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**ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
COLLEGE OF BUSINESS AND ECONOMICS
DEPARTMENT OF ECONOMICS**

**Effects of Monetary Policy on Economic Growth of Ethiopia: An
Autoregressive Distributed Lag (ARDL) Approach**

By: Yohannis Abdeta

**A THESIS SUBMITTED TO SCHOOL OF GRADUATE STUDIES OF
Addis Ababa UNIVERSITY IN PARTIAL FULFILLMENT OF THE
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ECONOMICS (ECONOMIC POLICY ANALYSISE)**

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**EFFECTS OF MONETARY POLICY ON ECONOMIC GROWTH OF ETHI
OPIA: An Autoregressive Distributed Lag (ARDL) Approach**

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DECLARATION

The study entitled, “Impacts of Monetary Policy on the Economic growth of Ethiopia: An Autoregressive Distributed Lag (ARDL) Approach” is my own work. I conducted the thesis work independently with the guidance and support of the research supervisor. This study has not been submitted for any degree or diploma in this or any other institution. It is in partial fulfillment of the requirements for the Degree of Master of Science in Economics (Economic Policy Analysis). All sources of material used for the research have been properly acknowledged.

Yohannis Abdeta

October, 2021

ENDORSEMENT

This thesis has been submitted to Addis Ababa University, Collage of Business and Economics for examination with my approval as a university supervisor.

Jemberu L (PhD)

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ABSTRACT

This study empirically investigated the effects of monetary policy on the economic growth of Ethiopia both in short run and long run. To achieve this objective the study used Auto Regressive Distribute Lagged (ARDL) model using annual time series data for the period of 1981 to 2019 to investigate the existence of short-run and long-run relationship between real GDP growth and set of monetary policy variables. In addition, the study used the variance decomposition (VDC) and impulse response functions (IRF) to test for the response of real GDP growth to innovations in monetary policy variables. Granger causality test was also employed to check the direction of causal effects of one variable on the other variable. The results of econometric analysis suggest that monetary policy in Ethiopia have a relatively significant influence on the real GDP growth through the direct money supply (M2) and real interest rate (RIR). In addition the co integration result showed that inflation rate has also negative significant impacts on the economic growth of Ethiopia both in the short run and long run. However, real effective exchange rate, gross fixed capital formation and budget deficit are found to have insignificant impacts on the economic growth of Ethiopia particularly in the long run according to the co integration result. However, in the short run real effective exchange rate, gross fixed capital formation and budget deficit are found to be influential impacts on the economic growth of the country. Although the co integration analysis showed the real interest rate have significant impact in the long run, the VDC shows the existence of weak relationship between real GDP and real interest rate in affecting economic growth of Ethiopia. The co integration analysis also showed gross fixed capital formation have insignificant impact in the long run, however, the VDC result implies the strong association between RGDP growth and GFCF particularly in the long run. And also there is one direction causal effect moving from GFCF to RGDPG of Ethiopia. More importantly despite the co integration results displays the insignificance long run impacts of real effective exchange rate, the result of IRF reveals the existence of negative significant long run relationship between the two monetary policy variables. Hence, in order to strengthen monetary policy that are operating in the country monetary authority should focus on the direct money supply and also a continued effort need to be made to develop the domestic financial sector, Open market operation, reduce fiscal dominance, control inflation rate and to adjust exchange rate to maintain external competitiveness.

Keywords: Monetary Policy, Real Gross Domestic Product, Broad Money Supply , Real Interest Rate and ARDL model.

List of Acronyms and Abbreviations

ADF:	Augmented Dickey Fuller
AIC:	Akaike Information Criteria
ARDL:	Auto Regressive Distributed Lag Model
BD:	Budget Deficit
CBE:	Commercial Bank of Ethiopia
CUMSUM:	Cumulative Sum of Recursive Residual
CUMSUMSQ:	Cumulative Sum of Square Recursive Residual
ECM:	Error Correction Model
GFCF:	Gross Fixed Capital Formation
HQC:	Hanan-Quinn Criteria
INR:	Inflation Rate
IRF:	Impulse Response Function
M2:	Broad money Supply
MOFEC:	Ministry of Finance and Economic Cooperation
NBE:	National Bank of Ethiopia
OLS:	Ordinary Least Square
REER:	Real effective Exchange Rate
RIR:	Real Interest Rate
RGDPGR:	Real Gross Domestic Product Growth Rate
SBC:	Schwarz Bayesian Criteria
USD:	United States Dollar
VAR:	Vector Auto Regressive
VECM:	Vector Error Correction model

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Monetary policy is one of the macroeconomic policy tools that monetary Authority can call on to try to keep the economy growing at reasonable rate. It can also be defined as policy-induced changes in the money supply or/and in interest rates(Handa, n.d.2009).The author also described the importance of monetary policy as to achieve certain national goals that have historically included full employment (or a low unemployment rate), full-employment output (or a high output growth rate), a stable price level (or a low inflation rate), a stable exchange rate (or a desirable balance of payments position), etc. (Ayomitunde et al., 2019)also explained the objectives of monetary policy in most countries as stabilizing price, generating employment, and maintaining the balance of payments equilibrium, promoting economic growth, and contributing in sustainable development.

However, the results of both theoretical and empirical literature on the role of monetary policy instruments in stimulating economic growth are not universally generalizable and remain variant, inconsistent, and inconclusive (Amarasekara, 2009); Dele, 2007; (White, 2013). For instance, some Keynesians think that “money does not matter”, hence irrelevant to influence economic growth, while in the other hand, some monetarists believe that “money does matter”. However, the new Keynesians argue that in the short-run, changes in the money supply seem to affect the real variables like GDP and employment levels because of price-rigidity (Price-stickiness) and imperfect information flow in the market.(Hossain, 2014);Steve (1997) and Domingo (2001) explain that there may not be possibility of economic growth without an appropriate level of money supply, credit and appropriate financial conditions in general.

The existing empirical evidence also suggests that monetary policy has a limited role in driving economic growth, particularly in the long term (Arestis, 2007; Asongu, 2014; Fontana & Palacio-Vera, 2007). In the long run output is fixed so; any change in the money supply only causes price change. But in the short run because price and wage usually do not adjust immediately, changes in the money supply can affect the actual production of goods and services through aggregate spending. Changes in money supply and interest rates influence consumer

spending as well as investment decisions. Consequently, aggregate demand changes in response to monetary policy adjustments. This why monetary policy generally conducted by monetary authority is a meaningful policy tool for achieving both inflation and growth objectives (Mathai, 2009).

Notwithstanding the dispute among economists on this relationship, there is strong belief that monetary policy is associated with economic growth. Monetary policy is without doubt an important tool for enhancing growth in the economy. It influences aggregate demand and aggregate supply, so affecting economic growth accordingly (Gul, Mughal & Rahim, 2012).

Given the role played by monetary policy in pursuit of a sustainable economic growth, it is very crucial to understand the relationship between monetary policy and economic growth of Ethiopia. Understanding this relationship is important, especially to the public policymakers, in conducting effective stabilization policies to solve price instability, to reduce unemployment rate and maintenance of balance of payments equilibrium to promote economic growth, and sustainable development. This study therefore seeks to assess the impact of monetary policy on economic growth with reference to the Ethiopian economy for the period 1981-2019.

1.2. Statement of the Problem

Monetary policy refers to the combination of measures designed to regulate the value, supply and cost of money in an economy in consonance with the level of economic activities. It can be described as the art of controlling the direction and movement of monetary and credit facilities in achievement of stable price and economic growth in the economy. However, there is no consensus among economist as to whether government intervention through the use of monetary policy will bring about economic stabilization. The classicists believe that given the equation of exchange and stability in the velocity of money plus the assumption that economy operates at full employment, the change in money supply will only affect price without any effect on real demand, investment and output. The Keynesians on the other hand believe that variations in money supply could lead to an increase or decrease in interest rate. A decrease in interest rate will affect aggregate investment and enhance aggregate income and output. This is based on the belief that interest rate is the key determinant of investment in the market economy. The investment process involves the employment of factors such as labor and capital which lead to

increase in total employment. The monetarists base their views on money supply as the key factor affecting the wellbeing of the economy. They believe that an increase in money supply will lead to an increase in nominal demand, and where there is excess capacity they believe that output will be increased. In the long-run, the monetarist position is that the increase in money supply will be inflationary without any effect on investment, employment and aggregate demand.

In spite of these controversies, the notion of monetary policy impacting economic growth through the maintenance of price stability has got increasing theoretical and empirical consensus particularly in the short term (Fontana & Palacio-Vera, 2007). As a result, a growing number of central banks have focused on inflation targeting monetary policy to indirectly spur higher real economic growth rates (Heintz & Ndikumana, 2010). National Bank of Ethiopia (NBE) in collaboration with government of Ethiopia has been exercising monetary policy by designing short term, medium term and long-term monetary policy strategy through inflation and exchange rate targeting monetary policy to stabilize inflation and exchange rate to sustain economic growth. In this process price stability is a proxy for macroeconomic stability which is vital in private sector economic decision on investment, consumption, international trade and saving and finally macroeconomic stability foster employment and economic growth(NBE, 2009). Maintaining exchange rate stability on the other hand is considered as principal policy objectives of NBE so as to be competitive in the international trade and to use exchange rate intervention as policy tools for monetary policy to affect foreign reserve position and domestic money supply affect foreign reserve position and domestic money supply(NBE, 2009).

In spite of the fact that manipulation of monetary policy is increasing in Ethiopia, the macro economic instability problems surrounding its economic growth still persists. For instance, high persistent and volatile rate of inflation became major macroeconomic problem across the country for the past two decades(Denbel et al., 2016) . The annual average inflation growth rate for the last two decades was recorded as 12.78% (NBE annual report, 2018/19). However, inflation beyond the optimum level is degrading the real value of money balance retards economic growth in the long run via its adverse effect on the domestic private saving and foreign direct investment. Moreover, it destructively impacts welfare of the public, more harshly the poor segment of society (Yamaguchi, 2015).In addition to high and volatile inflation; unstable exchange rate, high unemployment rate and low investment are the major macro-economic

problems by which economy of Ethiopia is suffering from. These perceived problems are being claimed to cause fast decline in the economic growth of Ethiopia in the long run. It is therefore, becomes necessary to examine the extent to which monetary policy impacts economic growth of Ethiopia in both the short run and long run.

In order to investigate the extent to which monetary policy affects economic growth of Ethiopia, many empirical studies have been conducted by many researchers (Naser Yenus (2018); Sisay Demissew et al (2020); Tadesse T. & Melaku (2019); Tesfay Gebrehiwet (2017); Fistum et al (2016); Tewelde Brehan Tesfay (2010); Tamirat & Inderjeet (2019)). Among them the studies conducted by Tamirat & Inderjeet, (2019); Fitsum et al (2016); Abate Yesigat (2019) investigated the effects of monetary policy on the economic growth of Ethiopia focusing on monetary policy variables alone. On the other hand the study conducted by Sisay Demissew et al (2020); Tadesse T. & Melaku, (2019); Tesfay Gebrehiwet, (2017); Tewelde Brehan Tesfay 2010) combined both the monetary policy variables and some macroeconomic factors but both the studies did not incorporate some potential controlling variables which can highly influence the effectiveness of monetary policy and also engine for economic growth of developing countries (Gulzar Ali, 2017; Oladunjoye et al, 2018, Christian Pinshi, 2020). This mean that neglecting important macroeconomic variables from empirical growth model and including monetary policy variables alone may delimit the robustness of the study result to establish the effects of monetary policy on the economic growth of Ethiopia (Fistum et al, 2016). Hence, in addition to monetary policy variables, this study includes other potential macro-economic variables like inflation, real effective exchange rate, gross fixed capital formation and budget deficit in the empirical model which highly influence the effectiveness of monetary policy and which are also believed to have influential impact on the economic growth of developing countries like Ethiopia.

More importantly, this study will also make additional contribution to empirical knowledge by employing the Superior Autoregressive Distributed Lag (ARDL) bounds testing approach by Pesaran, Shin & Smith (2001) which most of past studies did not employ in an attempt to investigate the effects of monetary policy on economic growth of Ethiopia.

Therefore, this study will investigate the extent to which monetary policy affects economic growth of Ethiopia in both the short and long terms by employing Autoregressive distributed Lag (ARDL) bound test approach for co integration employing annual time series data.

1.3. Objectives of the Study

1.3.1. General Objective

The general objective of this study was to investigate the extent to which monetary policy affects economic growth of Ethiopia both in the short run and long run

1.3.2. Specific Objectives

- ❖ To investigate the extent to which monetary policy proxed by broad money supply and interest rate affects economic growth of Ethiopia in the short run and in the long run.
- ❖ To identify the most relevant monetary policy variables through which monetary policy affects economic growth of Ethiopia both in the short run and long run
- ❖ To identify the effects of inflation on the economic growth of Ethiopia both in the short run and long run
- ❖ To identify the effects of real exchange rate on economic growth of Ethiopia both in the short run and long run.
- ❖ To investigate the effects of gross fixed capital formation and Budget deficit on economic growth of Ethiopia both in the short run and long run.

1.4. Research Question

The pertinent research questions that this study seeks to answer are:

- I. To what extent monetary policy proxed by broad money supply and real interest rate affect economic growth of Ethiopia both in the short term and long term?
- II. What is the most relevant monetary policy variables through which monetary policy affect economic growth of Ethiopia?
- III. What is the effect of inflation on the economic growth of Ethiopia?
- IV. What is the effect of real effective exchange rate on the economic growth of Ethiopia?
- V. What are the effects of gross fixed capital formation and budget deficit on the economic growth of Ethiopia

1.5. Significance of the Study

This study helps to know the country specific impact of monetary policy shocks on different real macroeconomic variables by using time series approach specifically of the country. Moreover, it

contributes to the existing literature by extending the works of others. Furthermore, the results of study could help the concerned policy makers with suggesting the appropriate ways of intervention, appropriate policy set up and good macroeconomic environment that favors the effectiveness policy in promoting economic growth and reducing poverty.

1.6. Scope and Limitation of the Study

The study explores the impact of monetary policy shocks on different macroeconomic variables. To achieve this objective, the periods 1981 to 2019 are chosen based on availability of data for variables used in the study. The result of the study is confounded by quality of data. This limitation arises from the inconsistency of data reported by different institutions and even by different departments in the same institution. Additionally, because of lack of data, the study has been unable to use a long time period for the study.

1.7. Organization of the Study

On this paper there are six chapters one is about the introductions, background, statements of the problems and objective are presented; chapter two is about the theoretical and empirical literatures, Chapter three includes monetary policy framework of Ethiopia, financial development of Ethiopia and macro-economic performance of Ethiopia. Chapter four includes the methodology and model specification data types and sources will be discussed, in chapter five the empirical result will be discussed and finally in chapter six conclusion and policy implication will be presented.

CHAPTER TWO

LITERATURE REVIEW

2.1. THEORETICAL LITERATURE REVIEW

2.1.1. Definition of Monetary Policy

Monetary policy is all about the control of money supply by the monetary authority of a country mostly targeting on either inflation rates or interest rates to stabilize the macro economies such as price stability, exchange rates stabilities and low unemployment of the country. John Sarwat, 2014 also defined monetary policy as the policy adopted by the monetary authority of a nation to control either the interest rate payable for very short term borrowing (borrowing by banks from each other to meet their short term, needs) or the money supply, often as an attempts to reduce inflation or the interest rate, to ensure price stability and general trust of the value and stability of the nations' currency. The ultimate policy objective of monetary policy of any country is geared at achieving moderate inflation rate, keeping unemployment rate low, balancing foreign trade, stabilizing exchange and interest rates, etc. and in general attaining stable and well-functioning macro-economic environment. In this process, monetary policy plays a central role. For instance, during economic recession where output falls with a fall in aggregate demand, monetary policy aims at increasing demand and hence production as well as employment will follow the same pattern of demand. In contrast, at the time of economic boom where demand exceeds production and treat to create inflation, the monetary policy instruments are utilized that could offset the condition and achieve price stability by counter cyclical action upon money supply (Johnston, and Sundararajan, 1999).Based on these two separate objectives monetary policy categorized as expansionary Monetary Policy and Contractionary Monetary policy.

2.1.2. Classification of Monetary Policy

Monetary Policy can be classified as expansionary and Contractionary. An Expansionary monetary policy refers the decrease in short term interest rates or injection of the money supply in the economy which is more rapidly than the usual one. It is passed by central banks and comes about through monetary policy instruments like open market operations, reserve requirements

and setting interest rate (Michael J BOYLE, 2020). The use of expansionary monetary policy occurs during a recession to reduce unemployment by decreasing interest rate hoping that less cost of capital will stimulate the business to borrow more money and hence expands. This would increase aggregate demand (the overall demand for all goods and services in an economy), which would increase short-term growth as measured by increase of gross domestic product (GDP). By increasing the amount of money circulating in the economy, expansionary monetary policy devaluates domestic currency to enable foreign purchaser to purchase more with their currency in the country with the devalued currency (Kimberly Amadeo, 2020). This will increase aggregate demand by increasing net export, aggregate demand and thereby aggregate output.

The other classification of monetary policy is Contractionary monetary policy. This policy occurs when monetary authority maintains short-term interest rates greater than usual or decreases the direct supply of money supply into economy. This makes the money supply to grow more slowly than usual, or even decreases it to slow short-term economic growth and less inflation. Contractionary monetary policy can result in increased unemployment and depressed borrowing and spending by consumers and businesses, which can eventually result in an economic recession if implemented too vigorously (Kimberly Amadeo, 2020).

2.1.3. Theories of Monetary Policy

There have been a wide range of theories of monetary policy and one differs from the other based on how variation in monetary aggregates could impact the economic growth. The impact of monetary policy on the real economic growth has long been a key issue in macroeconomic theory and hence there is no general consensus among economist as to whether the use of monetary policy will impact economic growth or not. This disagreement divided the economy into different schools of thought. They are, the classical theory, the Keynesian theory, and the monetarist theory.

A) Classical Theory of Monetary Policy

The classical economists' view of monetary policy had been a dominant theory and getting full popularity for a long period of time prior to the great depression of 1931. The theory argues that the money supply does not affect real economic variables, output does not change, and there is a direct relationship between money supply growth and inflation (Mankiw, 2009). The increase in

money supply does not affect real sector of the economy but it only pushes the aggregate demand out ward and ultimately ends with raising price level (Ackley, 2007). The increase in money supply that ends with increase in price leaves the real money stock unchanged which just offsets the increase in nominal money. Hence, monetary policy is totally neutral in the classical economy: real output, income and other real variables are completely left unchanged by change in the money supply it changes only nominal variables (Branson, 2005).

The classical economist used the quantity theory of money which is discussed in term of fisherian equation of exchange given by the expression $MV=PY$ to analysis whether monetary policy affect economic growth or not. In the expression, M represents money supply which is for some extent controlled by the Federal Government; V represent the velocity of circulation of money in the economy which is explains how many times a unit of currency purchase final goods and services on average within a year. P denotes the price level and Y represent GDP. Hence, PY represents GDP calculated at current market price. Accordingly, the equation of exchange is an identity which states that the market value of all final goods and services that is calculated at current market price (current nominal GDP) must equal to the supply of money multiplied by the average number of times a currency is used in transaction in a given year. The classical economist assumed that V and Y are fixe, and it follows that if the monetary authority increases in money supply (expansionary) monetary policy, or decrease in money supply (Contractionary) monetary policy it will lead to an increase (or decrease) in money supply (M), and the ultimate effect would ends with increase (or decrease) the price level P, in direct proportion for the change in money supply (M). In other words, expansionary monetary policy leads to inflation, and contractionary monetary policy leads to deflation of the price level.

The classical economists believe that the economy is always at full employment and hence all resources are being fully exploited at their maximum capacity (Blanchard, 2011). As to them when money supply increases, the demand for goods and services also increase as people uses additional money supply for purchasing goods and services for consumption, investment and other purposes; and this shifts aggregate demand upwards. However, since the economy is already working at full employment level, there will not be change in output but higher price will be the only ultimate effects of the money supply. Supply side economic performance will be the only way to increase real output and economic growth. The inability of monetary policy to impact real sector

is attributed to the assumption of constant velocity and the existence of full employment in the labor market (Mankiw, 2009). The absence of the real economy not to be impacted by monetary policy is called “monetary neutrality.”

Based on the assumptions of price and wage flexibility, the classical theory also described that the economy as a self-correcting and self-adjusting with prices and wages freely adjusting to the fluctuation of economy in the long run (Barro, 1983). In other words, the model reflects a pendulum which fluctuates such that when times are good, wages and prices quickly go up, and when times are bad, wages and prices freely adjust downward to equilibrate the economy in the long run. Hence, the Classical economists believed that the economy is self-correcting and self-adjusting, and this implies that the economy does not need any policy for stabilization purpose at the time of short run fluctuations.

B) Keynesian Theory of Monetary Policy

The Keynesian model that came about by Economist John Maynard Keynes as a consequence of the Great Depression of 1930 contrasts the classical economic theory stating that the economy is neither self-adjusting nor it remains always at full employment (Cameron, 2003). In other words, the economy can be below or above its potential. For example during the Great Depression, unemployment was widespread, many businesses failed and the economy was operating at much less than its potential (Mishkin, 2004).

Keynes believed that when market fails and unable to readjust itself through market force as prices and wages are not always flexible (they may be rigid sometimes), government and monetary authority are required to stabilize the economy using stabilization policies like monetary policy in the short run, unless the long run may never come. In fact, he is quoted as saying “In the long run, we are all dead” (Goodwin, 2008).

In such a way that when there is under unemployment in the economy, an increase in the money supply leads to an increase in aggregate demand, output and employment in short-run but in long-run there is no effect of money on these real variables. If the money supply increases beyond the full employment level, output causes to rise and prices rise in proportion with the money supply. Keynes also argues that it is the costs of such a recession that likely cause governments and central banks to allow a supply shock to result in inflation (Jhingan 2003)

According to the Keynesians view there is no significant relationship between monetary policy, output and price. They focus on the direction of causation running from income to money without any responses from money to income (Coddington, 1976). They believe that the increase or decrease in money supply reduce or rise interest rate and hence affects investment and consumption. Accordingly expansionary monetary policy increases the supply money to be lent through banking system, reducing interest rates. When interest rate is reduced, expenditures on investment goods and interest sensitive consumption goods usually increase, and this causes aggregate demand to increase and finally real GDP rises. Hence, monetary policy indirectly impacts real gross domestic product through income at last. They say changes in the stock of money supply affects income only indirectly (Shapiro, 2001). Accordingly, changes in income cause changes in the stock of money supply through change in the demand for money, given sticky interest rates (Branson, 2005). This indicates a unidirectional causality from income to money supply.

In a similar fashion, the Keynesian model states that prices are determined by the forces of demand and supply and hence, inflation as a real phenomenon is mainly the result of real economic factors (Blinder, 1988). They denied the role of money in the price change; structural factors are mainly the cause for changes in prices.

C) Monetarist Theory of Monetary Policy

Contrary to the Keynesians, the Monetarists led by Milton Friedman faithfully state that money supply plays an active role in determining income and prices (Laidler, 1981). This depicts that change in money supply affects both price and output in the short term. The direction of causation runs from money to income without any feedback only in the short-run. However, the inflation is a monetary phenomenon in that changes in money supply cause changes of prices in both short-run as well as long-run (Mayer, 1975). In clear notation, the monetarists' proposition suggests that there is a unidirectional causality from money supply to income and a unidirectional causality from money supply to prices. The new classical point of view totally ignored the association between money supply and income in both long-run and short-run because of rational expectation hypothesis (Froyen, 2014). Rather the overall effect of change in money supply remains only in price level (Maddock & Carter, 1982). Their view coincides with the classical view.

D) New Classical Theory of Monetary Policy

Post-monetarism has also been largely dominated by real business cycle models, the New Classical Model, New Keynesian Models and the New Consensus Model. The difference between these theories is actually slim and relates to the treatment of nominal rigidities of wages and prices as well the treatment of demand (Good friend and King, 1997; Palley, 2007)

According to Neoclassical model the relationship between money supply and economic growth is totally neglected in both long-run and short-run because of rational expectation hypothesis (REH) (Froyen, 2014). In a neoclassical model, an expansionary monetary policy has no impact on the real output level. A rise in the money supply is inflationary. This simply the quantity theory of money disguisedly coming through ISLM framework .This is because according to them economy is always operating at full employment and there is no unused resource in the economy because all factors of production are fully employed according to their assumptions. Hence, no output will increase as response to increase in demand. Here increase in demand causes only the level of price proportionally. As price rise the real money supply (M/P) is reduced and it pulls the LM curve back towards the left. This process will continue until the full employment level output is once again restored LM curve will have returned to its original position. This in turn rise interest rate to its initial position decreasing AD and output remains unchanged leaving only rise in price level (Nicoli Natras and G.ViskhVarma, 2014, pp. -159)

The New Classical Monetary policy Model is the other monetary policy theory and it assumes that in all markets there is perfect competition and prices are fully flexible. New-Classicists consider that monetary policy affects output only in the short run and the excessive money supply is inflationary in the long run (Majumder 2006). The model also predicts monetary policy neutrality (or near neutrality) with respect to real economic variables. The New Classical model considers four important assumptions, which includes: rational expectations, the natural rate hypothesis, continuous market clearing, and agents having imperfect information (imperfect information drives cycles in these models). Accordingly monetary policy has no any real effect in determining the equilibrium dynamics of employment, output, and the real interest rate; these variables are determined independently of monetary policy, and change in technology are assumed to be the only real driving force.

The other monetary policy theory is the real business cycle (RBC) theory for which the assumptions of New Classical Model laid foundation and for that it has two principles: Money has little importance in business cycles, and secondly, business cycles are created by rational agents responding optimally to real shocks (most importantly the technology) in an environment characterized by perfect competition and frictionless markets. According to rational expectation hypothesis (REH) and the continuous market clearing assumption, expected monetary policy will not affect real gross domestic product (RGDP). It is only unexpected and surprising monetary policy by which real economic variables are affected (Mankiw, 2006). The continuous market clearing and flexibility of wages and prices assumptions along with instantaneous adjustment of the economy to its long run equilibrium were rejected by the New Keynesian theorists (Mankiw, 2006). Many empirical studies also reject the relevance of the theory (Gottschalk, 2005). The integration of sticky prices and monopolistic competition into RBC frameworks became the major distinguishing feature of New Keynesian Economics (Goodfriend and King, 1997).

E) New Keynesian Theory of Monetary Policy

The New Keynesians are providing the strong microeconomic theoretical underpinning to the Keynesian system. Hence, their views support the Keynesian view that claims money supply indirectly affects income and price (Gordon, 1990). However, unlike the Keynesians they do not deny the effectiveness of monetary policy (Froyen, 2014). Their model states that expansionary monetary policy leads to a boom in employment and output and a fall in interest rate in the short run. However, output and employment do not change and the price level rises in the long run with proportionate increase in the nominal money supply. Accordingly, money is not neutral in the short run but it is neutral in the long run. This is due to adaptive expectation hypothesis (AEH) that people in the next period correct their expectations for upward movement of price, and they look forward for lower real wage rate. The expectation of household for lower wage rate in the next period makes them decrease their labor supply which ultimately shifts inward aggregate supply to its original position making monetary expansion neutral in the long run on the real output and employment but end up with only inflation (Hijira, 2009).

According to New Keynesian models, when fiscal or monetary policy changes, output and employment adjust; prices and/or wages are temporarily inflexible as monopolistically competitive firms are price setters in the goods market, and households are wage setters in the la

bor market. New Keynesian Economics refers to the retooling of traditional Keynesian models to be consistent with microeconomic fundamentals. The theory supports the long run neutrality and claims that monetary policy can only affect output in the short run. Empirical evidence on the use of New Keynesian models remains slight, and that practicality of theory is contested in part on grounds of absence of the role of money (Arestis and Sawyer, 2008).

2.1.4. Monetary policy Transmission Mechanisms

Monetary policy transmission is the process that links changes in policy rates or money supply to a series of other changes in economic variables such as market interest rates, asset prices, exchange rates, cash flow, bank credit supply, private spending and consumption, etc. ultimately affecting prices, economic output and unemployment. The channels through which monetary policy affects the different economic activities identified in the literature are the money, interest rate, credit, exchange rate, asset/equity and expectations channels (Mishkin.1995).

a) Money Supply Channel

Monetary policy assumes aggregate demand moves in proportion to the money balances used to finance transactions, affecting the split of nominal GDP between real GDP and the price level. It is this idea that forms the basis for broad money representing the intermediate target in many central bankers' money focused monetary policies (Mishkin, 2004). Interest Rate Channel This channel can be summarized under the standard Keynesian IS-LM framework, whereby an expansionary monetary policy leads to a fall in real interest rates, thus decreasing the cost of capital and stimulating investment, which then results in an increase in aggregate demand and output. Interest rate channel can be traced by using the following systematic mechanism.

$M \downarrow \Rightarrow r \uparrow \Rightarrow I \downarrow \Rightarrow AD \downarrow \Rightarrow Y \downarrow$

b)The Interest rate Channel

The interest channel of transmission of monetary policy was clearly defined in Keynes's General Theory. The present value of capital and durable consumption goods is negatively related to the real interest rate (marginal efficiency of capital function). The traditional Keynesian approach to the monetary transmission mechanism works directly through the interest rate. The proposition is based on the belief that monetary policy (e.g. a change in the short-term official interest rate)

has an impact on (short and long term) nominal as well as real interest rates that in turn affect consumer and investment spending, aggregate demand and output (Mishkin, 1996). Mishkin (2004) analyze this traditional mechanism based on the Keynesians view by assuming expansionary monetary policy. An increase in money supply lead to a fall in real interest rate which in turn lower the cost of capital which is a source for expansion in investment spending(including residential housing and durable expenditure), thereby, causing to a rise in aggregate demand and a rise in output.

An important feature of the traditional transmission mechanism is its focus on the real rather than the nominal interest rate as the rate that affects consumer and business decisions. This happen because of the slow adjustment of goods prices over time, meaning that expansionary monetary policy, which lowers the short-term nominal interest rate, also lowers the short-term real interest rate. Hence, a change in the nominal interest rate results in a change in real interest rate along the period where prices and expectation are adjusting.

In addition, it is often the real long-term interest rate and not the short-term interest rate that is viewed as having the major impact on spending. The expectations hypothesis mentioned in Mishikin (2004) referred the long-term interest rate as an average of expected future short term interest rates. They suggests that the lower real short-term interest rate leads to a fall in the real long-term interest rate which in turn lower real interest rates then lead to rises in business fixed investment, residential housing investment, inventory investment, and consumer durable expenditure, all of which produce the rise in aggregate output. The fact that it is the real interest rate rather than the nominal rate that affects spending provides an important mechanism for how monetary policy can stimulate the economy,

c) Credit Channel

Since the traditional interest rate channel seems to ignore the importance of the role of bank credit in affecting the aggregate spending in the economy, Bernanke and Gertler (1995) offered the credit channel as an alternative view of the monetary transmission mechanism. There are two major channels relying on credit, the balance sheet channel and the bank-lending channel. While the balance sheet channel focuses on the effect of monetary policy on the balance sheet of borrowers, the bank-lending channel emphasizes the impact of monetary policy action on the

supply provided by the banking system Exchange Rate Channel Monetary policy affects economic activity (output) through net exports. On the demand side, an expansionary monetary policy leads to a fall in interest rates relative to foreign-inducing capital outflows resulting in depreciation of local currency making exports cheaper, increased net exports and consequently aggregated demand and output. On the supply side, an expansionary monetary policy which depreciates local currency raises the domestic price of imported goods, leading to inflationary pressures through the exchange rate pass-through (Butkiewicz and Ozdogan, 2009). Money supply $\uparrow \Rightarrow$ Interest rate $\downarrow \Rightarrow$ Exchange rate \downarrow (devaluation) \Rightarrow Net exports $\uparrow \Rightarrow$ Output \uparrow .

d) Asset Price Channel

Traditional monetary theory suggests that monetary contraction, through an increase in the discount rate of financial assets, may lead to a fall in asset prices, which would then further affect the real economy. Mishkin (1995) singles out two main mechanisms through which monetary policy shocks are propagated by changes in equity prices. First, the theory of Tobin's q suggests that when equities are cheap relative to the replacement cost of capital, firms are reluctant to issue new equity to purchase investment goods, leading to a decline in investment. $M \uparrow \Rightarrow r \downarrow \Rightarrow P_e \uparrow \Rightarrow q \uparrow \Rightarrow I \uparrow \Rightarrow y \uparrow \Rightarrow \pi \uparrow$ (Investment) Second, equity prices may have substantial wealth effects on consumption because of the permanent income hypothesis. A rise in stock prices increases the value of financial wealth, thus increasing the lifetime resources of households as well as increased demand for consumption and output. A similar mechanism can be applied to the price of other assets such as housing, a substantial component of wealth. The Monetary Transmission Mechanism (MTM) also operates through land and housing price channels. $M \uparrow \Rightarrow I \downarrow \Rightarrow P_e \uparrow \Rightarrow TW \uparrow \Rightarrow C \uparrow \Rightarrow y \uparrow \Rightarrow \pi \uparrow$ (Consumption)

2.2. Empirical Literature Review

Many studies have been done by different scholars to establish the impact of monetary policy on economic growth. However, their empirical findings have not arrived at general consensus to date. Some studies have concluded insignificant or no impact of monetary policy on economic growth. The result of recursive VAR methodology using annual time series data from 1997-2010 by Mutuku and Koech (2014) on the impact of monetary and fiscal policy shocks on economic growth of Kenya revealed that monetary policy (both money supply and short-term interest rates) is insignificant in affecting the real economic growth. They argue that the weak relationship between monetary policy and real economic growth is due to weak structural, institutional and regulatory framework.

By employing vector auto regressive (VAR) model, Kamaan (2014) tried to measure the effect of monetary policy on economic growth of Kenya and he found that monetary policy does not have an impact on economic growth. The results are corroborated by Montiel et al. (2012) who estimated the Monetary Transmission Mechanisms (MTMs) in Tanzania covering the period 2002m1–2010m9 using both recursive and structural VAR model and found that monetary policy had no output effects.

By using the econometric regression model analysis on a monetarists' approach, Lashkary and Kashani (2011) studied the impact of monetary policy variables on economic growth of Iran employing annual time series data from the period 1959 to 2008, and found that the relationship between the money volume and real economic variables, economic growth and employment is not significant.

On the contrary, results of many empirical studies indicate that monetary policy positively and significantly impacts real economic growth through different monetary policy variables. Havi and Enu (2014) examine the relative importance of monetary policy and fiscal policy on economic growth in Ghana over the period of 1980 to 2012. The Ordinary Least Squares (OLS) estimation results revealed that money supply as a measure of monetary policy had a positive significant impact on the Ghanaian economy.

Vinayagathan (2013) used a seven-variable structural VAR model and utilizing monthly time series data from Sri Lanka covering the period from January 1978 to December 2011, estimated

the impact of monetary policy on the real economy of Sri Lanka. The empirical results of the study depicted that the change in interest rate significantly impacts real economic growth supporting the literature of economic theory. The study also found that the increase in money supply significantly influences real output but it is inconsistent; Output declines rather than increase.

To examine the impact of fiscal and monetary policies on real economic growth of Nigeria, Kareem et al. (2013) employed OLS method and correlation matrix with annual time series data covering particular period between 1998 and 2008. Their empirical result showed that narrow money and broad money are significant policy variables that positively affect real economic growth of Nigeria.

Davodi et al. (2013) tried to determine monetary transmission mechanism of economy of East African countries by using three variants of Structural VARs on monthly data sets from the period 2000 to 2010. The empirical results of their study indicated that monetary policy transmission mechanism tends to be generally weak when using standard statistical inferences, but somewhat stronger when using non-standard inference methods. For Burundi, Rwanda and Uganda, expansionary monetary policy (a positive shock to reserve money) resulted in positive and significant output shock. However, they also found that an expansionary monetary policy (a negative shock to policy rate) increases output in Burundi, Kenya and Rwanda.

Using narrative approach which was established by Romer and Romer (1989), Berg et al. (2013) examined the monetary transmission mechanism of four East African countries (Uganda, Kenya, Tanzania and Rwanda). The findings of their study revealed that there was clear evidence of a working transmission mechanism: after a large policy-induced rise in the short-term interest rate, lending and other interest rates rise, the exchange rate tends to appreciate, and output growth tends to fall.

Using the Error Correction Model (ECM) on time-series data covering 1975 to 2010, Fasanya et al. (2013) investigated the impact of monetary policy on economic growth in Nigeria. Their finding confirmed the existence of long-run relationship among the monetary policy variables and that inflation rate; exchange rate and external reserve are significant monetary policy variables that affect economic growth in Nigeria in accordance with theoretical expectations.

Onyeiwu (2012) examining the impact of monetary policy on the Nigerian economy using the OLS method to analyses data between 1981 and 2008, found that monetary policy proxied by money supply exerts a positive impact on GDP growth. Milani and Treadwell (2012) used a small-scale DSGE model to disentangle unanticipated and anticipated monetary policy shocks and study their effects. The estimation used likelihood-based Bayesian methods on US data from 1960:q1 to 2009:q1 on the output gap, inflation, and the federal funds rate as observable variables. They showed that the unanticipated monetary shocks have a smaller and more short-lived impact on output and a large, delayed, and persistent effect due to anticipated policy shocks. The overall fraction of economic fluctuations that could be attributed to monetary policy remained limited.

Chaudhry et al. (2012) investigated long-run and short-run relationships of monetary policy, inflation and economic growth in Pakistan using co-integration technique and the ECM for the period from 1972 to 2010. They found that monetary policy variable of call money was insignificant in the short run but positively significant in the long run.

Mugume (2011) utilized the five-variable non-recursive VAR to estimate monetary transmission mechanisms in Uganda using quarterly data between 1999q1 and 2009q1. Using broad money and three month T-bill rate (lending rate) as proxies of monetary policy, the results showed that a shock to interest rate (91-day T-bill rate) was considered as the monetary shock and it was found that a Contractionary monetary policy reduced economic growth lasting up to two quarters while innovation in broad money M2 had no statistically significant effect on output.

Coibion (2011) estimated the effects of monetary shocks on the US economy for the period from 1970 to 1996, using the standard VAR against the large effects from the Romer and Rømer (2004) approach (R and R). The study found that with the standard VAR approach, the monetary policy shocks appear to account for very little of the fluctuations in the real economy, measured either via industrial production or unemployment. It was also found that the 1980-1982 and the 1990 recessions could not be explained by the standard VAR. When a DSGE model by Smets and Wouters (2007) was estimated, it accounted for medium sized effects of the monetary shocks on real variables, including output.

Jawaid et al. (2011) probed the effect of monetary, fiscal and trade policy on economic growth in Pakistan, using the annual time series data from 1981 to 2009. They employed the co-integration and ECM revealing the existence of positive significant long-run and short-run relationship between monetary policy (money supply) and economic growth. Senbet (2011) also investigated the relative impact of fiscal versus monetary action on output in the USA using the VAR approach and revealed a positive significant impact of money supply on economic growth. Their findings are congruous with Adefeso and Mobolaji (2010) that also studied the relative effectiveness of fiscal and monetary policy on economic growth in Nigeria using the co-integration technique and error correction mechanism, based on annual data from 1970-2007.

Employing the OLS approach, Nouri and Samimi (2011) examined the relationship between money supply and economic growth for the period during 1974 to 2008 in Iran. They found a positive significant relationship between money supply and economic growth. Ogunmuyiwa and Ekone (2010) investigated the relationship between money supply and economic growth in Nigeria between 1980 and 2006. The OLS and ECM revealed a positive impact of money supply on economic growth both in short run and long run.

Moursi and El Mossallamy (2010) analyzed monetary policy in Egypt and its effect on inflation and growth by using the Bayesian approach to estimate a dynamic stochastic general equilibrium (DSGE) model for a small closed economy. Monthly time series data for the sample period 2002 to 2008 was utilized. They found that the impact of monetary policy negative shock is relatively more significant on output than on inflation, indicating that expansionary monetary policy is capable of stimulating economic growth without imposing too much pressure on prices.

Amarasekara (2009) utilized both recursive VAR and semi-structural VAR methodology on monthly data for the period from 1978 to 2005 to assess the effects of monetary policy on economic growth and inflation in the small open developing economy of Sri Lanka. The results from recursive VAR were consistent with results from the semi-structural VAR and they revealed a negative significant impact of interest rate on growth. Positive innovations decreased GDP growth. However, when money growth and exchange rate are used as policy indicators, the impact on GDP growth contrasts the established findings/theory.

Suleiman et al. (2009) employed the Johnson co-integration test to investigate the long run relationship between money supply (M2), public expenditure, and economic growth in Pakistan using annual data for the period 1977-2007. They found a positive relationship between money supply (M2) and economic growth in the long-run.

Buigut (2009) assessed the importance and similarity of the interest channel for EAC countries using the VAR model in assessing the similarity of transmission mechanism in the EAC (Uganda, Kenya and Tanzania). Rwanda and Burundi were excluded due to data challenges. The annual data on three variables (real GDP, CPI and Interest rates) used in different countries varied – Uganda (1984- 2005), Kenya (1984-2006), and Tanzania (1984-2005). No co-integration among the variables was found. He found out that the interest rate transmission mechanism was weak in all three countries and that a shock to the interest rate had no statistically significant effect on real output.

The results of the Autoregressive distributed lag model employed by Ali et al. (2008) to examine the effects of fiscal policy and monetary policy on economic growth in South Asian countries using annual data from 1990 to 2007 indicated that money supply had a positive and significant effect on economic growth in the short and long run.

Rafiq and Mallick (2008) examined the effects of monetary policy shocks on output in the three euro-area economies – Germany, France, and Italy (EMU3) – by applying a new VAR identification procedure. The results showed that monetary policy innovations are at their most potent in Germany. However, apart from Germany, it remained ambiguous as to whether a rise in interest rates coincides with a fall in output, showing a lack of homogeneity in the responses. They concluded that monetary policy innovations play a modest role in generating fluctuations in output for the EMU3. Dele (2007) examined the monetary and macroeconomic stability perspective of West African Monetary Zone Countries using quarterly data sample spanning 1991:1 to 2004:4. The regression results indicate that monetary policy, as captured by money supply and credit to government, hurt real domestic output of these countries. The study also shows that interest rates policy had adverse effects on GDP contrary to the theoretical expectation of an inverse relationship and that exchange rate devaluations have no effect on output.

Smets and Wouters, (2007) developed and estimated a DSGE model with sticky prices and wages for the euro area. The model was estimated with Bayesian techniques using seven key macroeconomic variables: GDP, consumption, investment, prices, real wages, employment, and the nominal interest rate. In addition, they introduced ten orthogonal structural shocks (including productivity, labor supply, investment, preference, cost-push, and monetary policy shocks) that allowed for an empirical investigation of the effects of such shocks and of their contribution to business cycle fluctuations in the euro area. They found monetary policy shocks are important in driving variations in the euro area output. Khabo and Harmse (2005) estimated the impact of monetary policy on South Africa, using OLS on the annual data series from 1960 to 1997 and found that money supply (M3) and inflation significantly related to economic growth in accordance with economic theory.

2.3. Empirical Literature Review of Ethiopia

Naser Yenus(2018), analyzed the dynamic effects of monetary policy innovations in Ethiopia by employing Short run and long run identification schemes on structural vector autoregressive model using quarterly data from the period 1991:Q1 to 2016:Q1. The study found that positive shock in interest rate causes a reduction in output and price puzzle. A positive shock to broad money supply has a positive and significant effect on output and price. A positive shock in real effective exchange rate has also an expansionary, though insignificant, effect on impact on both output and price. These results are especially true for the short run identification scheme. As to the results from the variance decomposition, the study shows that the highest variation in output and price is caused by broad money supply shock in the short run.

The results of Vector Auto Regressive model employed by Nuru (2009) to examine the monetary policy transmission mechanism of monetary policy on economic growth of Ethiopia using quarterly data from 1998Q3 to 2010Q2 found that effective direct monetary aggregate and exchange rate channels, weak credit channel and inactive interest rate channel.

Abate Yesigat (2019) employed the Structural Vector Auto Regressive approach using time series data from the period 1994/95Q1 to 2017/19Q4 to examine monetary policy transmission mechanism of Ethiopia concluded that monetary aggregate, exchange rate and credit to the

private sector are effective channels of monetary policy transmission in affecting output and inflation in Ethiopia, while the interest rate channel is weak.

Sisay Demissew et al,(2020) investigated the relative importance of fiscal policy and monetary policy of Ethiopia by employing Auto Regressive Distributed lag model using annual time series data covering the period from 1981-2008 and the result of the ARDL bound test approach revealed that fiscal policy and monetary policy significantly increased economic growth of Ethiopia. However relative to monetary policy fiscal policy is more effective.

Yeshiwas Ewunetu (2020) investigated the impacts of monetary policy on economic growth of Ethiopia using VAR model and causality test using time series data from 2002-2017. The study result revealed that monetary policy has short run effect on economic growth of Ethiopia through direct money supply. There is neutrality of monetary policy in affecting economic growth of Ethiopia in the long run.

Using VAR model Teweldbrihan Tesfaye,(2010) investigated the relative effectiveness of monetary policy and fiscal policy in affecting economic growth of Ethiopia using time series data from 1971 to 2009 and the study result shows that there is monetary policy neutrality in the long run in affecting economic growth of Ethiopia. There is only short run effect. Abdilkarim and Sisay Debebe (2020) tried to examine the dynamics of inflation and its impacts on the economic growth of Ethiopia, Kenya and Sudan using panel data and employing ARDL mode. The results show that broad money supply (M2) affects economic growth of Ethiopia, Kenya and Sudan.

(Tamirat Beyene¹, Inderjeet Singh² , June 2019) investigated the effectiveness of monetary policy in affecting industrial growth of Ethiopia using ARDL bound test approach employing time series data from 1974 to 2016. The study result revealed that monetary policy affects industrial growth of Ethiopia in the long run. Money supply, represented by M2, found to significantly and positively influence industrial growth verifying long run monetary non-neutrality.

Employing SVA model, Tesfaye Gebrebrihan examined the relative effectiveness of monetary policy and fiscal policy shocks on the Ethiopia Economy from 1991Q1 to 2016Q1 and the result

depicted that monetary policy through broad money supply (M2) affects economic growth of Ethiopia.

Demilie and Fikru, 2015 investigated the effects of monetary policy on the private sectors investments in Ethiopia using time series data ranging between 1975 to 2011 employing ARDL approach and the study result revealed that monetary policy has long run and short run effect on private sector investment of Ethiopia through broad money supply M2 whereas monetary policy through interest rate remained un active in affecting private investment of Ethiopia.

Using ARDL bound test approach Takilu Tadesse and Tesfaye Melaku,(2019) analyzed the relative impacts of monetary policy and fiscal policy using time series data spanning from 1975 to 2017. Their study result revealed that both monetary policy and fiscal policy are significant in affecting economic growth of Ethiopia. Monetary policy through broad money supply affects economic growth of Ethiopia in the long run whereas short run effect is insignificant.

The empirical study conducted by Alemayew Demisie,(2015) on the evaluation of monetary policy in Ethiopia using time series data ranging from 1990:1 to 2013:4 and employing SVAR model found that monetary policy shocks have been driver of business cycle fluctuation in Ethiopia. Monetary policy through nominal money supply interest rate and real effective exchange rate significantly affect economic growth of Ethiopia.

Girma Tadesse (2010) investigated the Dynamic effects of monetary policy on Ethiopian Economy between 1970 EC to 2011 EC by employing Autoregressive Distributive lag (ARDL) bound test model. The VEC result revealed that money supply, and unemployment rate have positively affected real GDP growth rate where as domestic credit, interest rate and inflation have negatively affected economic growth of Ethiopia. Money supply has statistically significant negative effect on the real gross domestic product growth in the short run. However the unemployment rate, domestic credit, interest rate and inflation have positive effect on economic growth of Ethiopia in the short run.

Fitsum, Yilkal and Teshome analyzed the Relationship between Inflation, Money Supply and Economic Growth of Ethiopia by using Co integration and Causality Analysis. Annual time series data for the sample period 1970/71-2010/11 was utilized. They found the presence of one co integrating vector and the existence of long run bi-directional causality between inflation and

money supply and uni-directional causality from economic growth to inflation. In the short run one way causality were found from money supply and economic growth to inflation.

The findings of the investigation of the Relative Effects of Fiscal and Monetary Policies on Ethiopian Economic Growth by Zewdu Teshome,(2020) using Johansson test of co-integration and Ordinary Least Squares estimation technique using annual time series data from the period 2009 to 2019 revealed that monetary policy proxy by interest rate has significantly a negative effect on the Ethiopian economic output.

The findings of structural VAR and Factor Model approach on the Role of Monetary and Fiscal Policies in Ethiopia economy from the period 1998:1 to 2017:4 by Alemu Lambamo 2018, concluded that Contractionary monetary policy is associated with a fall in output; i.e monetary policy has positive and statically significant effect on economic growth of Ethiopia even so the contribution of fiscal policy shocks is greater than monetary policy shocks in explaining fluctuations in output, with roughly equivalent contributions coming from fiscal policy component shocks.

2.4. Summary of the literature and research knowledge Gap

From the above theoretical and empirical literature reviews it can be concluded that the impacts of monetary policy on economic growth is still inconclusive. Many studies have been done by different scholars to establish the impact of monetary policy on economic growth. However, their empirical findings have not arrived at general consensus to date. Some studies have concluded insignificant or no impact of monetary policy on economic growth especially of developing countries (Mutuku and Koech (2014); Kamaan (2014); Montiel et al. (2012); Lashkari and Kashani (2011)).

On the contrary, results of many empirical studies indicated that monetary policy positively and significantly impacts real economic growth through different monetary policy variables (Havi and Enu (2014); Vinayagathan (2013); Kareem et al. (2013); Davodi et al. (2013); Romer and Romer (1989), Berg et al. (2013); Fasanya et al. (2013)).

In addition, the results of these empirical studies also revealed the relative importance of monetary policy variables in affecting economic growth. Accordingly, results of many studies

shows that aggregate money supply(M2 channel) is the best monetary policy variable to establish the impact of monetary policy on economic growth of countries where as interest rate as monetary policy variable has no any impact. Contrastingly some studies concluded that monetary policy can have impact on economic growth through interest rate.

Moreover, the above empirical studies including Ethiopia reveal that the inclusions of potential controlling macro-economic factors that may increase the robustness of the study result are lacking attention. Many studies employee in their model only monetary policy variables alone to establish the impacts of monetary on the economic growth of Ethiopia (Tamirat & Inderjeet, 2019); Fitsum et al 2016); Abate Yesigat (2019).On the other hand, some studies combined both monetary policy variables and other potential controlling variables for their empirical model but the most important variables are remained unemployed in the empirical model (Sisay Demissew et al(2020); Tadesse T.& Melaku T. (2019); Tesfay Gebrehiwet,(2017); Teweldebrehan Tesfay(2010)). The absence of this variable from the model may delimit the robustness of the study result.

In general, the inconclusiveness of impacts of monetary policy on economic growth and the difference in study result for relative significance of monetary policy variables and finally the focus of most of the existing studies being only on the monetary policy variables alone to establish the impacts of monetary policy on the economic growth of Ethiopia and thereby the existing knowledge gap initiates this study. Hence, the purpose of this study is to investigate in-depth the impacts of monetary policy on economic growth of Ethiopia combining monetary policy variables and other potential controlling variables by utilizing an appropriate econometrics model and also further contribute to the stock of literatures.

2.5. 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 (M2) and interest). In addition other potential macro-economic variables like inflation rate, real effective exchange rate, gross fixed capital formation and budget deficit are believed to influence the economic

growth. The conceptual framework indicates that real gross domestic product is dependent variable and the other six variables (two monetary policy variables and four control variables) are independent variables.

The coefficient of broad money supply growth rate is expected to be positive. This is based on the previous literature point out the positive impact of broad money supply growth on the real gross domestic product. Expansionary monetary policy or growth in money supply through decrease in short term interest rate or increase in money supply faster than the usual one raises aggregate demand which ultimately increase real gross domestic product. Conversely, Contractionary monetary policy or a reduction in money supply growth through raising interest or reducing money supply leads to reduction of aggregate demand and thereby aggregate output.

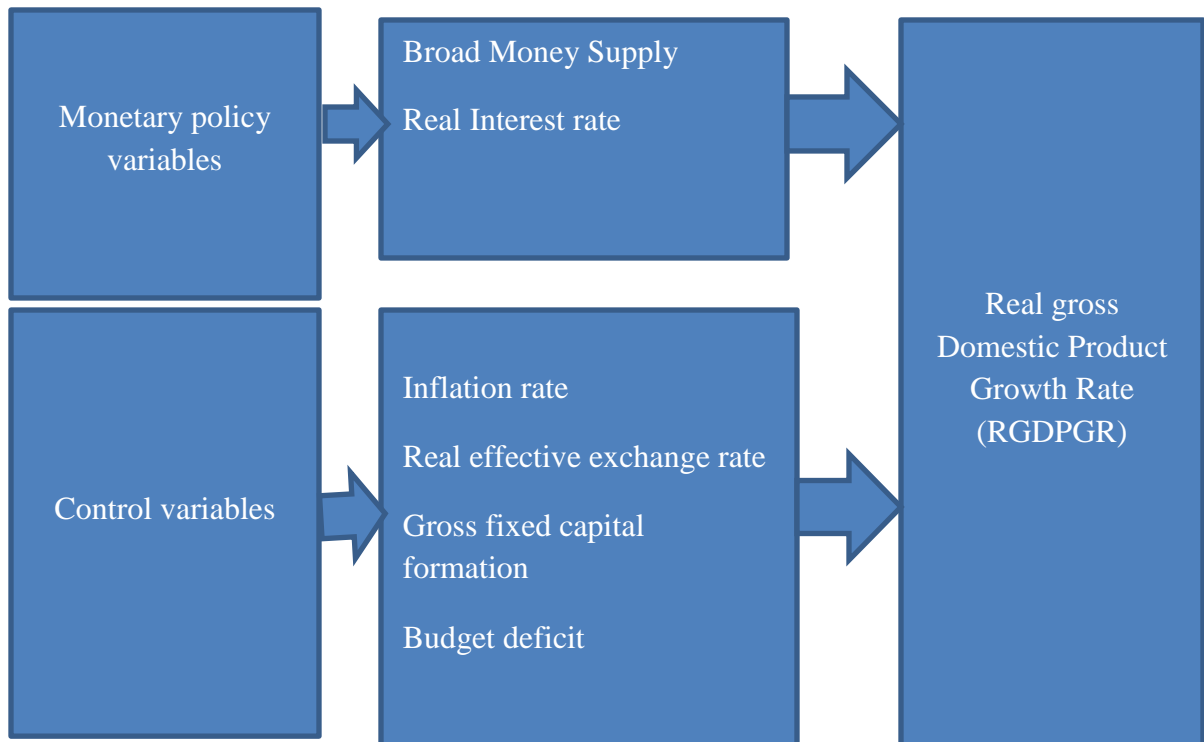
The coefficient of real interest rate is expected to be negative. This is based on the previous literature particularly of Keynesians stated that lower interest rate reduces cost of capital and encourages the individual to borrow more money and uses for purchasing goods and services for consumption, investment and other purposes. This shifts aggregate demand upward and as response to raised demand aggregate supply also increases.

The coefficient of inflation is expected to be negative. This is based on the existing literature point out that inflation rate beyond the desired level retards economic growth and hence there is negative relationship between inflation and gross domestic product. Inflation beyond the desired level affects the decision behavior of major economic agents like private investors, consumers and exporters. This reduces aggregate demand and finally aggregate output.

The coefficient of real effective exchange rate is expected to be positive. This is based on the previous literature point out a strong correlation between real effective exchange rate and real economic growth i.e. a positive and significant relationship .An increase in money supply reduces interest rate to ensure money market equilibrium. A reduction in interest rate result in foreign capital outflow and thereby domestic currency became cheaper relative to foregone currency(USD).This reduces the cost of exports and rendering countries more competitive in the global market, which on the other hand increases cost of importers. This raise in net exports, aggregate demand and ultimately aggregate out put

The coefficient of gross fixed capital formation is expected to be positive. This is based on the existing literature point out increase in gross fixed capital formation growth rate expected to increase economic growth (Edwards, (1996); Ahmad, Yusuf & Anoruo (2000))

The coefficient of Budget deficit is expected to be negative. This is based on the existing literature stated that the increase in budget deficit causes economic growth to decline. To summarize the main focus of the study, the following conceptual framework was developed by the researcher.



Source: Compiled by the author

Table 2.1: The Conceptual Frame Work of the Study

CHAPTER THREE

MONETARY POLICY AND FINANCIAL SECTOR DEVELOPMENT OF ETHIOPIA

3.1. Monetary Policy Development of Ethiopia

3.1.1. Monetary Policy Framework of Ethiopia

The history of monetary policy of Ethiopia started in 1943 when the State Bank of Ethiopia was established, with two separate departments performing the separate functions of an issuing bank and a commercial bank before they formally separated in 1963.

Starting from its establishment in 1963 by proclamation no 206/1963, the National bank of Ethiopia became independent for broad administrative and legal personality like Central bank of any other country. The bank was responsible not only for issuing paper money and coins but also it was delegated for the regulation of the supply and availability, and also interest rate and credit supply. International reserves management and administration of the country, licensing and supervising banks and holding of commercial banks reserves and lending money to them, to supervise loans of commercial banks and regulate interest rates, to fix and control the foreign exchange rates were also the main duties and responsibilities of the bank.

However, after 1974, when socialist regime had come to power, the country adopted the command economic system and hence, the monetary and banking proclamation no.99 of 1976 came into action to shape the role of the bank in line with the socialist economic principles. Since the national planning was by direction and all inclusive, National Bank of Ethiopia's area of supervision increased to include other financial institutions such as insurance institutions and credit cooperatives. Moreover the former Ethiopian dollar was replaced by the new Ethiopian birr during the period. Generally the socialist regime economic system was characterized by fixed exchange rate, absence of financial market, direct and absolute control on the capital markets, and price regulation.

Following the fall of the socialist regime in 1991, the 1994 newly issued proclamation reorganized the banks establishing on the market based economic policy. Its main targets were to promote stable money market, establishing and ensuring a sound financial system, better credit

supply and exchange rate conditions so that they are conducive to the balanced growth of the economy of the country. The 83/1994 newly issued proclamation assigned the National Bank of Ethiopia to control money supply and its availability. And also regulate availability of credit, establish applicable interest rates, set limit on the position of net foreign exchange and on the terms and amount of external indebtedness of banks and other financial institutions and to make short and long term refinancing facilities available.

The established National Bank of Ethiopia by proclamation no 83/1994 was amended by proclamation No.591/2008 by the government in 2008. By this proclamation, the following functions were assigned to the National Bank of Ethiopia as:

- ❖ Coining, printing and issuance of the legal tender currency and acts as banker. It also became the financial advisor and fiscal agent to the government regulates and determines the supply and availability of money and credit to the economy.
- ❖ Applicable interest rate and other cost of money charges; formulating implements and follow up the country's exchange rate policy; and manage and administer the international reserves of the country licenses; supervises and regulates the operations of banks; insurance companies and other financial institutions are also the major reasonable work assignments of National Bank of Ethiopia.
- ❖ Sets limits on gold and foreign exchange assets; which other banks and other financial institutions authorized to deal in foreign exchange and hold in deposits;
- ❖ sets limits on the net foreign exchange positions and terms, and the amount of external indebtedness of banks and other financial institutions.
- ❖ It provides short and long term refinancing facilities to banks and other financial institutions. Accepts deposit of any kind from foreign sources promotes and encourages the dissemination of banking and insurance services throughout the country
- ❖ Prepares periodic economic studies, together with forecasts of the balance of payments, money supply, prices and other relevant statistical indicators of the Ethiopian economy useful for analysis and for the formulation and determination by the Bank of monetary, saving and exchange policies represents the country in international monetary institutions and acts consistently with international monetary and banking agreements to which Ethiopia

is a party exercises and performs such other powers and activities as central banks customarily perform.

3.1.2. Monetary policy Instruments

The supply of money by central bank is guided by monetary policy aiming at achieving stable price/low inflation, full employment, and finally to increase economic growth. The act of keeping inflation at low level has been getting greater attention by many countries since recent years due to the emergence of strong empirical evidence that depicts high inflation retards economic growth of a nation by distorting investment, saving and production decision made by private agents(Khan,2010).

Targets of monetary policy are designed to achieve long term objectives of monetary policy. They are classified as either operating target or intermediate targets. Intermediate targets include variables that influence the ultimate objectives of monetary policy, but are not directly controlled by the central bank. Long term interest rate and different monetary aggregates are included under this category of monetary policy targets. On the other hand, operating targets of monetary policy are tactical goals that can be influenced by the central bank in the short run. To affect intermediate target, central banks cannot use monetary policy instruments directly. They can use them to affect operating targets, like short-term interest rates and reserve money which influence the intermediate targets.

Direct or indirect monetary policy instruments are the two typical classifications of monetary policy instruments that affect operating targets of monetary policy. The functions of direct instruments are based on the regulations that directly affect either the interest rate or the volume of credit. These interest rates and volume of credit includes administratively set interest rate ceilings, credit ceiling of individual bank and directed lending. As money market and financial markets develop, direct instruments become increasingly ineffective; besides they create distortions including financial repression, and promote financial disintermediation, and fiscal dominance.

As the central bank engages in transactions with both financial and nonfinancial institutions, price of bank reserves are determined by market force and hence the use of indirect instruments of monetary policy are usually termed as market-based instruments. Open-market operations,

central bank lending policies and reserve requirements are the three main types of indirect instruments that are used to inject and absorb liquidity from economy (khan, 2010). In case of National Bank of Ethiopia, they use a number of monetary policy and accommodation instruments with which to regulate market liquidity and influence reserve money. The commonly used instruments are discussed below.

3.1.2.1. Reserve Requirement

The Central Bank may require Deposit Money Banks to hold a fraction (or a combination) of their deposit liabilities (reserves) as vault cash and or deposits with it. The bank uses the fractional reserve to limit the amount of loans that banks can make to the domestic economy and this help the bank to limit the amount of money supplied to economy. This enables the central bank control the amount of liquidity in the economy. The assumption is to maintain stable relationship by between banks reserve holdings and the amount of credit they extend to the public. Reserve requirements contain direct control of central bank as they are set and changed according to regulation of the bank. However, reserve requirements can be classified as an indirect policy instrument since the effect of changes is a function of the demand for reserve money (NBE, 2009).

The way of computing reserve requirement in Ethiopia is netting out unclear checks paid and unclear effect forgone from the total deposits. The National Bank of Ethiopia currently fixed the requirement at 5% of the net deposit and failing to comply with this requirement will be penalized. Accordingly, the liquidity of banks is controlled by this instrument varying the rate according to the level of the target. The liquidity and credit expansion power of commercial banks are contracted by higher Reserve Requirement of NBE whereas lower reserve requirement leads to increase in liquidity and credit expansion power of banks. This has to be undertaken consistently with macroeconomic conditions (Gazena: 2001 cited in Zerayehu 2006).

3.1.2.2. Open Market Operations

Open Market Operation may be 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. One of these typical instruments is securities (treasury bills). At any time, when Central Bank need to control the amount of money supply circulating in the economy it sells securities and reduces the supply of reserves and when it buys securities-by redeeming them-it increases the supply of reserves to the Deposit Money Banks. Accordingly, the National bank of Ethiopia uses open market operations as one of its monetary policy instruments. When National Bank of Ethiopia faces shortage of securities, government needs to allocate some amount of its treasury bills to NBE for its monetary policy purpose (NBE, 2009). To improve open market operations, minimum interest rate should be at least close to yields on the government securities. Establishing secondary market for government securities is the next step.

The treasury bills market is the first step to grow open market operation in the condition of under developed financial market. Hence, government introduced the bi-monthly auction market in 1995 in order to finance its budget deficit from non-bank sources. In addition it is preparing fertile ground for the establishment of secondary market and to promote the NBE's controlling power on money stock and interest rate.

In order to attract the attention of private sectors to participate in the treasury bills market the government should trim down the minimum denomination and interest rate should be exempted from tax in treasury bills market. However, the treasury bills market is dominated by public organization due to the failure of the market to attract private bidders as expected. This is due to low bill interest rate, less than three percent on average which is the result of high competition among liquid banks and other financial institution. So private sectors prefer bank deposits to buying treasury bills. In effect, liquid commercial banks willing to lend to government by a lower rate than the deposit rate they are paying to their deposit liability (Zerayehu, 2006). As a result, the T-bill market failed to serve most of its pre-determined objectives which is developing secondary market but serving as a source of fund for government.

Despite inter-bank money market has been allowed by National Bank of Ethiopia, it is still largely and ironically at rudimentary level because of the treasury bills market which cast a shadow on its development as the excessively liquid use of treasury bills market that provides them with maximum security and lower cost as well as higher return (in absolute term) than inter-bank lending they give fund seeking banks lesser attention and even turn down their request (Gazena 2001 cited in Zerayehu 2006).

The Open market operation is actively carried out by National Bank of Ethiopia through Treasury bills market to manipulate variables like liquidity level and net domestic assets of the banking system and money supply in the economy and monitor whether they are consistent with the targeted level (NBE Birritu, No.78).

3.1.2.3. Standing credit facility of central bank

Standing credit facility of central bank is another instrument of monetary policy which is used to improve financial capacity of commercial banks and to promote financial intermediation and efficiency. Transparency and predictability of accessing central banks resources to cover short-term needs are the main benefits of such standing credit facility. This credit facility assures banks when they face problems like shortfall of clearing and a lack of alternatives for raising immediate funds in the inter-bank market, they can settle the clearing with the central bank's funds at a reasonable interest rate which has a clear relationship with short term market interest rates. This facility will be used by National Bank of Ethiopia as one of its monetary policy instrument (NBE, 2009).

The level of economic development of countries particularly of their financial sectors determines the instruments of monetary policy used by the Central Bank. The competition, efficiency, transparency and expansion of financial intermediation in the banking system are increased by the introduction of a wide-range of monetary instruments by central banks. It also stimulates commercial bank's liquidity management and eventually leads to the development of well-functioning of money and financial markets which could serve as a means for economic growth and development. Because of under development of money market and the virtual non-existence of a financial market, the use of such instrument has not been widely used yet in Ethiopia. (NBE, 2009). Thus, in order to effectively execute the monetary management function of the National Bank of Ethiopia, it is envisaged to use a mix of diversified monetary policy instruments

3.1.3. Development of Money Supply, Exchange rate, Interest rate and Inflation rate

The formulation and implementation of monetary policy is the responsibility of National Bank of Ethiopia and hence the bank works to bring sustainable economic growth and development, by maintaining price stability and exchange rate stability as its main objectives. Maintenance of

price stability is getting greater attention since it is used as a proxy for the achievement of stability of overall macro economy. The reason behind is that stable price helps to create stable economic activities like consumption, investment, international trade and saving; and in the end it will improve employment level and economic growth of the country. Ensuring price stability and macroeconomic environment for economic growth is the main trust of monetary policy to be geared continually.

3.1.3.1. Development of Money supply (M2)

Broad money (M2) is a broader definition of money and it includes everything in a narrow money and also adds other types of deposits (quasi-money), where narrow money contains basic amount of notes and coins and operational deposits at bank, and quasi-money comprises both saving and time deposits.

The developments in the monetary aggregate of Ethiopia was highly geared following the expansionary economic policies (such as increased public expenditure and money supply) followed by the government and National Bank of Ethiopia (Alemayehu and Kibrom, 2008). The broad money supply has been increased from birr 14, 408.4 billion in 1994/95 to birr 1,037 646.3 billion in 2019/20 with annual average growth rate of around 19.16 percent ('Birr' is the official currency unit of Ethiopia). The share of broad money as a percentage of GDP has shown a marked increase from 4.88 percent in 1994 to 49.20 percent in 2019/20 (NBE, 2020).

3.1.3.2. Development of Interest Rate

Before economic reform was under taken in 1998, discriminatory interest rates, foreign exchange as well as credit allocation policies was practiced in Ethiopian. Accordingly, the interest rate was deliberately set at a very low level and based on the degree of socialization; the interest rates that different sectors faced are not the same. However, the 1998 economic reform particularly of financial sector reform, allowed interest rates to be determined by the inter-play of the market forces. As a result, the interest rate became fairly liberal and the National Bank of Ethiopia has set only a floor for deposit rate and the remaining rates are determined by market forces.

Moreover, through the strategy of gradualism, the NBE has implemented this policy step by step. Accordingly, the average time deposit and saving deposit interest rate became 6.0% &

6.29% while the nominal lending interest rate by the Banks ranged between 10.5 percent and 13 percent, with some private Banks charging more than these. The development in differentiated interest rates, associated with the expansion of private banks, indicated the slow but growing competition among banks. There have not been significant changes in the interest rate structure of the banking system between 2002 and 2005. This was mainly due to the prevalence of excess liquidity in commercial banks. As a result, the simple average savings deposits rate remained at 3.08 percent per annum just 0.08 percentage points above the 3 percent minimum set by the NBE. Interest rate on time deposits, however, ranged between 3.62 percent for a maturity period of less than one year to 3.71 percent for those loans extending above two years. In 2010/11, the saving deposit rate and time deposit grow to 5.4 and 5.49 respectively while the nominal lending rate by the Banks ranged between 7.5% and 16%.

3.1.3.3. Exchange Rate Development

The exchange rate of Ethiopian currency against reserve currency (US dollar) was determined by government decree before economic reform was under taken in the 1992. The first Ethiopian exchange rate currency with US dollar started with official exchange rate of 2.48 birr per US Dollar by currency Proclamation of 1945. The Ethiopian birr was slightly devalued to 2.50 birr per US dollar in 1964 but it was revalued to 2.30 birr per US dollar in 1971 after the collapse of Bretton Woods. The subsequent 10% devaluation of the US dollar had temporarily brought about undervaluation of the birr. To realign the Ethiopian birr, it was again revalued to 2.07 birr per USD in February 1973.

From 1973 to 1992, the Ethiopian currency was fastened to the US dollar at a fixed rate of 2.07 birr per US dollar nearly for two decades. After the reform had taken place, the currency devalued to 5 birr per US dollar due to overvaluation of birr for the pre reform period. Before the reform, the National Bank of Ethiopia (NBE) rationed the limited supply of foreign exchange to socialized sectors than private sector based on priority in the national plan. This is because all foreign exchange earnings were capitulated to National Bank of Ethiopia.

As a result, exchange rate, which is based on auction, was introduced in 1993 and it was conducted on a biweekly basis as a Dutch auction, where the marginal rate, which clears the market, is taken as the ruling rate for the next two weeks. Before the 1995 unification of the two

rates, both the auction based exchange rate system and the official exchange rate utilized together. Export earnings, loans, and external grants are the sources of the supply of funds for the Foreign exchange market (Alemayehu, 2005). To make banks wholesale bidders, National Bank of Ethiopia has replaced the retail auction system with a wholesale auction system in 1998. An interbank foreign exchange market on a daily basis is the way of determining the current exchange rate, which is a clear indication of the government's policy of gradualism toward liberalizing the exchange rate market. However, the government's extensive controls on foreign exchange limit the accessibility of foreign exchange demanders to the official market, and then it leads to the emergence and development of an illegal foreign parallel exchange market.

Looking in to the development of Foreign Exchange Market, one can investigate how far the parallel exchange rate deviates from the official exchange rate and the real effective exchange rate indices from their nominal effective exchange rates. Conversely since the devaluation of domestic currency made the deviation started to narrow down and, in some cases, even the real effective exchange rate indicating that the overvaluation of the Birr has been reduced and the parallel market exchange rate premium has declined significantly. The ongoing foreign exchange liberalization should be strengthened until the exchange rate is set by solely market forces so as to eliminate the undesirable impact of the exchange rate premium on the economy (Zerayehu, 2006). Throughout the period from 1993 to 1997 the parallel exchange rate showed a significant divergence from the official rate. Both rates start to move together in 1998 and continue till 2007, at this time the exchange rate premium between the parallel and the official rate narrowed down. However, the average official exchange rate of birr 10.42/USD in 2008/09 indicate annual depreciation of 12.7%. The rate of depreciation is relatively higher than the previous period; this is because of NBE's intervention in interbank foreign exchange market to reverse the appreciation of real exchange rate in order to improve the external competitiveness of the country. The parallel exchange rate also highly depreciated and reached birr 11.8/USD. As a result the exchange rate widened again till 2009/2010. After 2009/10 both the official and parallel rate are depreciated to birr 16.11/USD and 16.52/USD respectively, these in turn narrow the premium between the official and the parallel exchange rate.

3.1.3.4. Development of Inflation rate

Inflation in Ethiopia during the review period showed a fluctuating behavior characterized by successive ups and downs. Ethiopia was characterized as a low inflation country with an inflation rate of single digit level. For instance According to Zerayehu (2006), explained from 1971 – 2003, the inflation averaged 6.70%. In this period the highest inflation of 45% was registered in 1991, the year which marks the end of the civil war and the incumbents the Ethiopian Peoples' Revolutionary Democratic Front took power. From 2003/04 to 2018/20, however, inflation started to rise rapidly but fluctuating year to year. The average inflation in this period of 2003 up to 2019 rose to **14.75 %** with the highest inflation rate of **44.39%** registered in 2008.

3.1.4. Financial Sector Development in Ethiopia

In Ethiopia the financial system is highly dominated by the banking system. In 1963 the commercial bank of Ethiopia established along with the National bank of Ethiopia. After the 1963 law, some other banks also established which was owned by foreigners. Before 1992 the financial sector was dominated entirely by the government. Although there were few banks owned by foreigners before 1975, all privately owned banks were nationalized and concentrated into Commercial Bank of Ethiopia. Afterward, the main financial sector reform was to direct the government banks to finance greatly increased public sector In terms of the financial sector, the 1992 reform brought in private sector players. The government not only began to serve the private sector, which previously had been demonized, but it also allowed the establishment of */new private financial institutions.

Equally, the role of Ethiopia's central bank needed to be reformulated. In undertaking this task, after 1992 the government adopted a strategy which allow gradual opening up of private banks and insurance companies alongside public ones and gradual liberalization of the foreign exchange market. In contrast, it follows a strategy that restricts the sector to Ethiopian nationals in order to strength domestic competitive capacity before full liberalization (Alemayehu, 2005). The main financial institutions operating in Ethiopia are banks, insurance companies and microfinance institutions although banking sector dominates the financial system. The number of banks operating in the country during the fiscal year reached 17 in 2011. In terms of ownership,

fourteen were private commercial banks and the remaining three state-owned. Unlike their number the privately owned commercial banks have a very small size compared to the public banks, especially the commercial bank of Ethiopia (CBE). In addition, all the private banks are domestically owned. There is a gradual but encouraging entry of private banks to the system though the larger share of the banking market still goes to CBE.

In terms of capital ownership, in 2003/04 the public banks had 2.17 billion birr which is 66.6 % of the total banking capital while the private had only 33.2% share which is 1.04 billion birr. In 2010, from the total capital of the banking system, the share of private banks rose to 43.6 percent (7.23 billion birr) from 33.2 percent seven years ago. In terms of disbursement of loans, the share of private banks has increased from 17 percent in 1997/98 to 48 percent in 2010/11. The available data also shows that the share of credit extended to the private sector has jumped to 73 percent between 1997/98 and 2002/03, while that of the public sector has declined from 15 to 5.5 percent during the same period. This implies the effectiveness of financial liberalization policy pursued by the government. In spite of this; the banking sector in general has excess liquidity. This may relate to the problems of access to credit that may relate to risky avert nature of the banking sector in the face of the growing level of nonperforming loans.

Beside the banking sector, the role of insurance companies and micro finance institutions become an important mix of the financial sector. By the end of 2010/11, the number of microfinance institutions operating in the country reached 31. Their total capital increased by 24 percent to Birr 2.9 billion and their assets rose by 27.6 percent to Birr 10.2 billion mirroring their ever growing rose in the economy. Meanwhile, the number of insurance companies reached to 14 and registered a total capital of Birr 955.7 million. Private insurance companies accounted for 69.5 percent of the total capital, while the remaining share was taken up by the single public owned enterprise, the Ethiopian Insurance Corporation (NBE, 2011).

CHAPTER FOUR

METHODOLOGY AND ESTIMATION TECHNIQUES

This chapter provides a brief discussion on research methodology and method framework used to achieve the objectives of the study. It was organized in to four sections. The first section presented source of data. The second section presented model specification, the third section presented method of data analysis and estimation techniques, and the last section presented model estimation procedures.

4.1. Source of the Data

In this study the secondary annual data was used to analyze the study. The type of data this study used were secondary time series annual data which were relevant for this study. The annual data used for this study were ranging from 1981-2019, which totally 39 observations. The selection of data was depending on the availability of data.

The data were secondary and obtained from the National bank of Ethiopia (NBE), Ministry of Finance and Economic Cooperation (MoFEC) World Development Indicators (WDI). Accordingly, real gross domestic product growth rate (RGDPGR), and inflation rate were obtained from world development indicators (WDI); broad money supply, interest rate, real effective exchange rate, gross fixed capital formation were obtained from National Bank of Ethiopia (NBE) and budget deficit was obtained from (MoFEC).

Here, six explanatory variables were included in the model of which two were monetary policy variables namely: broad money supply (M2) and real interest rate; and the remaining four variables were potential macroeconomic variables: inflation rate, real effective exchange rate, gross fixed capital formation and budget deficit that can influence the effectiveness of monetary policy variables. Real gross domestic product growth rate (RGDPGR) was included in the model as dependent variable. An econometric method of data was analyzed using Eviews 9 statistical software packages.

4.2. Model Specification

In this study, to investigate the effects of monetary policy on the economic growth of Ethiopia, annual data over the period of 1981 up to 2019 was used. Real GDP growth rate which was proxied for economic growth was the dependent variable of the study while the independent variables were broad money supply, real interest rate, inflation rate (INF), real effective exchange rate, gross fixed capital formation(GFCFGR) and budget deficit(BD). The variables were taken from different papers discussed in the empirical literatures taking into consideration the availability of data. Money supply and interest rate are used as a proxy for monetary policy to see their relative significance in affecting economic growth. The other variables: inflation rate, real effective exchange rate, gross fixed capital formation and budget deficit were taken as control variables. The selected sets of variables were supported by the aggregate production empirical models used in the literature (Anyanwu, 2014).

This study specified econometric equation for economic growth model drawing from the St Louis equation and McCallum (1991) on the role of monetary policy. The St. Louis equation has gotten considerable attention from policymakers. For more details about the St. Louis equation, see Andersen and Jordan (1968), Carlson (1978) and Hasan (2001). The functional form of the model can be stated as follows:

$$RGDPGR_t = f(M2_t, RIR_t, INF_t, REER_t, GFCF_t, BD_t) \dots \dots \dots (1)$$

Therefore, in line with the objectives of this study the base line model is formed from equation (1) as

$$RGDPGR_t = \alpha_0 + \alpha_1 M2_t + \alpha_2 RIR_t + \alpha_3 INF_t + \alpha_4 REER_t + \alpha_5 GFCFGR_t + \alpha_6 BD_t + \varepsilon_t \dots \dots \dots (2)$$

Where

α_0 : Intercept of the Regression

$\alpha_1 > 0, \alpha_2 < 0, \alpha_3 < 0, \alpha_4 > 0, \alpha_5 > 0, \alpha_6 < 0$: Parameters to be estimated

RGDPGR_t: Real Gross domestic Product Growth Rate at time period “t”

M2_t: Broad Money Supply Growth Rate at time period “t”

RIR_t: Real Interest rate at time period “t”

INF_t: Inflation rate at time period “t”

REER_t: Real Effective exchange rate at time period “t”

GFCF_t: Gross Fixed Capital Formation at time period “t”

BD_t: Final consumption Expenditure at time period “t”

ε_t : Error term at period “t”

t: time period.

4.2.1. Definition and Measurement of Variables

4.2.1.1. Real Gross Domestic Product Growth Rate (RGDPGR)

The real economic growth or Real GDP growth rate, measures economic growth as it related to the gross domestic product (GDP) from one period to another. It is the market value of all goods and services produced in a country in a particular time period. It takes in to account the effects of inflation. Since inflation plays a key role in the GDP of an economy, it is very important to ascertain the effects inflation on GDP. As a result, the real economic growth rate takes in to account the purchasing power and is inflation adjusted. This is the reason it is considered to be a better measure of economic growth rate than nominal GDP growth rate and hence it has been extensively used in the literature (Nogueira, 2009). The RGDPGR entered into the model measuring the real economic growth annually. It entered in to the model in annual growth rate.

4.2.1.2. Broad Money Supply (M2)

Money supply is the total amount of monetary assets (entire stock of currency and other liquid instruments) available in an economy at a specific time. Broad money (M2) is a category for measuring the amount of money circulating in an economy. It is defined as the most inclusive method of calculating a given country’s money supply, and includes narrow money, along with other assets that can easily be converted in to cash to buy goods and services. The monetary policy variable of money supply (measured by M2) is adopted owing to its empirical use in a wide range of studies (Christiano, Eichenbaum, & Evans, 1999). Expansionary

monetary policy (increase in money supply (M2) or reduction in interest rates) is expected to spur economic growth whereas Contractionary monetary policy (decrease in money supply or increase in interest rate) is expected to reduce economic growth. The broad money supply entered into the model in annual growth rate.

4.2.1.3. Inflation rate (INR)

Inflation is the rate at which the general level of prices for goods and services is rising and, consequently, the purchasing power of currency is falling. It is a situation in which the economies overall price level is rising. It represents sustained and pervasive increment in aggregate price of goods and services resulting decline in purchasing power of money. Accordingly, when inflation is high and unexpected, it can be very costly to an economy. Low and stable inflation is believed to create a favorable environment for economic growth, while volatile and high inflation (beyond a threshold level) deters economic growth (Pollin& Zhu, 2006; Yilmazkuday, 2013).It entered into the model measured in CPI.

4.2.1.4. Real Interest Rate (RIR)

Interest rate is the rate at which interest is paid by a borrower (debtor) for the use of money that they borrow from a lender (creditor). An increase in interest rates means higher loan installments to be paid and more opportunities for borrowers to have difficulty in paying their loans. Decreases in interest rate due to expansionary monetary policy may revive the economy by promoting investment and aggregate demand thereby creating a positive impact on economic growth (Campos, 2012).On the other hand a slow economic growth which may be due to tight monetary policy via a relatively high interest rate regime can lead to a fall in the economic growth which may be due to the negative impacts of interest rate on the economic growth.

Real interest rate is an interest rate that has been adjusted to remove the effects of inflation to reflect the real cost of funds to the borrower, and the real yield to the lender. The real interest rate of an investment is calculated as the amount by which the nominal interest rate is higher than the inflation rate. In this study the interest rate was entered in to the model in the form of real interest rate.

4.2.1.5. Real effective Exchange Rate

Real effective exchange rate (REER) is the weighted average of country's currency in relation to an index or basket of other major currencies. The weights are determined by comparing the relative trade balance of country's currency against that of each country in the index. It is an indicator of the international competitiveness of a nation in comparison with its trade partners. An increase in a nation's REER means businesses and consumers have to pay more for the products they export, while their own people are paying less for the products that it imports .It is losing its trade competitiveness. On the other hand, a decrease in real effective exchange rate implies that exports become cheaper and imports become more expensive; and therefore, a decrease indicates a gain in trade competitiveness. The real effective exchange rate has garnered ground in research as a proxy for external competitiveness. While the findings are inconclusive, the majority support a positive relationship between real effective exchange rate and economic growth (Haddad & Pancaro, 2010; Rodrik, 2008).

4.2.1.6. Gross Fixed Capital Formation

Gross fixed capital formation represents the value of the durable goods (tangible and intangible assets) for non-military purposes, purchased by the resident producing units to be used at least in one year in the production process, as well as the value of services incorporated in fixed capital goods. The capital formation, the most engine of economic growth, consists of large-scale projects (construction of roads, irrigation channels and waterways or measures which are taken in health care) to be made in order to economic activity and trade to be carried out. An increase in gross fixed capital formation is expected to increase economic growth implying that there is positive relationship between gross fixed capital formation and economic growth .The GFCF entered in to the model measured in annual growth rate.

4.2.1.7. Budget deficit

A budget deficit occurs when government expenditure exceeds revenues from taxes and other sources. Although the concept of a budget deficit applies to any organization with operating revenues and expenses the term is most commonly applied to government budget. When public saving is negative the government is said to be running a budget deficit. To spend more than tax revenues allows, a government borrows money and run budget deficits, which are financed by

borrowing. Generally there are three theoretical views on the relationship between budget deficit and economic growth. The Keynesian theory asserts that budget deficit and economic growth have positive relationship; the neoclassical on the contrary states both variables have negative relationship and Ricardian equivalence argues that relationship between the two variables is neutral. In this study the relationship between budget deficit and economic growth follows the neoclassical theory that states the existence of negative relationship between budget deficit and economic growth. The budget deficit entered in to the model in the form of annual growth rate.

4.3. Method of Data Analysis and Estimation Techniques

To investigate the long term and short term effects of monetary policy on the economic growth of Ethiopia, this study adopted the approach of Pesaran, et.al(2001) for co-integration known as Autoregressive Distributed Lag Model (ARDL). This is because the model has distinct advantage over other co-integration procedure proposed by Engle Granger (1987) and Johnson and Juselius (1990). Following the establishment of the order of the ARDL model the single reduced equation can be estimated by OLS method technique. This approach does not require the order of integration of the variables to be the same implying that the bound test works well whether underlying regressors are purely $I(0)$, purely $I(1)$, fractionally integrated or mutually co-integrated.

In addition, this technique is suitable for small size or finite sample size and provides unbiased estimates of the long term even when there is endogeneity in some explanatory variables (Harris and Sollis, 2003).

The ARDL bounds testing procedure involves two stages. First the ARDL model of interest specified in equation 6 was estimated by using the OLS to test for the existence of long run relationship among the relevant variables.

And F-test for the joint significant of the lagged level of the variables was performed to test the null hypothesis of no long term relationship among the variables in the equation.

If the F-statistic is above the upper critical value, the null hypothesis of no long-term relationship can be rejected irrespective of the order of integration of the time series. Conversely, if the test

statics falls below the lower critical value, then the null hypotheses cannot be rejected. However, if the statics falls between the upper and the lower critical value, then the result is inconclusive.

The second stage involved the estimation of the long term and short term coefficients once the long term relationship or co-integration has been established. The optimal order of the variable is obtained using the Akai Information Criteria (AIC).

For modeling ARDL approach, the following simple model can be considered:

$$Y_t = \alpha + \beta X_t + \delta Z_t + \varepsilon_t \dots \dots \dots (3)$$

The error correction version of the ARDL model is given by:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^p \beta_i \Delta y_{t-i} + \sum_{i=1}^p \delta_i \Delta x_{t-i} + \sum_{i=1}^p \varepsilon_i \Delta z_{t-i} + \lambda_1 y_{t-1} + \lambda_2 x_{t-1} + \lambda_3 z_{t-1} + u_t \dots \dots \dots (4)$$

The first part of the equation with β , δ and ε represents short run dynamics of the model. The second part with λ s represents long run relationship. The null hypothesis in the equation is $\lambda_1 + \lambda_2 + \lambda_3 = 0$, which means non-existence of long run relationship and u_t is disturbance (white noise) term.

Based on the above equation 5 the model can be stated in the following specific case:

$$\begin{aligned} \Delta \text{RGDPGR}_t = & \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta \text{RGDP}_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta \text{M2}_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta \text{RIR}_{t-i} \\ & + \sum_{i=0}^n \beta_{4i} \Delta \text{INF}_{t-i} + \sum_{i=0}^n \beta_{5i} \Delta \text{REER}_{t-i} + \sum_{i=0}^n \beta_{6i} \Delta \text{GFCF}_{t-i} \\ & + \sum_{i=0}^n \beta_{7i} \Delta \text{BD}_{t-i} + \lambda_1 \text{RGDP}_{t-1} + \lambda_2 \text{M2}_{t-1} + \lambda_3 \text{RIR}_{t-1} + \lambda_4 \text{INF}_{t-1} \\ & + \lambda_5 \text{REER}_{t-1} + \lambda_6 \text{GFCF}_{t-1} + \lambda_7 \text{BD}_{t-1} + \tau_t \dots \dots \dots (5) \end{aligned}$$

Where Δ denotes the first difference operator, β_0 is constant term is the lag length and τ_t is the white noise residual, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and β_7 characterize the coefficient of the short run dynamics of the model whereas, $\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5, \lambda_6$ and λ_7 coefficients show the long run relationship. The variables are as defined in equation 3 above. The null and alternative hypotheses for co-integration test among variables in equation (5) are:

Where ECM is the error correction term, which captures the correction of the long-term economic growth model to its steady state position in case of any short term disturbances. The ECM is expected to be negative and statistically significant. ϵ_t is the white noise error term.

4.4. Model Estimation Procedures

4.4.1. Unit Root Test (Stationarity Test)

Even though the classical regression model assumes that both the dependent and independent variables are to be stationary over time, most economic variables exhibit long-run trend movement and only become stationary after they are differenced (Alemayehu, Daniel and Ndung'u, 2009). Thus, empirical literature for unit root shows that almost all macro variables are non-stationary in level while their difference is stationary. Applying the standard regression techniques to the levels of variables leads to a spurious correlation, which may give very high R² value and significant t-ratio even without true relationship among the variables. Therefore, Ordinary Least Squares (OLS) may lead to inconsistent and less efficient parameters as they may show that there is a strong relationship whilst in actual there is no relationship at all and hence the results obtained from such regressions will not have a meaningful economic interpretation. Hence, prior to estimation of the long run models the time series properties of the variables, unit root test, should be conducted.

Some commonly test which is usually employed to test whether time series variables are stationary or non-stationary is the Augmented Dick-Fuller (ADF) test. The ADF test determines the existence of a unit root. Basically this test has been chosen for its reliability, accuracy and resourcefulness. The ADF test is a particular series say, Y_t , such that;

$$Y_t = \alpha + \rho Y_{t-1} + \beta_1 \sum_{i=1}^n \phi_i \Delta Y_{t-i} + U_t \dots \dots \dots (8)$$

Where Δ is a first difference operator and n is the lag length. The parameter of interest here is ρ that indicates the stationarity and non-stationarity of the data. The unit root test helps us to conclude whether the variable under study could be relied to use it as it is or it needs further integration to render it stationary.

4.4.2. Selecting Optimal Lag Length

The optimal lag length of time series data should be taken into account during modeling the data. We have to be care full also in determining the lag length of each variable because too few lags will leave autocorrelation in the errors and distort the test results and too many lags, on the other hand, will reduce the power of the test. Economists suggest the use of information criteria such as Akaike Information Criteria (AIC), Schwarz Bayesian Criteria (SBC) and Hanan-Quinn Criteria (HQC) are used to determine the optimal lag length. In this study Akaike Information Criteria (AIC) was chosen to determine optimal lag selection because its advantages relative to other Crateria.

4.4.3. Diagnostic tests of Autoregressive Distributed Lag (ARDL) model

To make the estimated model robust and unbiased, we need to determine the fitness of the model through checking goodness of fit statistics and conducting diagnostics tests. Common tests for goodness of fit include R2, which shows a correlation in bi variate case and hence the value closer towards 1 is considered to be better. In a multivariate regression, adjusted R2 is chosen instead of R2. R2 increases with the increase in the number of variable while adjusted R2 increases only when the new variable improves the prediction power. Durbin Watson (DW) statistics measure of autocorrelation (also called serial correlation) in residuals from regression analysis. If the value of DW is near to two, then model is considered to be „non-autocorrelation“. Diagnostic tests tell us about the robustness of estimated coefficients and stability of Model. The diagnostic test examines the serial correlation, functional form, normality test and heterosedasticity test associated with the model. The structural stability test is conducted by employing the Cumulative residual (CUSUM).In order to select appropriate model, we must go through certain steps such as Pre-estimation test including Unit root test using Augmented Dickey Fuller Test and other tests, maximum lag length, etc. and Post estimation test which include stability test (Ramsey’s Reset Test as well as recursive test) residual and coefficient diagnostic test. The residual diagnostic test includes normality, serial correlation and heterosedasticity. To identify the long run relationship between variables coefficient diagnostic test such as Bound Test, ARDL co integrating and long run or error correction model will be conducted.

4.4.4. Co-integration Test

The credible means of avoiding spurious regression is to use co integration technique which allows the estimation of correct regression with non-stationary data. Any equilibrium relationship among a set of non-stationary variables implies that their stochastic trends must be linked. After all, the equilibrium relationship means that the variables can't move independently of each other. This linkage among the stochastic trends necessitates that the variables are to be co integrated (Brooks, 2002). The co integration technique is based on the assumption of an equilibrium relationship among the variables, which implies that two or more variables that are individually non-stationary but are integrated of the same order possess a linear combination of a one-degree lower order of integration. Therefore, if all the variables are $I(1)$ and are co integrated, then their co integrating equation would yield a composite variable of order $I(0)$, i.e. it would be stationary (Handa, 2009). Thus, Co integration among the variables reflects the presence of long run relationship in the system.

Therefore, there is a need to test for Co integration because differencing the variables to attain stationarity generates a model that does not show the long run behavior of the variables. It gives only the short run dynamics, in which case valuable information concerning the long run equilibrium properties of the data could be lost (Kennedy, 1992). Hence, testing for Co-integration is the same as testing for long-run relationship carried out. In general, if variables that are integrated of order 'n' produce a linear combination which is integrated of order less than 'n' then the variables are co integrated and hence have stable long run equilibrium relationship (Gujarati, 1995).

4.4.5. Granger Causality test

The co-integration relationship indicates the existence of causal relationship between variables but it does not indicate the direction of causal relationship between variables. Therefore, we use VECM Granger causality test for detects the direction of causality among underlined dependent and independent variable. The Granger Causality test is an essential econometrics technique that shows causation among various vectors and possesses both long-term and short-term policy implication. If two variables are not co-integrated, then one does not affect the other and are independent. To determine the pattern of such relationship, Granger (1969) has developed

causality test method. If current and lagged values of X improve the prediction of the future value of Y, then it is said that X „Granger causes“ Y. The simple model of Granger causality is as follows:

$$\Delta Y_t = \sum_{i=1}^p \alpha_i \Delta Y_{t-i} + \sum_{j=1}^p \beta_j \Delta X_{t-j} + U_{t1} \dots \dots \dots (9)$$

$$\Delta X_t = \sum_{i=1}^p \lambda_i \Delta X_{t-i} + \sum_{j=1}^p \delta_j \Delta Y_{t-j} + U_{t1} \dots \dots \dots (10)$$

The equation (9) showed that the current value of ΔY is related to the past values of itself and the past values of ΔX . Similarly, Equation (10) postulates that ΔX is related to the past values of itself and that of ΔY .

The null hypothesis in Eq. (9) is which means, “ ΔX does not Granger cause ΔY ”. Similarly, the null hypothesis in Eq.(10) is, and states “ ΔY does not Granger cause ΔX .” The rejection or non-rejection of the null hypothesis is based on the F statistics. If the null hypothesis is rejected for equation (9), it can be said that there is a unidirectional causality from X to Y. Conversely, if the null hypothesis is rejected for equation (10) it can be said that there is a unidirectional causality from Y to X. If the null hypothesis is rejected for both equations, it can be said that there is bidirectional causality between Y and X.

4.4.6. Variance Decomposition and Impulse Response Functions

In order to test for the response of the dependent variable to the shocks from other variables included in the model the study employs the variance decomposition function (VDF) and the impulse response function (IRF). The variance decomposition function (VDF) and impulse response function (IRF) were developing under the vector autoregressive (VAR) model. The VDF and IRF in the context of the vector autoregressive (VAR) estimation are conducted to elaborate the dynamic relations between two variables. The VDF is conducted to determine whether a proportion of forecast error variance of one variable is attributed to the effects of the other variable whereas the impulse response function (IRF) assessed the dynamic behavior of the model, which means the response of one variable in the system to a sudden temporary change in other variable in the system while holding all other shocks at zero. In order to evaluate the VDCs

and IRFs, the study first estimates a VAR model in order to compute the VDCs and IRFs as expressed below;

$$Y_t = C_t + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \dots + \beta_p Y_{t-p} + \mu \dots \dots \dots (11)$$

Where Y represents the dependent variable, C is the vector, β_1 , β_2 and β_p are parameters, t represents the time trend, p represents the optimal lag length and μ represents the white noise.

In stimulating a standard VDFs and IRFs, the orthogonalized responses are normally used where the underlying shocks of the VAR model are orthogonalized using the Cholesky decomposition.

CHAPTER FIVE

ESTIMATION AND DISCUSSION OF RESULTS

5.1. Descriptive Statistics

Descriptive statistics provided summary of information about the properties and the behavior of the variables included in the model. It is explained by the distributions of variables like measures of central tendencies (mean, median, mode), measures of variability around the mean (standard deviation and variance) and measures of deviation from normality (Skewness and kurtosis), information concerning the spread of distribution (maximum, minimum and range), and information about the stability or sampling error of certain measures including standard errors(SE) of the mean, SE of the Kurtosis and SE of Skewness(included by default when Skewness and kurtosis are requested). To know the properties and the behavior of the study variables before estimating the main model is important to assess the variables. Table 5.1 below, reported the behaviors of the variables included in the model. Accordingly, the means of RGDPGR, M2, RIR INF, REER, GFCFGR and BD are 5.61, 17.11, 4.49, 9.84, 158.53, 12.32 and 2.36 respectively and these mean values tell us the average values of each of the variables.

Table 5.1 Summary of all the variables

	RGDPGR	M2	RIR	INF	REER	GFCFGR	BD
Mean	5.61	17.11	-4.49	9.84	158.53	12.32	2.36
Median	8.36	15.57	-3.05	8.14	149.00	10.55	-0.22
Maximum	13.86	39.21	19.00	44.39	344.50	97.26	71.60
Minimum	-11.14	4.06	-51.24	-9.81	11.90	-42.62	-43.86
Std. Dev.	6.78	7.76	13.89	10.95	61.01	26.50	25.62
Skewness	-0.86	0.63	-1.35	1.01	0.67	1.09	1.15
Kurtosis	2.69	3.10	5.90	4.87	4.21	5.27	4.58
Jarque-Bera	5.01	2.62	25.51	12.36	5.35	15.25	12.73
Probability	0.08	0.27	0.00	0.00	0.07	0.00	0.00
Sum	218.78	667.35	-174.98	383.95	6182.78	455.88	92.23
Sum Sq. Dev.	1747.37	2290.16	7335.97	4553.80	141429.40	25281.14	24942.35
Observations	39	39	39	39	39	39	39

Source: Computed by author using Eviews9

The median tells us the middle values for each of the variables included in the model. So, the medians for RGDPG, M2, RIR, INF, REER, GFCF and BD from table 5.1 above are 8.36, 15.57, -3.05, 8.14, 149.00, 10.55 and -0.22 respectively. The maximum and minimum values report the highest and lowest figures in each of the variables where as the standard deviation reports the deviation from the sample mean with respect to each of the variables. Accordingly, the values for standard deviation for each of the variables: RGDPGR, M2, RIR, INF, REER, GFCF and BD are 6.78, 7.76, 13.89, 10.95, 61.01, 26.50 and 25.62 respectively.

From table 5.1 above also real GDP growth rate and real interest rate have negative Skewness, long left tail, showing that majority of the values of the series are found below the sample mean which is 5.61 and -4.49 respectively. However, M2, INF, REER, GFCFG and BD have long right tail because they have positive Skewness which tells us a lot of values of the series are higher than their respective sample mean.

A kurtosis value of 2.69 for RGDPG is clearly lower than 3 because the value of 3 implies that the distribution is normal is mesokurtic. But with 2.69 we can say that RGDPG although mirror the normal distribution is pletykurtic which implies that this series have a lot of values below sample mean 5.61. However all the other remaining values of the series: M2, RIR, INF, REER, GFCFG and BD have long right tail positive Skewness and leptokurtic because all of them have values greater than 3 which implies that they have a lot of values above the sample mean.

The null hypothesis for Jarque-Bera test statistics is that the distribution is normal. For RGDPG, M2 and REER the probability values are 0.08, 0.27 and 0.07 which are above the significance level of 0.05. So, we cannot reject the null hypothesis of the distribution is normal. Hence, the variables have normal distribution. However, for the rest of the variables we clearly rejected the null hypothesis of normal distribution because the probability values are highly statistically significant. Hence, for the variables: RIR, INF, GFCFGR and BD the distributions are not normal.

5.2. Econometric Results

Before any meaningful regression is performed with the time series variables, it is essential to test the existence of unit roots in the variables and hence to establish their order of integration. If time series data are not stationary it simply mean that they did not exhibit mean reversion that is

the data generating process of that series does not evolve around zero which is useless to use in forecasting

The variables used in the analysis need to be stationary and should be co-integrated in order to deduce a meaningful relationship from the regression. Working with non-stationary variables gives rise to spurious regression (seemingly related variables) results, from which further inference is no more meaningful. Appropriate tests of stationarity should be employed on variables of interest in order to avoid problems of spurious correlation normally associated with the inclusion of non-stationary series in regression models. Hence, this study first tested for unit roots in order to determine the stationarity status of the variables using the Augmented Dickey-Fuller (ADF) and co-integration. The analysis of these tests then helped us to know the relationship between monetary policy variables like broad money supply (M2), real interest rate (RIR), Inflation rate (INR), real effective exchange rate (REER), Budget deficit and gross fixed capital formation, and real economic growth (RGDP) of Ethiopia.

The well-known Augmented Dickey- Fuller (1981) is applied to test the existence of unit root (stationarity) and to ascertain their order of integration. The primary interest of this tests is to determine whether the variables are stationary or not at levels, and first differenced.

5.2.1. Empirical Results for Unit Root Testing

As it is discussed the model is a valid instrument for estimation if the variables are stationary at I (0) and I (1), but the estimation procedure will be inappropriate if any of the variables are integrated at I(2) . The purpose of doing stationarity test is to free the result from spurious regression. The results for the unit root test are presented in table 5.2 below that shows the ADF unit root test results with three scenarios for each of the variables- with intercept, with intercept and trend, and without any intercept and trend. The results show that all the variables are integrated of order zero or one. Among the variables used in the model real gross domestic product (RGDPGR), real interest rate (RIR), inflation rate (INF), gross fixed capital formation (GFCF) and budget deficit are stationary at level whereas the remaining two variables: broad money supply(M2), real effective exchange rate(REER) and are stationary after first differencing rejecting the null hypothesis that says each variable is non-stationary either at level or after first differencing.

Table 5.2: Unit root test for variables

Variables	ADF test statistics at I(0) level			ADF test statistics at I(1) level			Order of integration
	Intercept	Trend and intercept	Without trend and intercept	Intercept	Trend and intercept	Without trend and intercept	
RGDPGR	-4.3910***	-5.4497***	-1.2409	-7.3429***	-7.2340***	-7.4269	I(0)
M2	-2.6676	-3.4021	-0.140905	-6.6709***	-6.5580***	-6.7425***	I(1)
RIR	-5.3317***	-5.4564***	-4.9525***	-5.8711***	-5.7782***	-5.9650***	I(0)
INF	-4.9169***	-5.0790***	-1.378439	-7.8023***	-7.7002***	-7.9205***	I(0)
REER	-2.4064	-2.464579	-0.8003	-7.5872***	-7.5689***	-7.6916***	I(1)
BD	-7.3189***	-4.5688***	-7.3296***	-12.4203***	-12.2917***	-12.5883***	I(0)
GFCF	-7.0607***	-7.4379***	-2.9873***	-12.0184***	-11.8630***	-12.1993***	I(0)

Source: Author’s Computation in Eviews 9

Note: **, *** represents 5% and 1% level of significance respectively.

A natural step after testing for stationarity of the variables is to conduct a co-integration test. In other words, in addition to the stationarity of each of the variables, we will examine if the linear combinations of the variables is also stationary or not. In the case where the series are of different order, the Bound Test for co-integration is more appropriate (Pesaran and Shin, 2001). Estimating the Auto Regressive Distributed Lag model which was specified in equation (2) above using the appropriate lag-length selection criterion is the first task in the bounds test approach of co-integration. In this study Akaike Information Criterion (AIC) was taken as a guide and a maximum lag order of 2 was chosen for the conditional ARDL model. Then F-test through the Wald-test (bound test) is performed to check the joint significance of the coefficients specified in equation (2). The Wald test is conducted by imposing restrictions on the estimated long-run coefficients of real GDP, broad money supply growth, real interest rate, inflation rate real effective exchange rate budget deficit and gross fixed capital formation. The computed F-statistic value is compared with the lower bound and upper bound critical values at 5% significance level. If the F-statistic is greater than the upper bound it can be concluded that there is long run relationship among the variables. Conversely, if the F-statistic is less than the lower bound test one can conclude that there is no long run relationship among the variables under consideration. However, if the F statistic falls between the upper and lower bound critical values, it can’t be concluded and need to look at the sign and significance of the error correction model in order to conclude.

Table 5.3: F Statistic Result and Critical Values for the ARDL Model Test Approach

Test statistics	Value	K
F statics	4.961	6
Critical Value Bound		
Significance level	I(0)	I(1)
10%	2.53	3.59
5%	2.87	4.00
2.50%	3.19	4.38
1%	3.6	4.9

Source: Author's computation using Eviews 9

The table 5.3 above shows the computed F-statistic of the bound test 4.96 is larger than the lower bound and the upper bound critical value at any level of significance. In this case, the null hypothesis of no co-integration can be rejected at any level of significance. Hence there is a co-integration relationship among the variable or a stable long-run equilibrium. In other word, we reject the null hypothesis at 1%, 5% and 10% level of significance, there exists of Co-integration relationship among RGDPGR and the other explanatory variables i.e. Broad Money supply growth rate (M2), Real interest rate (RIR), Inflation rate (INF), real effective exchange rate (REER), budget deficit (BD) and Gross fixed capital formation (GFCF). Therefore, we reject the null hypothesis of no co-integration implying that the variables have long-run relationship and hence it is possible to estimate long run ARDL model which is Error correction model (ECM).

The issue of finding the appropriate lag length for each of the underlying variable in the ARDL model is very important because we want to have Gaussian error terms (i.e. standard normal error terms that do not suffer from non-normality, autocorrelation, heterosedasticity etc.). In order to select the appropriate model of the long run underlying equation, it is necessary to determine the optimum lag length (k) by using proper model order selection criteria such as; the Akaike information criterion (AIC), Schwarz-Bayesian Criteria (SBC) or Hannan-Quinn Criterion (HQC). As suggested by pesaran and shin (1999) and Nareyn (2004) since the observation is annually, we choose 2 as the maximum order of lag in the ARDL before the selected model is estimated by OLS regression for the first difference part of the equation. Specifically, in this study the Akaike information criterion (AIC) in lag-selection is used

because of its advantages. The offered model used in this study ARDL (2, 2, 0, 1, 1, 0, 0) selection based on the Akaike information criterion (AIC).

5.2.2. Long-run ARDL Model Estimation Results

In the stationarity test, the result showed that the variables were stationary at level and at first difference. The F statistic result which indicated the existence of long run co-integration among the variables also confirmed to precede to the estimation of the long run coefficients of the model. Under the long-run section, table 5.3 presented the results found after running the appropriate ARDL model to find out the long run coefficients.

Table 5.4: Estimated long run coefficients using the ARDL:

ARDL (2, 2, 0, 1, 1, 0, 0) selected based on Akaike Information Criterion.

Long Run Coefficients: Dependent variable is RGDPGR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
M2	0.856340	0.363980	2.352712	0.0285**
RIR	-1.185170	0.470659	-2.518110	0.0200**
INF	-1.603914	0.600307	-2.671823	0.0143**
REER	-0.005147	0.023058	-0.223204	0.8255
GFCFGR	-0.807872	0.405764	-1.990988	0.0597*
BD	0.810546	0.416118	1.947875	0.0649*
C	-4.136108	6.696120	-0.617687	0.5434
@TREND	0.705559	0.306724	2.300309	0.0318**

Source: Author's computation using Eviews 9

Note :(*), (**) & (***) indicates significance of coefficients at 10%, 5% and 1% respectively.

Table 5.4 above presents the long-run estimates for the variables involved in the model. The result indicated that growth rate of broad money supply (M2), real interest rate (RIR) and inflation rate are found to be statistically significant at 5% significance level with expected sign confirming the a priori expectation supporting the theoretical foundation. The long run results for real effective exchange rate, gross fixed capital formation and budget deficit were found to be statistically insignificant at 5% significance level. Gross fixed capital formation, real effective exchange rate and budget deficit were showing unexpected sign.

The long run coefficient of broad money supply (M2) indicates a positive sign with significant p-value at 5% significance level depicting that one percent increase in money supply might cause an eventual increase in the real GDP growth of Ethiopia by 0.856 percent in the long run. This implies the existence of positive and direct relationship between money supply and the economic growth of Ethiopia. Consequently, the direct increase in money supply serves as an injection into the economy thereby boosting investment, export, consumption and aggregate production level. The economy by this trend might experience stability in the balance of payment equilibrium while the whole economy will be well positioned in the international market, there by leading to the attainment of the desired level of economic growth. This implies the non-neutrality of monetary policy on the growth of economy of Ethiopia. This long term non neutrality of monetary policy to affect economic growth is backed by a wide range of empirical findings (Ali et al.(2008);Ogunmuyiwa and Ekone (2010);Naser Yenus(2019); Miftahu Idris,2019).

Inflation rate, represented by CPI has significant and negative effect on economic growth of Ethiopia at 5% percent significance level. A 1% rise in inflation rate leads to -1.604 percent falls in economic growth of Ethiopia in the long run. This because inflation beyond the optimum level is degrading the real value of money balance retards economic growth in the long run via its adverse effect on the domestic private saving and foreign direct investment. Moreover, it destructively impacts welfare of the public, more harshly the poor segment of society. The negative and statistically significant effects of inflation on the economic growth of Ethiopia is also supported by empirical study results found by (Alemayehu and Kibrom, 2008; ADB, 2011; Desta, 2009; Ismail O Fasanya, 2014; Temesgen Benti, 2016).

More over the coefficient of interest rate (RIR) reveals a negative sign with significant p-value at 5% significance level. This implies that one percent decrease in real interest rate might leads to a increase in real GDP by 1.185% hence demonstrating an inverse relationship between interest rate and economic growth of Ethiopia. By implication high interest rate might defuse into the economy in the form of decrease in investment and employment thereby has an effect on the income level and aggregate output. The multiplier effect of this transmission might result in lowering the aggregate production level and thus affecting the overall economic development. This result confirms many of past empirical study results by (Miftahu Idris, 2019; Naser Yenus,

2019; Alemayew Demisie, 2015; Tshoklogo A Kganet Sano, 2017; Girma Tadesse, 2020; Nnenna M Nwoko, JC Ihemeje, E Anumdu, 2016).

The Table 5.4 provides negative association between real effective exchange rate and economic growth of Ethiopia. The relation between real GDP and real effective exchange rate is statistically insignificant, the finding suggesting that the long-run relationship is insignificant therefore real effective exchange rate has no significant influence on real economic growth of Ethiopia in the long-run. The same study result was found by (Enock Nyorekwa Twinoburyo and Nicholas M.Odhiambo, 2016; Mengesha Manedo, 2016)

The Table 5.4 also reveals that gross fixed capital formation which includes both private and public capital is found to be statistically significant at 10% significance level indicating the existence of weak association between gross fixed capital formation and economic growth of Ethiopia. This might have been because of the dominance of public/governmentally formed capital over private sector capital formation is prevailing in Ethiopia. Gross fixed capital formation includes both public and private capital. In Ethiopia the larger share of capital formation is dominated by public/government which is unproductive, inefficient and corruptive to add more value to GDP growth and also the dominance of public over private investment crowding out private sectors which are more efficient than public sectors to add some values to GDP growth of Ethiopia. More over the negative sign of the value of the coefficient is unexpected and surprising that it opposes the theoretical underpinning of the existence of positive relationship between gross fixed capital formation and economic growth. The same study result was found by (Kidanemariam Gidey Gebrehiwot, 2013; Muluken Nigussie, 2016)

The result in Table 5.4 also shows that the coefficient of budget deficit is positive and has a weak relationship with real GDP growth. That means the finding suggesting that the long-run relationship is insignificant therefore budget deficit has no significant influence on the economic growth of Ethiopia in the long-run.

5.2.3. Short-Run ARDL Model Estimation Results

Since the results from the Bounds co integration test showed the existence of a long-run relationship between the variables, the next step will be to proceed to estimate an error correction model. Accordingly, the short-run impacts of monetary policy on economic growth of Ethiopia

are examined with the Error Correction Model (ECM) based on the ARDL approach. It indicates the speed of adjustment to restore equilibrium in the dynamic model and the coefficient of the ECM which has to be negative and statistically significant shows how quickly the dependent variable converges to the long run equilibrium (shows the eliminating of speed of disequilibrium). Therefore, Table 5.5 shows that the error correction coefficient of real gross domestic product (RGDP) has negative sign and is statistically significant at 1% significance level confirming the existence of co-integration between dependent and independent variables. The estimated short run coefficient for the error correction term is -0.8414 showing that there is high speed of adjustment to the long run equilibrium after the occurrence of disturbance in the short run. The value -0.8414 indicates that 84.14% of the deviation in the short-term gets corrected each year. The deviation in the short term gets corrected within 1 year and two months. Such highly significant Error correction term is another proof for the existence of a stable long run relationship among the variables (Banerjee, et al., 2003)

Table 5.5: Results of Error Correction Model based on the ARDL

ARDL Co integrating And Long Run Form
 Dependent Variable: RGDPGR
 Selected Model: ARDL(2, 2, 0, 1, 1, 0, 0)
 Date: 10/13/21 Time: 04:53
 Sample: 1981 2019
 Included observations: 35

Co integrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RGDPGR(-1))	0.278609	0.116345	2.394683	0.0260**
D(M2)	0.040409	0.132277	0.305489	0.7630
D(M2(-1))	-0.285289	0.154339	-1.848457	0.0787*
D(RIR)	-0.997154	0.269656	-3.697874	0.0013***
D(INF)	-1.502952	0.353572	-4.250772	0.0004***
D(REER)	-0.073422	0.018221	-4.029562	0.0006***
D(GFCFGR)	-0.679711	0.274473	-2.476420	0.0219**
D(BDFT)	0.681960	0.279498	2.439943	0.0236**
@TREND	0.593629	0.218279	2.719589	0.0128**
CointEq(-1)	-0.841359	0.180891	-4.651193	0.0001***

Source: Author's estimation using Eviews 9

Note; (**), (***) indicates significance of coefficients (at 5% and 1% respectively).

From the above table 5.5, short run analysis results reveals that the Real Gross Domestic Product is affected by its own one period lagged value. The coefficient of difference of current period of real interest rate (RIR), current period inflation rate (INF), current period real effective exchange rate (REER), current period GFCFGR and current period BD in the ECM are statistically significant factors at 1% significance level whereas the other variables: the coefficient of difference of current and first periods of broad money supply (M2), are not statically significant at 5% significance level. However the result of Wald test shows that the combined effects of broad money supply in the first period and after one period lag is highly significant at 1% significance level in affecting economic growth of Ethiopia in the short run.

Similar to the long run, the short run results for coefficient of the user `cost of capital that is real interest rate is statically significant at 1% significance level with expected sign. A 1% decrease in real interest rate leads to increase in economic growth of Ethiopia with 0.997 percent in the short run. The result is in line with study result found by (Tamirat Beyene¹, Inderjeet Singh², 2019).

The short-run established relationship between real gross domestic product and inflation rate is negative and statistically significance at 1% significance level in the current period. This means that 1% increases in inflation rate in the current period results in -1.503 percent decline in real gross domestic product in the short run other things remained fixed.

Unlike the long run, real effective exchange rate statistically and significantly affect real gross domestic product of Ethiopia negatively in the short run. A devaluation of Ethiopian birr against weighted trade partner's currencies by 1% in the current period causes a reduction of real economic growth of Ethiopia by **-0.0734%** in the short term. The study result found by Tamirat Beyene, (2019); Fentahun aylie, (2011); Yonas Masresha, (2015)) similar to the result found by this study. This finding is contrasting with the traditional approach to exchange rate. Classical theory of the analysis of the relative impact of monetary depreciation has expansionary effects on economic growth through aggregate demand channel will not be applicable for Ethiopian economy rather other determinants are matter to enhance international competitiveness. Clearly speaking, the empirical results of this study imply that increase in real effective exchange rate so called depreciation hurts instead of promoting economic growth in the short run through increasing the cost of raw materials which are needed for further domestic production. This is

because Ethiopia is highly import dependent country for investment, consumption and other goods.

The effect of both current and one period lag broad money supply on the economic growth of Ethiopia is insignificant at 5% significance level. However after one year money supply is significant at 10% significance level with negative sign and hence improve economic growth towards equilibrium by -0.285289 . This adjustment in the short run is significant with p-value of approximately 0.0787 even though the relationship is weak.

The short run empirical result for budget deficit is statistically significant at 5% significance level with unexpected positive sign opposing the a priori expectation of negative effects of budget deficit on the economic growth in the short run. Accordingly a 1% increase in budget deficit leads to 0.682 percent increases in economic growth of Ethiopia in the current period.

The current period gross fixed capital formation which includes both private and public capital formation has negative sign and statistically significant effects on economic growth of Ethiopia in the short- run and hence GFCFGR improves economic growth towards equilibrium by -0.6797 . This adjustment in the short run is significant with p-value of 0.0219 . The unexpected sign of the coefficient of GFCF contradicts with economic growth theories. In my opinion, it may be data and/or valuation problem, but it is difficult to justify the exact reason behind such unexpected result using this research. Hence, further detailed research should be done to identify the reason behind such result (unexpected sign of GFCF).

5.2.4. Long-run Diagnostics and Stability Test

It is important that the estimated model passes through a battery of diagnostic tests before drawing conclusions from the results and using them to inform policy making. As outlined in chapter 4, we conduct a series of diagnostic tests including: serial correlation test (Brush and Godfray LM test), functional misspecification test (Ramsey's RESET test), normality test (Jarque- Brea test), and hetroskedasticity test.

5.2.4.1. Serial Correlation Test

When there is specification error in the functional form of the model, the result will be problem of serial correlation. It mean that serial of the residual is serially correlated. To identify whether

serial of the residual is serially correlated or not, serial correlation test is under taken using Breusch- Godfrey serial correlation LM Test. If the result of Breusch- Godfrey serial correlation LM Test shows the absence of serial correlation in residual, our model is the best model. On the following table 5.6 the Breusch- Godfrey serial correlation LM Test result clearly depicts that the p-value of 0.5233 (52.33%) which is more than 5 % Hence, we cannot reject null hypothesis which states there is no serial correlation. Therefore, the model is a good regression model

Table 5.6 Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.365107	Prob. F(2,19)	0.6989
Obs*R-squared	1.295346	Prob. Chi-Square(2)	0.5233

5.2.4.2. Heterosedasticity Test

Heterosedasticity test is a systematic change in the spread of the residuals over the range of measure value. It is used to test the whether the residuals are heterosedasticity or not, that means to be a best model the residuals must be homoscedasticity. The following table 5.7 shows the p-value of both the F- and χ^2 (LM²) version of the test statistic and the P-value of scaled explained SS more than 5%, meaning that we can accept the null hypothesis. Our null hypothesis is that residual no hetroskedasticity which is desirable. Therefore the model is good.

Table 5.7 Heterosedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.766918	Prob. F(13,21)	0.6838
Obs*R-squared	11.26731	Prob.Chi-square(13)	0.5884
Scaled explained SS	3.045477	Prob. chi-square(13)	0.9978

5.2.4.3. Ramsey RESET test

Ramset RESET test is a general specification test for the linear regression model. It shows that whether a particular model is functionally well constructed or not. If the test is rejected null hypothesis, this indicates sign of misspecification or particularly non-linearity in the data. The following Ramsey RESET test results from the table 5.8 shows that the P-value 0.1820 (18.20%) which is greater 0.05 level of significance. In this case we should not reject the null hypothesis.

That means the result proved that the model did not have omitted variable bias and the model was specified well.

Table 5.6: Ramsey RESET Test

	Value	Df	Probability
t-statistic	1.382616	20	0.1820
F-statistic	1.911626	(1, 20)	0.1820

F-test summary:	Sum of Sq.	Df	Mean Squares
Test SSR	22.72781	1	22.72781
Restricted SSR	260.5129	21	12.40538
Unrestricted SSR	237.7851	20	11.88925

Jarque-Berra Normality Test

5.2.4.4. Jarque-Berra Normality Test

Using information about the Skewness and Kurtosis of the residual Jarque-Berra test assess whether the residual is normally distributed or not. The Jarque-Berra normality test result suggests that the p-value is 0.6363 which is greater than 5% significance level indicating that the residual is normally distributed.

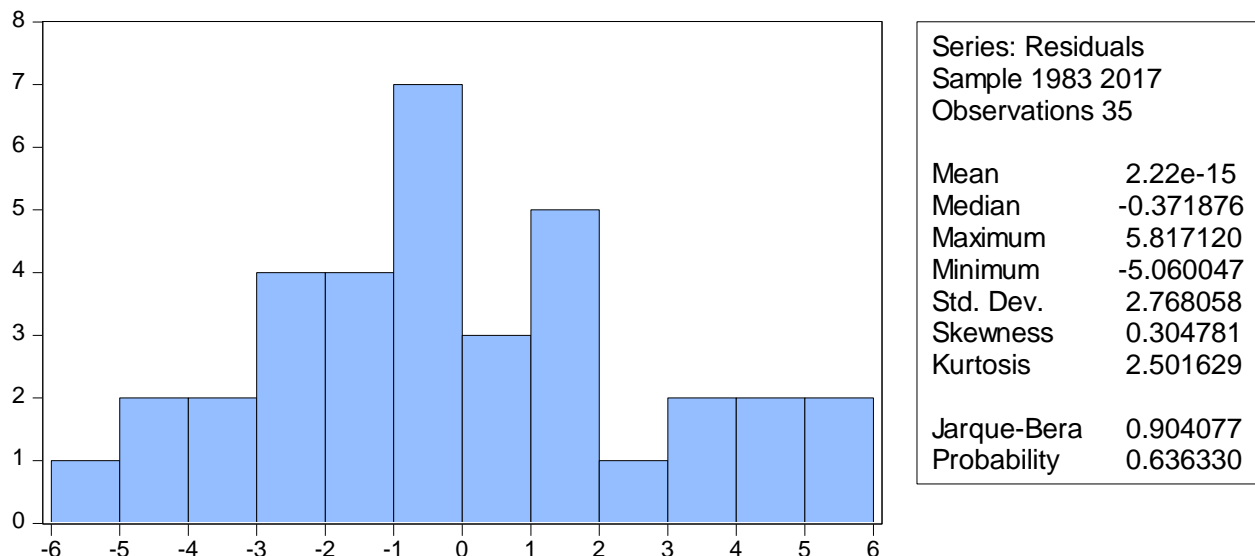


Figure 5.1: Normality test

To sum up, the diagnostic results presented above indicate that the model is well specified, there is no serial correlation among the residuals, the residual is homoscedastic, and the residual is normally distributed and the function is properly specified. Thus, the estimation model passes the battery of diagnostic tests needed to verify the standard assumptions made in empirical estimation of the model.

5.2.4.5. Model stability Test

We examine the stability of the model using the graph plots of cumulative sum square of residuals with 5% critical lines. And, if the cumulative sum squared remains inside between the two critical lines or bounds back after it is out of the boundary lines, the null hypothesis of correct specification of the model cannot be rejected. But, if the cumulative sum goes outside (never returns back) between the two critical bounds there exists series parameter instability problem.

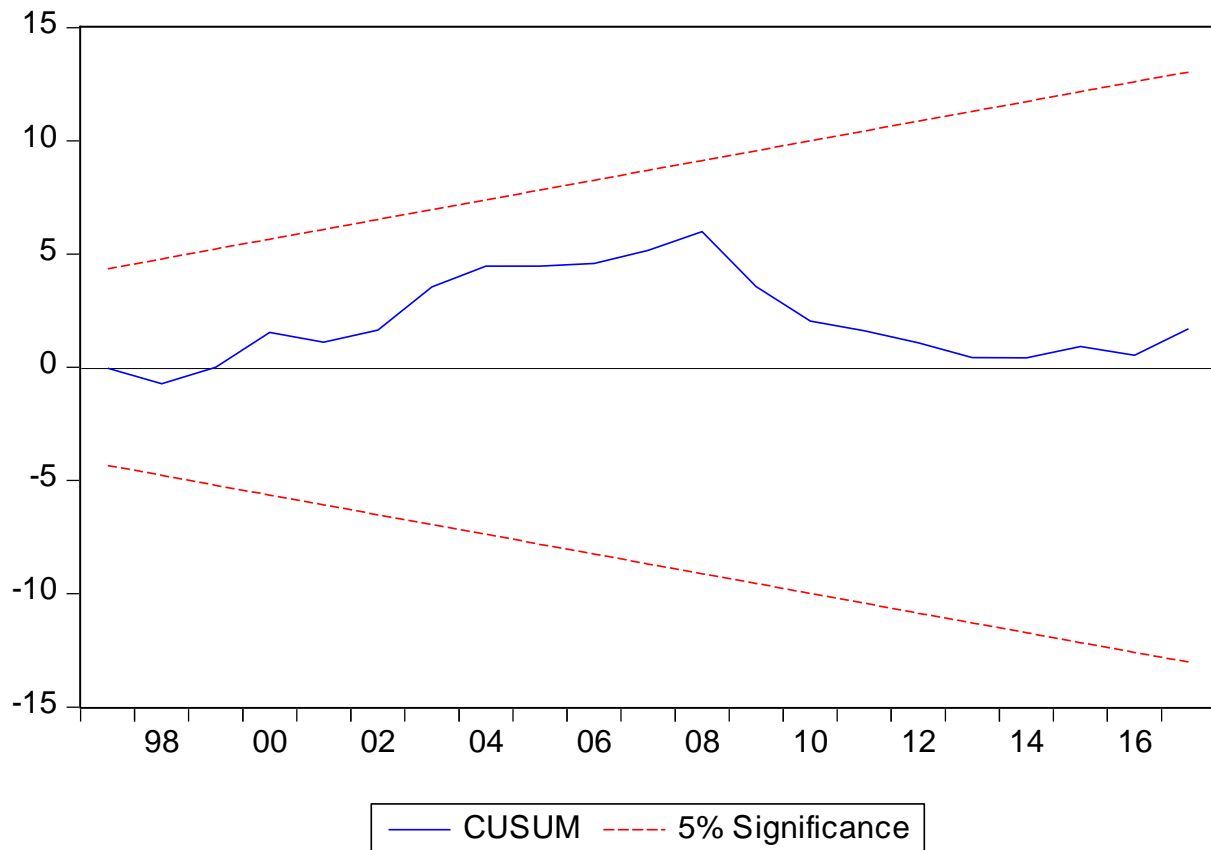


Figure 5.2: Graphical Representation of CUSUM Result

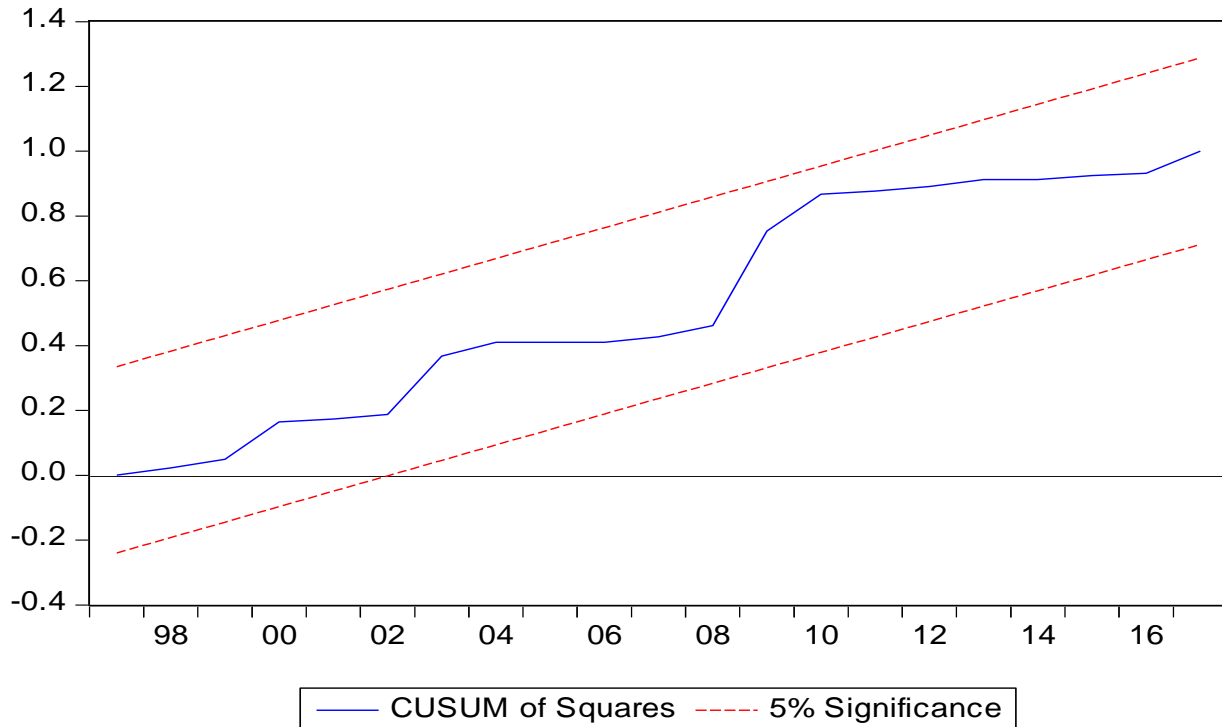


Figure 5.3: Graphical Representation of CUSUMSQ Result

As depicted in the figure above, the plot of cumulative sum square of recursive residuals graphical test of stability revealed by oscillation of the calculated statistics between the critical bounds at 5% level of significance and since the plots of CUMSUM and CUSUM square stay within the lines, it confirms the equation is correctly specified and the model is stable.

Hence, the post estimation tests of the above result shows that the model passes the basic criteria, and this renders the outputs of the model reliable to use for the intended policy purposes and further analysis.

5.2.5. Granger Causality Tests

The co-integration relationship indicates the existence of causal relationship between variables but it does not indicate the existence of direction of causal relationship between variables. There for, we use Pairwise Granger Causality test for detects the direction of causality among underlined dependent and independent variables. If the variable A and B are co-integrated, then there may exist any of the three relationship; I, A affects B II, B affect A and III, A and B affect each other. The first two i.e. (I &II) shows unidirectional relationship while the third shows bidirectional relationship. If the two variables are not co-integrated or statistically insignificant,

it implies that the one variables does not affect the other variables. This indicates that the variables are independent. The Granger causality test result in table 5.9 shows that there is unidirectional causality between inflation and rgdpgr running from inflation to rgdpgr. This is because the p-value is lowers than 0.05 i.e. (0.0390 lower than 0.05) reject the null hypothesis of inflation rate does not Granger cause rgdpgr. There is unidirectional causality between GFCF and RGDPGR because the p-value is lower than 0.05 i.e. (0.0012 lower than 0.05) reject the null hypothesis of GFCF does not Granger cause RGDPGR. There is unidirectional relationship between budget deficit and real gross domestic product because the p-value which is 0.0119 is lower than 0.05. There is also unidirectional relationship between broad money supply (M2) and real interest rate (RIR because the p-value is 0.0227 which is less than 0.05. There is also unidirectional relationship between broad money supply (M2) and real inflation rate (INF) because the p-value is 0.0197 which is less than 0.05. Hence we reject the null hypothesis M2 does not causes inflation. However, there is no bidirectional relationship among variables. There is unidirectional causality between real interest rate RIR and real effective exchange rate(REER) because the p-value is lower than 0.05 i.e. (0.0422 lower than 0.05) reject the null hypothesis of RIR does not Granger cause REER. There is unidirectional relationship between GFCF and REER because the p-value (0.0166) is greater than 0.05 and hence we reject the null hypothesis GFCF does not granger causes REER. There is unidirectional relationship between Budget deficit (BD) and REER because the p-value (0.0028) is greater than 0.05 and hence we reject the null hypothesis BD does not granger causes REER.

Table 5.7: Granger Causality test

Pairwise Granger Causality Tests

Date: 10/13/21 Time: 04:57

Sample: 1981 2019

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
M2 does not Granger Cause RGDPGR RGDPGR does not Granger Cause M2	37	2.73480 0.56478	0.0801 0.5741
RIR does not Granger Cause RGDPGR RGDPGR does not Granger Cause RIR	37	3.03726 1.46125	0.0620 0.2470
INF does not Granger Cause RGDPGR RGDPGR does not Granger Cause INF	37	3.59727 1.84001	0.0390 0.1752
REER does not Granger Cause RGDPGR RGDPGR does not Granger Cause REER	37	1.38288 0.14740	0.2654 0.8635
GFCFGR does not Granger Cause RGDPGR RGDPGR does not Granger Cause GFCFGR	37	8.49818 0.34537	0.0012 0.7107
BDFT does not Granger Cause RGDPGR RGDPGR does not Granger Cause BDFT	37	5.10874 3.28107	0.0119 0.0506
RIR does not Granger Cause M2 M2 does not Granger Cause RIR	37	2.92359 4.26845	0.0682---- 0.0227
INF does not Granger Cause M2 M2 does not Granger Cause INF	37	2.78580 4.44895	0.0767 0.0197
REER does not Granger Cause M2 M2 does not Granger Cause REER	37	0.98716 0.65426	0.3837 0.5266
GFCFGR does not Granger Cause M2 M2 does not Granger Cause GFCFGR	37	1.10276 1.60093	0.3450 0.2185
BDFT does not Granger Cause M2 M2 does not Granger Cause BDFT	37	0.76215 0.28906	0.4749 0.7509
INF does not Granger Cause RIR RIR does not Granger Cause INF	37	0.21151 0.08147	0.8105 0.9219
REER does not Granger Cause RIR RIR does not Granger Cause REER	37	0.19956 3.50136	0.8201 0.0422
GFCFGR does not Granger Cause RIR RIR does not Granger Cause GFCFGR	37	0.94818 1.87455	0.3988 0.1710
BDFT does not Granger Cause RIR RIR does not Granger Cause BDFT	37	1.95340 0.53094	0.1583 0.5931
REER does not Granger Cause INF INF does not Granger Cause REER	37	0.21251 2.90520	0.8097 0.0693

Source: Author's Computation from Eviews9

5.2.6. Impulse Response and Variance Decomposition Analysis

The variance decomposition on the table 5.10 shows that, the period of ten years horizon. In the first horizon, the result shows that 100% of its forecast error variance is attributes to RGDGPR (own shock).It mean that in the short run 100% forecast error variance in RGDP is explained by itself. Other variables do not have strong influence on the RGDP. However from second period onwards RGDGPR and GFCF have strong influence on real GDP and in both short run to long run. Over all periods RGDGPR and GFCF have stronger impacts on the RGDGR. From third period to tenth period, next to RGDGPR and GFCF, broad money supply (M2), real interest rate(and inflation rate have strong impacts on the RGDP both in short run the long run whereas the relative impacts of remaining two variables real effective exchange rate and budget deficit are weak in both short run and long run. From the above explanations, it is clear that the VDF verifies the significant role played by real GDP growth rate, real interest rate, growth of broad money supply and inflation rate in accounting for fluctuation in forecast error variance of real GDPGR of Ethiopia. Among the variables in the model, the change in GFCF and RGDP itself has the most information regarding the variation of RGDGPR .But the other variables such as real effective exchange rate and budget deficit are found to be negative and statistically insignificance.

Table 5.8: Variance Decomposition Result

Period	S.E.	RGDPGR	M2	RIR	INF	REER	GFCFGR	BDFT
1	4.839986	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	6.766353	51.53178	0.431437	0.747334	0.108281	0.887579	46.17686	0.116733
3	7.888749	39.87694	9.422740	5.752151	7.659438	1.193152	33.97171	2.123865
4	8.448053	37.00916	11.28820	5.206911	8.904504	2.227416	32.23769	3.126121
5	8.582515	35.90364	12.29795	5.051954	9.364311	2.326464	31.99815	3.057528
6	8.728074	35.22680	12.13491	4.936219	10.08740	2.258026	32.06964	3.286997
7	8.865045	34.20082	12.44475	5.051628	11.11364	2.244243	31.55202	3.392892
8	9.018629	33.38096	13.48969	4.987400	11.90196	2.297808	30.50078	3.441415
9	9.081883	32.98803	14.08886	4.974551	11.95831	2.366765	30.11022	3.513270
10	9.121091	32.72354	14.23075	5.014868	12.07836	2.350457	30.05914	3.542877

Source: Author's Computation from Eviews9

Furthermore, the result of impulse response functions are presented as follow, the figure show plots of the generalized IRF of real GDP growth rate with respect to broad money supply (M2), real interest rate (RIR), inflation rate (INF), Real effective exchange rate (REER), Gross fixed capital formation (GFCF) and budget deficit(BD). This approach reveals insight into dynamic relationships between the variables as it portrays the response of a variable to unexpected shock in another variable over specified time horizon. The horizontal axis in each graph shows the number of years after the impulse has been initialized while the vertical axis shows the responses of the appropriate variables.

According to the first plane of Figure 5.4, shock from broad money supply growth rate caused improvement to real GDP growth from period 1 to period 10, It mean that a one standard deviation shock or impulse or innovation given to broad money supply will result in an increase in real GDP growth up to tenth period. The result shows that, a positive innovation of broad money supply growth cased a positive impact on the real GDP growth. Conversely, the negative broad money supply causes the real GDP growth to decline. Therefore, the result indicates in the short-run and long-run the impact of broad money supply growth rate on the real GDP growth rate.

The response of Real GDP growth rate to shocks in real interest rate is shown in the second plane of Figure 5.4 below, from period 1 to 2 periods, innovation from interest rate causes stable real GDP growth. From period 2 to period 9 there is decline RGDP growth and from period 9 to period 10 the interest rate causes stable real GDP growth in Ethiopia economic growth. A one standard deviation shock or impulse or innovation, given to real interest rate will result in stable GDP growth up to 2nd period later from 2nd period onwards there is a decline real GDP growth up to tenth period. Hence the response of real GDP to shock in interest rate is negative both in the short run and long run.

The response of Real GDP growth rate to shocks in inflation rate shows that up to period 1 the innovation caused stable in real GDP growth and from period 2 to period 10 innovations caused increase in real GDP growth. This mean that a one standard deviation shock or impulse or innovation given to inflation rate will result in stable GDP growth rate for the first period and

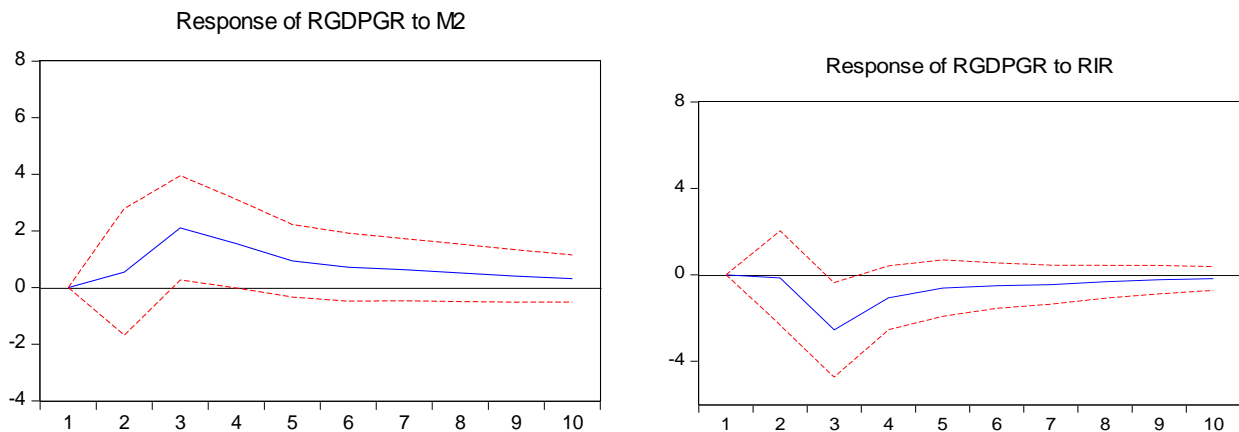
later on from 2nd period onwards to tenth period real GDP growth increases. Hence, the response of real GDP to shock inflation rate is positive both in the short run and long run.

The response of real GDP growth rate to shock in real effective exchange rate is shown in the fourth of plane of figure 5.4. From period 1 to period 2 innovations in the real effective exchange rate caused increase in the real GDP growth and from period 2 to period 10 there is decline in real GDP growth of Ethiopia. The above results shows devaluation of Ethiopian birr relative trade partner's currency was found to reduce the growth real GDP growth rate.

The response of Real GDP growth rate to shocks in GFCF shows that from first period to period 4 the innovation caused increase in real GDP growth and after period 4 to period innovations caused decline in real GDP growth. This mean that a one standard deviation shock or impulse or innovation given to GFCF will result in enhancement in real GDP growth rate up to fourth period later on from 4nd period onwards real GDP growth declines. Hence, the response of real GDP to shock GFCF is both positive and negative in the short run and long run

The response of Real GDP growth rate to shocks in Budget deficit shows that from first period to period 4 the innovation caused increase in real GDP growth and after period 4 innovations caused decline in real GDP growth. This mean that a one standard deviation shock or impulse or innovation given to Budget deficit will result in enhancement in real GDP growth rate up to fourth period later on after 4nd period onwards real GDP growth declines. Hence, the response of real GDP to shock BD is both positive and negative in the short run and long run.

Response to Cholesky One S.D. Innovations ± 2 S.E.



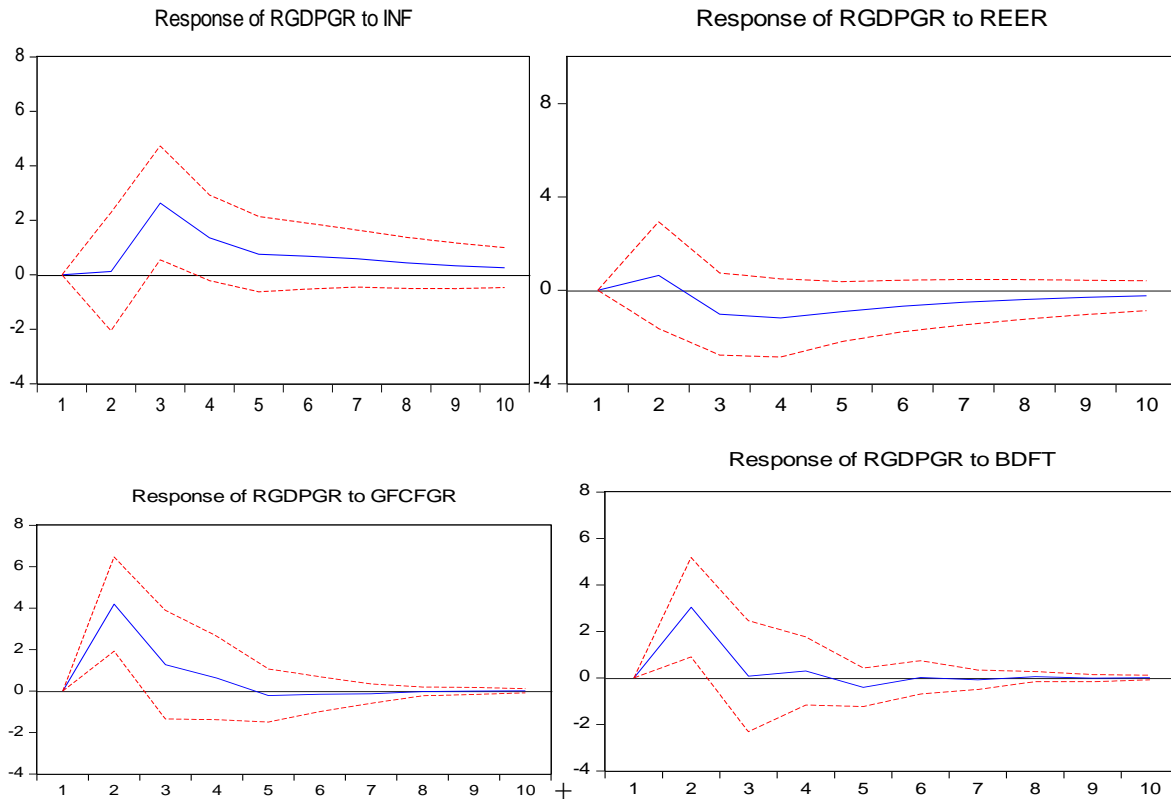


Figure 5.4: Impulse Response Function

Source: Author's computation in Eviews 9

CHAPTER SIX

CONCLUSION AND POLICY IMPLICATIONS

6.1. Conclusion

This study deeply investigated the extent to which monetary policy affects economic growth of Ethiopia both in the short run and long run. To achieve the intended objective, the study employed Auto Regressive Distributed Lagged (ARDL) model to investigate the existence of short run and long run relationship between monetary policy and economic growth of Ethiopia proposed by both theoretical and empirical literature. Additionally, the study employed the variance decomposition (VDC) and impulse response functions (IRF) were used to test for the response of real GDP growth rate to innovations in monetary policy variables. The study variables included in the model are: broad money supply growth (M2), Real interest rate (RIR), Inflation rate (INF), Real effective exchange rate, Gross fixed capital formation (GFCFGR) and budget deficit, as an explanatory variables and Real GDP growth rate (RGDPGR) as dependent variable.

To address the stationarity problem of the series, (ADF) test was undertaken on data obtained from various sources. The result of the test confirmed that the series are integrated of order I(0) and I(1). The ARDL bound testing techniques also identified the existence of long-run relationship among the variables. The test identified that there is co-integration among the variables since the F-statistic of the test is greater than its upper bound critical values.

The post estimation diagnostic test result revealed that the model successfully passed all tests of serial correlation, normality, heteroscedasticity, Ramsey RESET test for testing functional form and stability tests. Hence, robust results of the diagnostic test imply that the result of the ARDL model can be trusted and relied upon for policy modeling and can be trusted for policy use. The regression for the underlying ARDL model fits well, as indicated by an R-squared of 84.44%. The plots of the cumulative sum of recursive residuals (CUSUM) and CUSUMSQ results are within the 5% critical lines, revealing that the model is stable and confirming the stability of the long-term coefficients of the regressors and there is no any structural break showing the result of the estimation are reliable and efficient.

The co integration analyses result indicated the existence of long-run association between real gross domestic Product(RGDPGR),Broad Money Supply(M2),Real interest rate(RIR),Inflation Rate(INR),real effective exchange Rate(REER),gross fixed capital formation(GFCF) and Budget Deficit(BD).The co integration result also indicated that from the total of six explanatory variables three of them were found to be statically significant in the long run. Broad money supply (M2), real interest rate (RIR) and inflation rate were found to be statically significant in impacting Real GDP growth while reel effective exchange rate, gross fixed capital formation and Budget deficit were not significant.

The long run positive and statistically significant effects of broad money supply on real GDP growth of Ethiopia confirms the theoretical predication that monetary policy impacts economic growth of the country in the long run. This implies that monetary policy when M2 is a proxy for monetary policy is the best policy for economic growth of Ethiopia supporting the theory of non-neutrality of monetary policy in the long run. The long-run relationship between real interest rate and Real GDP growth is negative and statistically significant in the long run. This also implies that monetary policy significant effects on the economic growth of Ethiopia in the long run when real interest rate is used as a proxy for monetary policy.

The other major finding of the study result revealed that inflation rate significantly and negatively affects economic growth of Ethiopia both in the long run and in the short run for the study period. This implies that high inflation rate is adversely affecting the growth of economy of Ethiopia by eroding the purchasing power of money and retards the individual saving and then investment and economic growth.

Short-run analysis results revealed that the one period lag and current period real gross domestic product growth affect economic growth of Ethiopia positively and are statistically significant while current period real effective exchange rate, current period inflation and current period real interest rate affects economic growth of Ethiopia proxed by real gross domestic product growth rate negatively and statistically significant at 5% level of significance. However, other variables such as current period and one period lag broad money supply, current period gross fixed capital formation are found to be statistically insignificant in the short-run. The error correction coefficient (CointEq (-1)) that shows the speed of adjustment to the long run equilibrium is negative sign and statistically significant at 1% significance level.

Despite the short run and long run co integration analysis explained the relationship between real GDP growth and explanatory variables in the model, the relative effects of change in explanatory variables on the real economic growth is better assessed by variance decomposition(VDC), impulse response analyses(IRF) and granger causality test. Results of the VDC analysis and granger causality indicated that, inflation rate, gross fixed capital formation and the growth of money supply have strong effects on the real GDP growth of Ethiopia. The result from IRF also indicated that the growth of money supply and inflation rate have a stronger effects on the economic growth of Ethiopia. Although the co integration analysis showed the real interest rate have significant effects in the long run, the result from VDC, IRF and granger causality test showed the existence of weak relationship between real interest rate and economic growth of Ethiopia. The co integration analysis also showed gross fixed capital formation have insignificant impact in the long run, however, the VDC result implied the strong association between RGDP growth and GFCF particularly in the long run. More importantly, despite the co integration results displayed the insignificance long run effects of real effective exchange rate; the result of IRF reveals the existence of negative significant long run effect of real effective exchange rate.

6.2. Policy Implication

This study comprises the following crucial policy implications in the area of effects of monetary policy on the Economic growth of Ethiopia.

- ✚ The first major long term finding of the study revealed that monetary policy positively and significantly affects economic growth of Ethiopia in the long term when broad money supply (M2) is used as proxy for monetary policy. This implies that there is high correlation between monetary policy and real economic growth of Ethiopia both in the long run verifying non neutrality of monetary policy. The study addresses the classicalists' arguments regarding the non-neutrality of money; in developing country monetary policy became effective in altering output growth. Hence, the monetary authority of Ethiopia should focus on the broad money supply as the best monetary policy variable to bring robust economic growth of Ethiopia. However, the amount of money to be injected in the economy should be steady and proportional to the real gross domestic product growth rate of the country. In the same way real interest rate is a good policy variable since the result from co integration showed the significance effects of interest rate on the economic growth of Ethiopia and hence NBE

should reduce interest rate to reduce cost of capital and then attract investment to promote economic growth of the country

- ✚ The negative and significant effect of inflation rate suggests the important monetary authority's roles of maintaining inflation stability for the sake of economic growth of the country. This is because high and persistent inflation rate is adversely affecting the growth of economy of Ethiopia by eroding the purchasing power of money and retards the individual saving and then investment and economic growth of the country. And more specifically indicated that the government and National bank of Ethiopia should come up with strategies aimed at reducing the impact of inflation rate. As a result, the study recommends that a more practical effort is needed by the monetary authorities to target the inflation vigorously to prevent its adverse effect by ensuring a tolerable rate that would stimulate the economic growth of Ethiopia. To this end, governments should improve the performance of supply sides (productivity to match with the growing demand conditions). And also the amount of money supply should be steady and proportional to real GDP growth of the country.
- ✚ Even though the co integration analysis showed gross fixed capital formation has weak effect on the economic growth in the long run the VDC and Granger Causality Test result suggested the strong association between real GDP growth and GFCF in both long run and short run. This implies that gross fixed capital formation is a good policy variable to affect economic growth of Ethiopia. Hence, to accelerate economic growth of Ethiopia, the government should promote and encourage both domestic and foreign direct investment which is a means for expansion of gross capital formation. The investment policy should more transparent, attractive and competitive. This leads to positive impact on investment in terms of volume and diversification. Therefore the Ethiopian authority must place emphasis on the growth of investment in order to expand public and private capital formation in efforts to enhance and stimulate economic growth of Ethiopia.
- ✚ Finally, the current study has used two monetary policy variables four control variables to investigate the effects of monetary policy on the economic growth of Ethiopia. Therefore, further researches require exploring the other macroeconomic factors affecting the effects of monetary policy variables. For future studies it is better to include other important variables like growth in human capital, growth in technology and other macroeconomic variables in the model.

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APPENDICES

Appendix A: Serial Correlation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.365107	Prob. F(2,19)	0.6989
Obs*R-squared	1.295346	Prob. Chi-Square(2)	0.5233

Test Equation:

Dependent Variable: RESID

Method: ARDL

Date: 10/13/21 Time: 04:54

Sample: 1983 2017

Included observations: 35

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDPGR(-1)	0.032847	0.219014	0.149978	0.8824
RGDPGR(-2)	0.060570	0.140504	0.431093	0.6713
M2	0.059107	0.161451	0.366098	0.7183
M2(-1)	-0.035824	0.158895	-0.225456	0.8240
M2(-2)	0.006701	0.170981	0.039191	0.9691
RIR	-0.038278	0.303682	-0.126047	0.9010
INF	-0.053315	0.394363	-0.135193	0.8939
INF(-1)	0.005688	0.109472	0.051954	0.9591
REER	-0.000582	0.019522	-0.029831	0.9765
REER(-1)	0.001884	0.022834	0.082491	0.9351
GFCFGR	-0.031582	0.285638	-0.110567	0.9131
BDFT	0.031369	0.290775	0.107881	0.9152
C	-0.234548	5.651416	-0.041503	0.9673
@TREND	-0.022609	0.226776	-0.099696	0.9216
RESID(-1)	0.001013	0.339302	0.002986	0.9976
RESID(-2)	-0.271621	0.319038	-0.851376	0.4052

R-squared	0.037010	Mean dependent var	2.22E-15
Adjusted R-squared	-0.723245	S.D. dependent var	2.768058
S.E. of regression	3.633697	Akaike info criterion	5.721755
Sum squared resid	250.8714	Schwarz criterion	6.432771
Log likelihood	-84.13071	Hannan-Quinn criter.	5.967198
F-statistic	0.048681	Durbin-Watson stat	1.882175
Prob(F-statistic)	1.000000		

Appendix B: Heterosedasticity Test

Heterosedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.766918	Prob. F(13,21)	0.6838
Obs*R-squared	11.26731	Prob. Chi-Square(13)	0.5884
Scaled explained SS	3.045477	Prob. Chi-Square(13)	0.9978

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

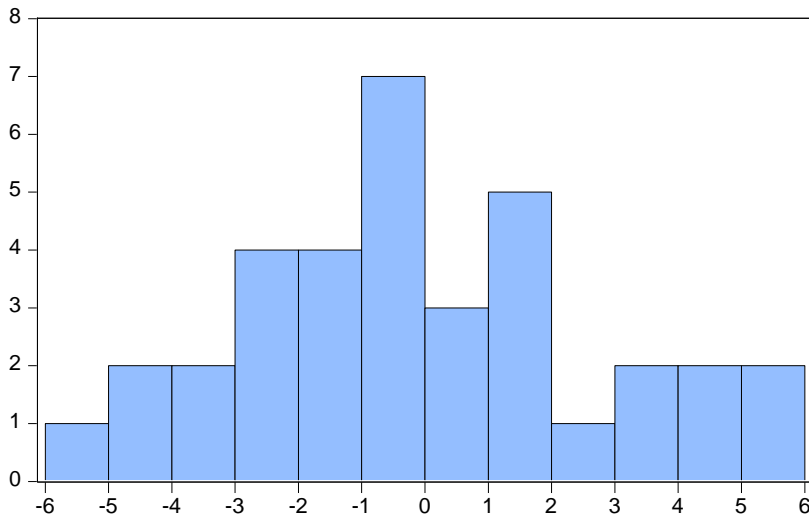
Date: 10/13/21 Time: 04:54

Sample: 1983 2017

Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.138495	15.01701	0.142405	0.8881
RGDPGR(-1)	0.309670	0.400331	0.773536	0.4478
RGDPGR(-2)	-0.183978	0.320294	-0.574403	0.5718
M2	-0.488990	0.364155	-1.342808	0.1937
M2(-1)	-0.425537	0.408843	-1.040832	0.3098
M2(-2)	-0.202995	0.424890	-0.477759	0.6378
RIR	-0.240590	0.742355	-0.324090	0.7491
INF	0.012998	0.973372	0.013354	0.9895
INF(-1)	-0.006542	0.241344	-0.027107	0.9786
REER	0.040989	0.050162	0.817132	0.4230
REER(-1)	0.022096	0.053735	0.411201	0.6851
GFCFGR	-0.218324	0.755616	-0.288935	0.7755
BDFT	0.139153	0.769450	0.180848	0.8582
@TREND	0.782208	0.600915	1.301694	0.2071
R-squared	0.321923	Mean dependent var	7.443226	
Adjusted R-squared	-0.097839	S.D. dependent var	9.254163	
S.E. of regression	9.696310	Akaike info criterion	7.670542	
Sum squared resid	1974.387	Schwarz criterion	8.292681	
Log likelihood	-120.2345	Hannan-Quinn criter.	7.885305	
F-statistic	0.766918	Durbin-Watson stat	1.576724	
Prob(F-statistic)	0.683767			

Appendix C: Normality Test



Series: Residuals	
Sample 1983 2017	
Observations 35	
Mean	2.22e-15
Median	-0.371876
Maximum	5.817120
Minimum	-5.060047
Std. Dev.	2.768058
Skewness	0.304781
Kurtosis	2.501629
Jarque-Bera	0.904077
Probability	0.636330

Appendix D: Ramsey RESET Test

Ramsey RESET Test

Equation: UNTITLED

Specification: RGDPGR RGDPGR(-1) RGDPGR(-2) M2 M2(-1)

M2(-2) RIR

INF INF(-1) REER REER(-1) GFCFGR BDFT C @TREND

Omitted Variables: Squares of fitted values

	Value	Df	Probability
t-statistic	1.382616	20	0.1820
F-statistic	1.911626	(1, 20)	0.1820

F-test summary:

	Sum of Sq.	Df	Mean Squares
Test SSR	22.72781	1	22.72781
Restricted SSR	260.5129	21	12.40538
Unrestricted SSR	237.7851	20	11.88925

Unrestricted Test Equation:

Dependent Variable: RGDPGR

Method: ARDL

Date: 10/13/21 Time: 04:54

Sample: 1983 2017

Included observations: 35

Maximum dependent lags: 2 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (2 lags, automatic):

Fixed regressors: C @TREND

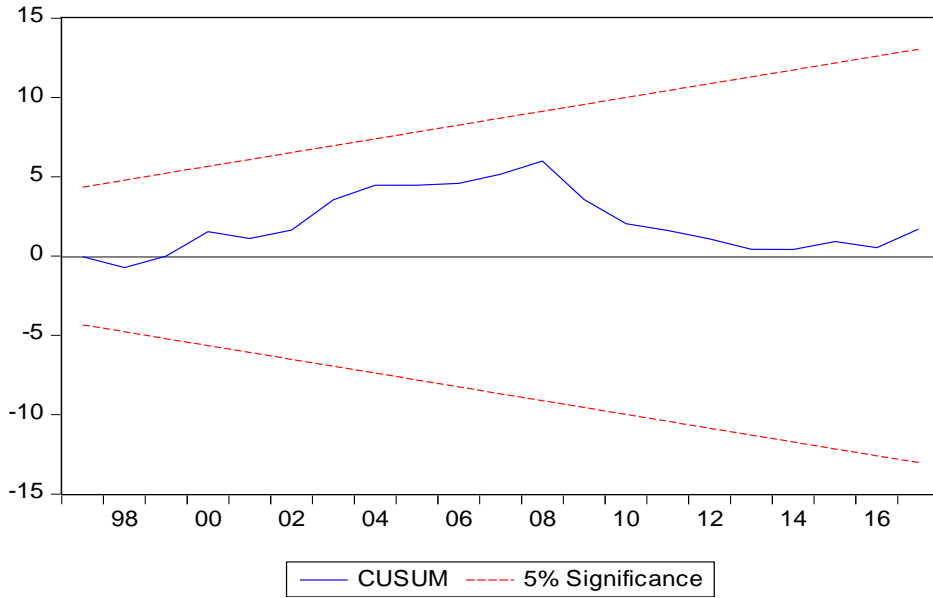
Variable	Coefficien	Std. Error	t-Statistic	Prob.*
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t

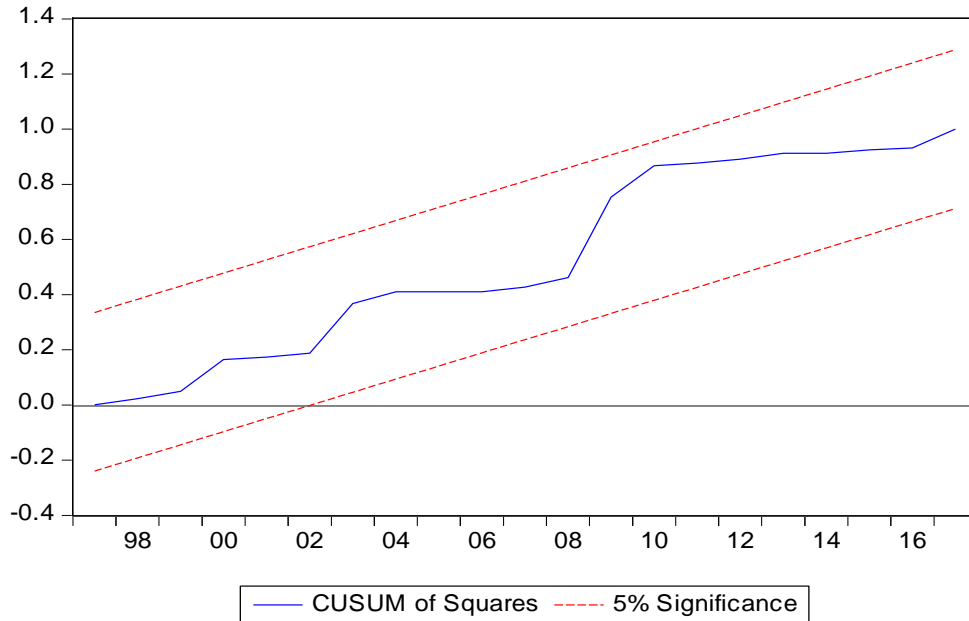
RGDPGR(-1)	0.491605	0.147689	3.328645	0.0033
RGDPGR(-2)	-0.342131	0.122816	-2.785721	0.0114
M2	0.102392	0.137037	0.747190	0.4636
M2(-1)	0.433891	0.148112	2.929470	0.0083
M2(-2)	0.381007	0.166199	2.292470	0.0329
RIR	-1.143080	0.284304	-4.020632	0.0007
INF	-1.738899	0.385920	-4.505857	0.0002
INF(-1)	0.192450	0.090332	2.130463	0.0457
REER	-0.087266	0.020456	-4.266059	0.0004
REER(-1)	0.085416	0.022462	3.802743	0.0011
GFCFGR	-0.801045	0.282670	-2.833850	0.0103
BDFT	0.821643	0.291678	2.816956	0.0106
C	-4.845840	5.430769	-0.892294	0.3828
@TREND	0.698813	0.226828	3.080805	0.0059
FITTED^2	-0.028554	0.020652	-1.382616	0.1820
R-squared	0.858931	Mean dependent var	5.532101	
Adjusted R-squared	0.760183	S.D. dependent var	7.041052	
S.E. of regression	3.448080	Akaike info criterion	5.611039	
Sum squared resid	237.7851	Schwarz criterion	6.277617	
Log likelihood	-83.19319	Hannan-Quinn criter.	5.841142	
F-statistic	8.698207	Durbin-Watson stat	1.831594	
Prob(F-statistic)	0.000011			

*Note: p-values and any subsequent tests do not account for model Selection.

Appendix E: - CUMSUM Result



Appendix F: - CUMSUMSQ Result



Appendix G: - ARDL Model Result

Dependent Variable: RGDPGR
Method: ARDL
Date: 10/13/21 Time: 04:53
Sample (adjusted): 1983 2017
Included observations: 35 after adjustments

Maximum dependent lags: 2 (Automatic selection)
 Model selection method: Akaike info criterion (AIC)
 Dynamic regressors (2 lags, automatic): M2 RIR INF REER GFCFGR BDFT

Fixed regressors: C @TREND
 Number of models evaluated: 1458
 Selected Model: ARDL(2, 2, 0, 1, 1, 0, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RGDPGR(-1)	0.437250	0.145418	3.006853	0.0067
RGDPGR(-2)	-0.278609	0.116345	-2.394683	0.0260
M2	0.040409	0.132277	0.305489	0.7630
M2(-1)	0.394791	0.148510	2.658352	0.0147
M2(-2)	0.285289	0.154339	1.848457	0.0787
RIR	-0.997154	0.269656	-3.697874	0.0013
INF	-1.502952	0.353572	-4.250772	0.0004
INF(-1)	0.153485	0.087667	1.750777	0.0946
REER	-0.073422	0.018221	-4.029562	0.0006
REER(-1)	0.069092	0.019519	3.539778	0.0019
GFCFGR	-0.679711	0.274473	-2.476420	0.0219
BDFT	0.681960	0.279498	2.439943	0.0236
C	-3.479952	5.454838	-0.637957	0.5304
@TREND	0.593629	0.218279	2.719589	0.0128
R-squared	0.845448	Mean dependent var	5.532101	
Adjusted R-squared	0.749773	S.D. dependent var	7.041052	
S.E. of regression	3.522127	Akaike info criterion	5.645181	
Sum squared resid	260.5129	Schwarz criterion	6.267321	
Log likelihood	-84.79067	Hannan-Quinn criter.	5.859944	
F-statistic	8.836646	Durbin-Watson stat	1.925643	
Prob(F-statistic)	0.000008			

*Note: p-values and any subsequent tests do not account for model Selection.

Appendix H: - ARDL Bounds Test

ARDL Bounds Test

Date: 10/13/21 Time: 04:53

Sample: 1983 2017

Included observations: 35

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	4.960604	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.53	3.59
5%	2.87	4
2.5%	3.19	4.38
1%	3.6	4.9

Test Equation:

Dependent Variable: D(RGDPGR)

Method: Least Squares

Date: 10/13/21 Time: 04:53

Sample: 1983 2017

Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RGDPGR(-1))	0.176449	0.135306	1.304068	0.2063
D(M2)	0.052491	0.156536	0.335326	0.7407
D(M2(-1))	-0.329231	0.195149	-1.687073	0.1064
D(INF)	0.209025	0.412660	0.506530	0.6178
D(REER)	-0.056358	0.026841	-2.099679	0.0480
C	-2.841920	6.828401	-0.416191	0.6815
@TREND	0.388906	0.252241	1.541802	0.1381
M2(-1)	0.711753	0.303794	2.342877	0.0291
RIR(-1)	-0.159154	0.316825	-0.502341	0.6207
INF	-0.405060	0.422237	-0.959318	0.3483
REER(-1)	-0.027747	0.023660	-1.172766	0.2540
GFCFGR(-1)	-0.455450	0.297461	-1.531125	0.1407
BDFT(-1)	0.519300	0.301016	1.725158	0.0992
RGDPGR(-1)	-1.010471	0.197820	-5.108038	0.0000
R-squared	0.828393	Mean dependent var	-0.014572	
Adjusted R-squared	0.722160	S.D. dependent var	8.159770	

S.E. of regression	4.301057	Akaike info criterion	6.044773
Sum squared resid	388.4810	Schwarz criterion	6.666912
Log likelihood	-91.78353	Hannan-Quinn criter.	6.259536
F-statistic	7.797894	Durbin-Watson stat	1.637194
Prob(F-statistic)	0.000022		

Appendix I: - ARDL Co integrating and Long Run Estimation

ARDL Co integrating And Long Run Form

Dependent Variable: RGDPGR

Selected Model: ARDL(2, 2, 0, 1, 1, 0, 0)

Date: 10/13/21 Time: 04:53

Sample: 1981 2019

Included observations: 35

Co integrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RGDPGR(-1))	0.278609	0.116345	2.394683	0.0260
D(M2)	0.040409	0.132277	0.305489	0.7630
D(M2(-1))	-0.285289	0.154339	-1.848457	0.0787
D(RIR)	-0.997154	0.269656	-3.697874	0.0013
D(INF)	-1.502952	0.353572	-4.250772	0.0004
D(REER)	-0.073422	0.018221	-4.029562	0.0006
D(GFCFGR)	-0.679711	0.274473	-2.476420	0.0219
D(BDFT)	0.681960	0.279498	2.439943	0.0236
D(@TREND())	0.593629	0.218279	2.719589	0.0128
CointEq(-1)	-0.841359	0.180891	-4.651193	0.0001

Co inteq = RGDPGR - (0.8563*M2 -1.1852*RIR -1.6039*INF -0.0051
*REER -0.8079*GFCFGR + 0.8105*BDFT -4.1361 + 0.7056*@TREND)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
M2	0.856340	0.363980	2.352712	0.0285
RIR	-1.185170	0.470659	-2.518110	0.0200
INF	-1.603914	0.600307	-2.671823	0.0143
REER	-0.005147	0.023058	-0.223204	0.8255
GFCFGR	-0.807872	0.405764	-1.990988	0.0597
BDFT	0.810546	0.416118	1.947875	0.0649
C	-4.136108	6.696120	-0.617687	0.5434
@TREND	0.705559	0.306724	2.300309	0.0318

Appendix J: Granger Causality

Pairwise Granger Causality Tests

Date: 10/13/21 Time: 04:57

Sample: 1981 2019

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
M2 does not Granger Cause RGDPGR	37	2.73480	0.0801
RGDPGR does not Granger Cause M2		0.56478	0.5741
RIR does not Granger Cause RGDPGR	37	3.03726	0.0620
RGDPGR does not Granger Cause RIR		1.46125	0.2470
INF does not Granger Cause RGDPGR	37	3.59727	0.0390
RGDPGR does not Granger Cause INF		1.84001	0.1752
REER does not Granger Cause RGDPGR	37	1.38288	0.2654
RGDPGR does not Granger Cause REER		0.14740	0.8635
GFCFGR does not Granger Cause RGDPGR	37	8.49818	0.0012
RGDPGR does not Granger Cause GFCFGR		0.34537	0.7107
BDFT does not Granger Cause RGDPGR	37	5.10874	0.0119
RGDPGR does not Granger Cause BDFT		3.28107	0.0506
RIR does not Granger Cause M2	37	2.92359	0.0682
M2 does not Granger Cause RIR		4.26845	0.0227
INF does not Granger Cause M2	37	2.78580	0.0767
M2 does not Granger Cause INF		4.44895	0.0197
REER does not Granger Cause M2	37	0.98716	0.3837
M2 does not Granger Cause REER		0.65426	0.5266
GFCFGR does not Granger Cause M2	37	1.10276	0.3450
M2 does not Granger Cause GFCFGR		1.60093	0.2185
BDFT does not Granger Cause M2	37	0.76215	0.4749
M2 does not Granger Cause BDFT		0.28906	0.7509
INF does not Granger Cause RIR	37	0.21151	0.8105
RIR does not Granger Cause INF		0.08147	0.9219
REER does not Granger Cause RIR	37	0.19956	0.8201
RIR does not Granger Cause REER		3.50136	0.0422
GFCFGR does not Granger Cause RIR	37	0.94818	0.3988
RIR does not Granger Cause GFCFGR		1.87455	0.1710
BDFT does not Granger Cause RIR	37	1.95340	0.1583
RIR does not Granger Cause BDFT		0.53094	0.5931
REER does not Granger Cause INF	37	0.21251	0.8097
INF does not Granger Cause REER		2.90520	0.0693
GFCFGR does not Granger Cause INF	37	1.34402	0.2760
INF does not Granger Cause GFCFGR		1.94285	0.1609
BDFT does not Granger Cause INF	37	2.38796	0.1080
INF does not Granger Cause BDFT		0.54129	0.5872
GFCFGR does not Granger Cause REER	37	4.71642	0.0166
REER does not Granger Cause GFCFGR		0.44241	0.6466

Appendix K: Variance decomposition of RGDPGR

Variance Decomposition of RGDPGR:

Period	S.E.	RGDPGR	M2	RIR	INF	REER	GFCFGR	BDFT
1	4.839986	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	6.766353	51.53178	0.431437	0.747334	0.108281	0.887579	46.17686	0.116733
3	7.888749	39.87694	9.422740	5.752151	7.659438	1.193152	33.97171	2.123865
4	8.448053	37.00916	11.28820	5.206911	8.904504	2.227416	32.23769	3.126121
5	8.582515	35.90364	12.29795	5.051954	9.364311	2.326464	31.99815	3.057528
6	8.728074	35.22680	12.13491	4.936219	10.08740	2.258026	32.06964	3.286997
7	8.865045	34.20082	12.44475	5.051628	11.11364	2.244243	31.55202	3.392892
8	9.018629	33.38096	13.48969	4.987400	11.90196	2.297808	30.50078	3.441415
9	9.081883	32.98803	14.08886	4.974551	11.95831	2.366765	30.11022	3.513270
10	9.121091	32.72354	14.23075	5.014868	12.07836	2.350457	30.05914	3.542877

Appendix L: - Impulse Response results

