{Prob} > z$) is less than the significance level (commonly 0.05), the null hypothesis is rejected, indicating non-normality. Below are the interpretations for each variable.

Table 4. 2: Shapiro–Wilk W test for normal data

Variable	W	V	z	Prob>z
L.GDP (Shs billion)	0.87917	3.936	2.839	0.00226
L.Interest Rates (%)	0.96194	1.240	0.445	0.32805
L.Money Supply, M3 (Shs billion)	0.93922	1.980	1.415	0.07850

Source: Bank of Uganda; World Bank

For L.GDP, the Shapiro–Wilk test yielded a W statistic of 0.87917, with a V value of 3.936, a z value of 2.839, and a p-value of 0.00226. Since the p-value is well below the standard threshold of 0.05, the null hypothesis of normality is rejected. This indicates that the logged GDP data does not follow a normal distribution. The deviation from normality could affect any econometric models requiring normality assumptions and may need further transformation or alternative methods to address this.

For L.Interest Rates, the W statistic is 0.96194, with a V value of 1.240, a z value of 0.445, and a p-value of 0.32805. Since the p-value is greater than 0.05, we fail to reject the null hypothesis. This suggests that the logged interest rates are approximately normally distributed. The normality of this variable indicates it is suitable for models or tests that require normally distributed data.

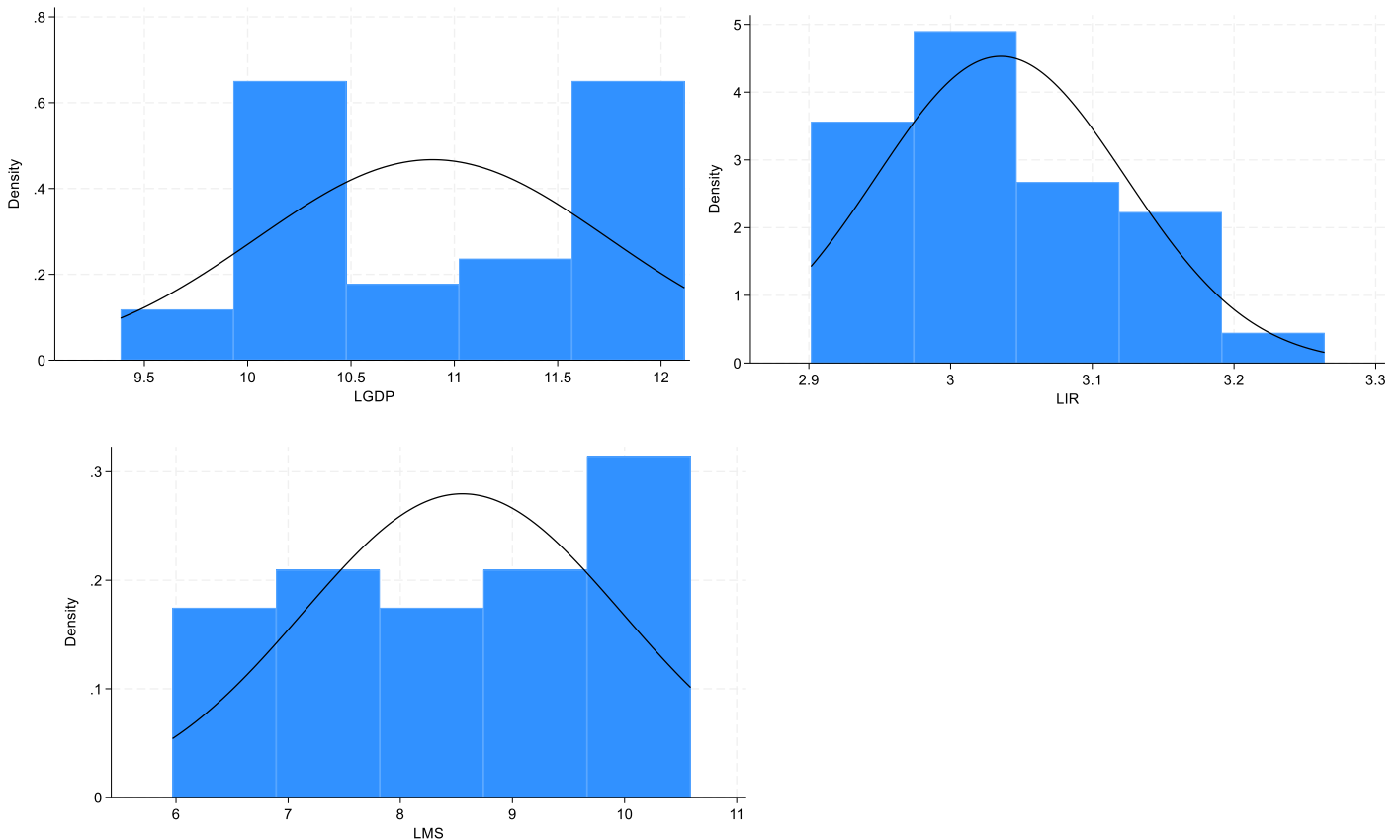
For L.Money Supply, the W statistic is 0.93922, with a V value of 1.980, a z value of 1.415, and a p-value of 0.07850. While the p-value is above 0.05, it is relatively close to the threshold, indicating marginal adherence to normality. The logged money supply data can

be considered approximately normal but should be used cautiously in models where strict normality is a requirement.

Therefore, the Shapiro–Wilk test results indicate that while the logged interest rates and logged money supply data are approximately normal, the logged GDP data significantly deviates from normality. This suggests that corrective measures, such as transformation or the use of non-parametric methods, may be necessary for the logged GDP variable.

4.4 Graphical visualization of the plots of GDP, Money Supply, and Interest Rates

The figure below shows the density plots for the log-transformed variables (L.GDP, LIR, and LMS). The interpretations are as follows.



The plot for L.GDP shows a relatively symmetric but multimodal distribution, with noticeable peaks and dips, indicating that the data does not follow a standard normal distribution. This aligns with the Shapiro–Wilk test results, which showed significant non-normality for L.GDP. The plot for LIR (Logged Interest Rates) displays a distribution that

closely resembles a normal bell-shaped curve, with a slight skew to the right, consistent with the test results suggesting approximate normality. Lastly, the plot for LMS (Logged Money Supply) suggests a slightly skewed distribution with lighter tails and moderate variability, reflecting a closer approximation to normality but with some deviation. These plots visually confirm the statistical findings, emphasizing that while LIR and LMS are relatively normal, L.GDP deviates significantly from normality and may require further adjustment.

4.5 Pairwise correlation

Table 4.3 shows the pairwise correlation analysis reveals important relationships between the log-transformed GDP (L.GDP), Interest Rates (L.Interest Rates), and Money Supply (L.Money Supply, M3).

Table 4. 3: Pairwise correlation of economic growth and monetary policy

Variables	(1)	(2)	(3)	(4)
(1) L.GDP (Shs billion)	1.000			
(2) L.Interest Rates (%)	-0.1261	1.0000		
(3) L.Money Supply, M3 (Shs billion)	0.9769*	-0.1834	1.0000	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The correlation between L.GDP and L.Money Supply is 0.9769, which is highly positive and statistically significant at the 10% level ($p < 0.1$). This indicates a strong positive relationship, suggesting that increases in the money supply are strongly associated with higher levels of GDP growth. This aligns with economic theories emphasizing the role of money supply in stimulating economic activity. In contrast, the correlation between L.GDP and L.The interest rate is -0.1261, which is weakly negative and statistically insignificant. This suggests that there is no strong or consistent relationship between GDP growth and interest rates in this data. The weak negative value could imply that higher interest rates may have a slight dampening effect on GDP growth, as higher borrowing costs can reduce investment and consumption, but this relationship is not robust in the given data.

4.6 Unit root test

As seen in Table 4.4, the unit root test results indicate whether the log-transformed variables GDP (L.GDP), Interest Rates (L.Interest Rates), and Money Supply (M2) are stationary or contain unit roots. The null hypothesis of the test assumes the presence of a unit root, meaning the variable is non-stationary.

Table 4. 4: Augmented Dickey-Fuller test for unit root

Variable	Number of Obs	Number of Lags	Test Statistic	Critical Value 1%	Critical Value 5%	Critical Value 10%	MacKinnon p-value
L.GDP (Shs billion)	29	1	-0.774	-3.723	-2.989	-2.625	-0.774
L.Interest Rates (%)	29	1	-2.598	-3.723	-2.989	-2.625	-2.598
Money Supply, M2 (Shs billion)	25	5	-2.173	-3.723	-2.989	-2.625	-2.173

Source: Bank of Uganda; World Bank

For L.GDP, the test statistic is -0.774, which is higher than all critical values at the 1%, 5%, and 10% levels (-3.723, -2.989, and -2.625, respectively). Additionally, the MacKinnon p-value of -0.774 confirms that the null hypothesis cannot be rejected. This indicates that L.GDP has a unit root and is non-stationary in its current form. For interest rates, the test statistic is -2.598, which is also higher than the critical values at the 1%, 5%, and 10% significance levels. The MacKinnon p-value supports the conclusion that the null hypothesis cannot be rejected. Therefore, the interest rate also exhibits non-stationarity and contains a unit root. For Money Supply (M2), the test statistic is -2.173, which again fails to exceed the critical values at all significance levels. The MacKinnon p-value confirms the inability to reject the null hypothesis. This means that Money Supply (M2) is also non-stationary and contains a unit root. In this regard, the results show that all three variables L.GDP, L.Interest Rates, and Money Supply are non-stationary in their current forms, indicating the presence of unit roots. This suggests that differencing or other transformations may be required to achieve stationarity for further econometric analysis.

4.7 Johansen tests for cointegration

After determining the existence of unit roots in the series, the study sought to examine whether there is cointegration among the explanatory variables under consideration. The results are as follows.

Table 4. 5: Johansen tests for cointegration

Rank	Params	LL	Eigenvalue	Maximum Trace Statistic	Critical Value 5%
0	6	77.505288	.	12.7361*	15.41
1	9	81.743802	0.25346	4.2590	3.76
2	10	83.873326	0.13659		

* Selected rank

The results show that at rank 0, the trace statistic is 12.7361, which is below the critical value of 15.41. This indicates that the null hypothesis of no cointegrating relationships cannot be rejected. Therefore, there is no statistical evidence to support the existence of a long-run equilibrium relationship among the variables. At rank 1, the trace statistic is 4.2590, which exceeds the critical value of 3.76. However, since the selected rank is 0, this indicates that the model does not find sufficient evidence for cointegration when following the standard selection criteria. In conclusion, the results suggest that there are no cointegrating relationships among the variables, implying that they do not share a long-run equilibrium connection. This suggests that the variables may not converge to a stable long-term relationship and are likely independent in the long run. Further analysis should focus on short-term dynamics or stationarity adjustments if required.

4.8 Granger causality Wald tests

From Table 4.6, the Granger causality results reveal the directional relationships between the variables, highlighting whether one variable can predict changes in another. The interpretations are as follows.

Table 4. 6: Granger causality Wald tests

Dependent Variable	Excluded Variable	chi2	df	p-value	Direction of Causality
LGDP	LIR	.79981	2	0.670	No causality
LGDP	LMS	16.264	2	0.000	GDP → LMS
LGDP	ALL	18.097	4	0.001	GDP → ALL
LIR	LGDP	9.5474	2	0.008	LIR → LGDP
LIR	LMS	12.832	2	0.002	LIR → LMS
LIR	ALL	13.06	4	0.011	LIR → ALL
LMS	LGDP	11.722	2	0.003	LMS ↔ LGDP
LMS	LIR	.44204	2	0.802	No causality
LMS	ALL	12.759	4	0.013	LMS → ALL

Note: ** statistical significance at 5% and *** statistical significance at 1%.

For GDP (LGDP) as the dependent variable, the results show no causality from Interest Rates (LIR), as the p-value is 0.670. However, there is strong evidence of causality from Money Supply (LMS) to GDP, with a statistically significant p-value of 0.000. This indicates that GDP growth Granger-causes changes in the money supply. When considering all variables together, GDP remains a significant predictor (p-value = 0.001), confirming its causal influence.

For Interest Rates (LIR) as the dependent variable, there is significant causality from GDP (LGDP) to Interest Rates (p-value = 0.008) and from Money Supply (LMS) to Interest Rates (p-value = 0.002). This suggests that both GDP and Money Supply are important predictors of changes in interest rates. When all variables are considered together, there is still a significant causal relationship (p-value = 0.011), indicating that Interest Rates are influenced by both GDP and Money Supply.

For Money Supply (LMS) as the dependent variable, there is significant bidirectional causality between GDP and Money Supply, with both GDP causing LMS (p-value = 0.003) and LMS causing GDP (p-value = 0.003). This reciprocal relationship suggests strong feedback dynamics between these two variables. However, no causality is found from Interest Rates to Money Supply (p-value = 0.802). When all variables are considered together, Money Supply remains a significant predictor (p-value = 0.013).

In conclusion, the Granger causality results indicate that GDP and Money Supply share a strong bidirectional relationship, reflecting mutual feedback in their dynamics. Interest Rates are influenced by both GDP and Money Supply but do not exhibit a reciprocal relationship with them. Overall, these results emphasize the interconnectedness of GDP and monetary variables, with GDP playing a key role in predicting changes in other variables, particularly Money Supply. This underscores the central importance of GDP in the economic system.

4.8 Lag-order selection criteria

The lag-order selection criteria in Table 4.7 guide the optimal lag length to use in econometric modeling. The selection in Table 4.7 is based on various statistical measures, including the Final Prediction Error (FPE), Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HQIC), and Schwarz Bayesian Information Criterion (SBIC). Lower values of these criteria indicate a better fit of the model at the corresponding lag length.

Table 4. 7: Lag-order selection criteria

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-9.35922				.000471	.85236	.896659	.993804
1	107.128	232.97	9	0.000	2.9e-07	-6.56055	-6.38336	-5.99478*
2	120.891	27.526*	9	0.001	2.1e-07*	-6.88905*	-6.57896*	-5.89894

Source: Bank of Uganda; World Bank

For lag 0, the information criteria values are relatively high, suggesting that this lag is not optimal. At lag 1, there is a significant improvement, as indicated by lower values for all criteria. However, the SBIC criterion selects lag 1 as the optimal lag length, as its value is the lowest at this lag. At lag 2, further improvements are evident, with the FPE, AIC, and HQIC all selecting lag 2 as the optimal lag length, as these criteria have their lowest values at this point. Additionally, the likelihood ratio (LR) test shows a significant value at lag 2 (p-value = 0.001), supporting the inclusion of this additional lag. Therefore, while SBIC selects lag 1 as optimal, most of the criteria (FPE, AIC, HQIC, and the LR test) point to

lag 2 as the most appropriate lag length. Therefore, lag 2 is likely the best choice for capturing the dynamics of the variables in this context.

4.9 ARDL model for examining the influence of monetary policy on GDP growth

Table 4. 8: ARDL model for examining the influence of monetary policy on GDP growth

				Number of obs	=	27	
				R-squared	=	0.4568	
				Adj R-squared	=	0.1173	
Log likelihood = 27.641473				Root MSE	=	0.1129	
	D.LGDP	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
ADJ							
	LGDP						
	L1.	-0.30553	0.192577	-1.59	0.132	-0.71377	0.102718
LR							
	LIR	-1.11887	1.949637	-0.57	0.574	-5.25191	3.01418
	LMS	0.686776	0.086216	7.97	0	0.504007	0.869546
SR							
	LGDP						
	LD.	0.210924	0.290295	0.73	0.478	-0.40447	0.826322
	LIR						
	D1.	-0.061	0.405906	-0.15	0.882	-0.92148	0.799482
	LD.	0.413008	0.418902	0.99	0.339	-0.47502	1.30104
	LMS						
	D1.	-0.06464	0.508055	-0.13	0.9	-1.14167	1.012384
	LD.	0.826958	0.427191	1.94	0.071	-0.07865	1.732563
	L2D.	0.421095	0.554466	0.76	0.459	-0.75432	1.596509
	L3D.	-0.00719	0.503723	-0.01	0.989	-1.07503	1.060656
	_cons	2.415269	1.141144	2.12	0.05	-0.00385	4.834386

Source: Bank of Uganda; World Bank

From the results in Table 4.8, the model includes 27 observations with an R-squared value of 0.4568, indicating that approximately 45.68% of the variation in GDP growth is explained by the included variables (money supply, interest rates, and lagged GDP). However, the adjusted R-squared value of 0.1173 is significantly lower, suggesting that the model's explanatory power decreases after accounting for the number of predictors. The Root Mean Square Error (RMSE) of 0.1129 shows the average deviation of the predicted values from the observed GDP growth. Overall, the model provides moderate explanatory power but may benefit from improvements to enhance its robustness.

From the adjustment model, the lagged value of GDP growth has a coefficient of -0.30553, which is not statistically significant (p-value = 0.132). This indicates that deviations from long-run equilibrium are not corrected strongly or reliably in the next period. While the magnitude of the coefficient suggests that about 30.55% of disequilibrium is adjusted each period, the lack of statistical significance weakens confidence in the adjustment process in the context of this model.

In the long run, the money supply (LMS) has a significant positive effect on GDP growth, with a coefficient of 0.686776 and a highly significant p-value of 0.000. This implies that increases in the money supply contribute substantially to GDP growth in the long run. In contrast, interest rates (LIR) do not exhibit a significant long-run effect on GDP growth, with a coefficient of -1.11887 and a p-value of 0.574. This indicates that monetary policy through interest rates may not play a meaningful role in influencing long-term GDP growth within this model.

In the short run, neither the lagged differences in GDP (LD.LGDP) nor the first difference of interest rates (D1.LIR) show significant effects on GDP growth, with p-values of 0.478 and 0.882, respectively. The lagged difference in interest rates (LD.LIR) also remains insignificant (p-value = 0.339). However, the lagged difference of money supply (LD.LMS) has a coefficient of 0.826958 and is marginally significant (p-value = 0.071), suggesting a potential delayed positive effect of money supply on GDP growth. The first difference in money supply (D1.LMS) is insignificant (p-value = 0.9), indicating no immediate short-term impact.

In conclusion, the ARDL model results suggest that the money supply (LMS) is a key driver of GDP growth, with a strong and positive influence in the long run and a marginally significant effect in the short run. Conversely, interest rates (LIR) do not demonstrate a significant impact on GDP growth in either the short or long run. The adjustment mechanism for correcting deviations from equilibrium is weak and statistically unreliable. Overall, the findings emphasize the importance of money supply in driving economic growth, with interest rates playing a less influential role within this framework.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter concludes this report. It covered the conclusions based on the results of the study and the associated recommendations as follows.

5.2 Conclusions

The analysis of the study focused on evaluating the relationship between monetary policy variables and GDP growth. The findings provided valuable insights across several dimensions, including descriptive statistics, pairwise correlations, stationarity, cointegration, causality, and the ARDL model results. This chapter summarizes these findings to draw a comprehensive conclusion about the interplay of the studied variables.

Findings from the descriptive statistics indicated that the variables exhibited varying distributions and levels of stability. The mean and median values of GDP growth and money supply were closely aligned, suggesting a near-symmetric distribution for these variables, while interest rates showed a slight positive skew. However, the Shapiro–Wilk test revealed that GDP growth data deviated significantly from normality, whereas money supply and interest rates were approximately normal. These initial observations suggested the need for further transformations and robust statistical methods to analyze the relationships among the variables.

Pairwise correlation analysis revealed key associations between the variables. Findings indicated that GDP growth and money supply had a strong positive correlation, suggesting that higher money supply was closely associated with increased GDP growth. Conversely, the results found that the relationship between GDP growth and interest rates was weak and negative, implying a minimal influence of interest rates on GDP growth. This highlighted the dominant role of money supply over interest rates in driving economic activity.

Stationarity tests revealed the presence of unit roots in all variables, as none of them were stationary in their levels. Findings from the unit root tests indicated that GDP growth, money supply, and interest rates required differencing or transformations to achieve stationarity. These results underscored the need for techniques such as the ARDL model, which accommodates non-stationary data, to properly analyze the relationships.

Cointegration analysis using the Johansen test found no evidence of a long-run equilibrium relationship among the variables. The results revealed that the null hypothesis of no cointegrating relationships could not be rejected, suggesting that the variables did not converge to a stable long-term equilibrium. This finding implied that short-term dynamics may be more relevant in understanding the interplay between monetary policy and GDP growth.

The Granger causality analysis provided further insights into the directional relationships between the variables. Findings revealed bidirectional causality between GDP growth and money supply, indicating mutual influence between the two variables. Results found that interest rates influenced GDP growth and money supply but did not exhibit a reciprocal relationship. These results highlighted the interconnectedness of GDP growth and monetary policy, with money supply emerging as a key driver.

From the ARDL model, findings revealed that money supply had a significant positive impact on GDP growth in the long run, reinforcing its role as a critical determinant of economic activity. Results found no significant long-run effect of interest rates on GDP growth, suggesting that monetary policy through interest rates had limited influence over the long term. In the short run, the findings indicated that money supply exhibited marginally significant delayed effects on GDP growth, while interest rates showed no significant short-term impact. In conclusion, the findings demonstrated that monetary policy, particularly through money supply, had a significant and positive impact on economic growth, both in the short and long run. This highlighted the critical role of money supply as a primary driver of GDP growth. Conversely, interest rates did not exhibit any significant effect on GDP growth in either the short or long term. These results suggest that monetary policy efforts aimed at stimulating economic growth should focus more on

managing the money supply effectively, as it showed a direct and substantial influence. Interest rate adjustments, while traditionally important in monetary policy, appeared to have a limited effect in the context of this study.

5.3 Recommendations

Based on the findings of the study, the following recommendations are proposed to enhance the effectiveness of monetary policy in fostering economic growth:

1. Prioritize Money Supply Management

The findings revealed that money supply has a significant and positive impact on GDP growth in both the short and long run. Policymakers should focus on managing money supply effectively to ensure adequate liquidity in the economy. Measures such as maintaining optimal growth in the money supply and enhancing monetary transmission mechanisms can help stimulate economic activity and support sustained growth.

2. Reevaluate the Role of Interest Rates

Given that interest rates were found to have no significant impact on GDP growth, policymakers should reassess the reliance on interest rate adjustments as a tool for influencing economic activity. Instead, a balanced approach that includes other monetary instruments, such as credit allocation policies or reserve requirements, could be more effective in achieving economic growth objectives.

3. Enhance Coordination Between Monetary and Fiscal Policy

To maximize the positive effects of monetary policy, particularly through money supply, policymakers should ensure close coordination with fiscal policy. Aligning fiscal spending with monetary expansion can amplify growth effects and minimize potential inflationary pressures that might arise from excessive liquidity.

4. Strengthen Data Monitoring and Analysis

Continuous monitoring and analysis of the relationships between monetary policy variables and GDP growth are essential. Policymakers should invest in robust data collection and econometric tools to refine their understanding of these dynamics, ensuring timely and evidence-based policy decisions.

5. Focus on Sectoral Impacts of Money Supply

While the overall effect of money supply on GDP growth was significant, future monetary policies should also consider sector-specific impacts. Targeting money supply expansion in high-growth or underserved sectors could enhance economic diversification and resilience.

6. Promote Financial Inclusion

To ensure that the positive effects of money supply are widely distributed, efforts should be made to improve access to financial services. Encouraging financial inclusion will enable broader participation in economic activities, further boosting GDP growth.

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