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FINANCIAL INNOVATION, MONETARY POLICY AND ECONOMIC GROWTH IN ETHIOPIA

BY

BELAYNEW BIRLIE

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BY

BELAYNEW BIRLIE

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This is to certify that the thesis prepared by Belaynew Birlie, entitled: *Financial Innovation, Monetary Policy and Economic Growth in Ethiopia* and submitted in Partial Fulfillment of the Requirements for the award of Master of Science Degree in Economics (Economic Policy Analysis) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by the Examining Committee:

Examiner_____Signature_____Date_____

Examiner_____Signature_____Date_____

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Acronyms

ADF	Augmented Dickey Fuller
AHM	Aghion, Howitt, and Mayer-Foulkes
AIC	Akaike Information Criterion
ARDL	Autoregressive Distributive Lag Model
AR	Auto regressive
CSA	Central statistics agency
CPI	Consumer Price Index,
CRR	Cash Reserve Ratio
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMSQ	Cumulative Sum of Squares of Recursive Residuals
DCPS	Domestic Credit to Private Sector
DF	Dickey Fuller
DFS	Digital Financial Services
ECM	Error Correlation Model
EPRDF	Ethiopian People's Revolutionary Democratic Front
ETB	Ethiopian Birr
EXR	Exchange Rate
FPE	Final Prediction Error
GDP	Gross Domestic Product
GEX	Government Expenditure
GFC	Great Financial Crisis
GFCF	Gross Fixed Capital Formation
GoE	Government of Ethiopia
GSMA	Global System for Mobile Communication Association
HQ	Hannan-Quinn Information Criterion
I(0)	Integrated Order of Zero
I(1)	Integrated Order of One
IMF	International Monetary Fund
IS	Interest Rate Spread

LR	Sequential Modified Likelihood Ratio Test Statistics
M1	Narrow Money
M2	Broad Money
MEC	Marginal Efficiency Of Capital
MFS	Monetary and Financial Statistics
MoFED	Minister of Finance And Economic Development
MS	Money Supply
NBE	National Bank Of Ethiopia
OECD	Organization of Economic Cooperation and Development
PP	Phillips-Perron
RGDPPCGr	Real Gross Domestic Product Per Capita Growth Rate
SC	Schwarz Information Criterion
SEMCs	Southern and Eastern Mediterranean Countries
SLR	Statutory Liquidity Ratio
TOP	Trade Openness
VAR	Vector Autoregressive Model
VECM	Vector Error Correlation Model
WB	World Bank

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Abstract

The objective of this study is to explore the relationship among financial innovation, monetary policy, and economic growth of Ethiopia for the period spanning from 1980–2018. In order to analyze the long-run and short-run relationship between real GDP per capita growth rate (dependent variable) and its drivers, the study employed Autoregressive Distributed Lag (ARDL) Approach to Co-integration and Error Correction Models. Furthermore, the Granger-causality test is also applied in order to identify the directional causality among financial innovation, monetary policy and economic growth under the pair wise granger causality frame work. The empirical results revealed that both gross fixed capital formation and government expenditure are found to have positive association with economic growth and statically significant in the long run and in the short run. However, consumer price index and broad to narrow money ratio (LM2/M1, proxy for financial innovation) are found to have negative and statistically significant association with economic growth in the long run. However, consumer price index also has a relationship to growth, which is negative and significant. Added to this, is that the results from the Granger-causality test support unidirectional causality running from financial innovation to economic growth and to monetary policy, and from monetary policy to economic growth.

Key words: *Innovation, financial innovation, economic growth, Ethiopia, monetary policy, ARDL*

JEL classifications*: E52, O3, O4, O5*

CHAPTER ONE: INTRODUCTION

1.1 Back Ground of the Study

In recent years innovation is at the forefront as a significant phenomenon in any sector of the modern economy and as a result the world has changed dramatically. Firms can use innovation to implement a new and better way of executing their operations. According to Lawrence (2010), innovation is defined as "a tremendous development by corporations in approaching with innovative items or the application of new operations or methods in manufacturing." And also innovation is defined by the creation of new ideas, products, or processes by organizations to create new, high-quality, and convenient services and products (Kumar et al, 2011).

Financial innovation has been used to refer to a wide range of changes and advances affecting financial markets in a variety of contexts. The term can be used to refer to the introduction of new financial instruments in a very narrow meaning and the changes in the structure and depth of financial markets, as well as changes in financial institutions' roles to the broader one. Because financial innovation is a continuous process, it is difficult, in practice, to grasp all of its contours; and even more difficult to foresee its repercussions, which adds an element of uncertainty to the economic setting in which central banks work. If financial innovation enhances the financial systems efficiency, it should also have a considerable impact on the functioning of the overall economy.

Despite being an integral aspect of financial development, the impact of financial innovation on economic growth in underdeveloped nations has received little attention. Studies on the financial innovation in underdeveloped nations have primarily focused on welfare issues, particularly its impact on financial inclusion (Chibba, 2009). Financial innovation has restructured and revolutionized financial services around the world, and its impact on economies is becoming increasingly noteworthy.

In developing economies monetary policy has a significant role through increasing the growth rate of the economy by influencing the cost and availability of credit, by regulating inflation and maintaining equilibrium in the balance of payment stability (Chand, 2018). Since the primary goals of monetary policy are to restrict credit in order to limit inflation and stable the price level, to stabilize the exchange rate, to establish balance-of-payments equilibrium, and to foster economic development. To our country context Ethiopia, the principal objective of the monetary policy of the National Bank of Ethiopia (NBE) is to maintain price & exchange rate stability and support sustainable economic growth. As such, price stability is a proxy for macroeconomic stability which is vital in private sector economic decision and macroeconomic stability, whereas exchange rate stability as the principal policy objective of national bank of Ethiopia (NBE) to affect both foreign reserve position and domestic money supply (NBE, 2009).

Economic growth is the most important macroeconomic variable since it shows a society's overall performance as a result of producing more goods and services, which necessitates improved productivity and labor supply. Many empirical studies over the past decade confirmed that there exist a positive association between financial innovation and economic growth (e.g., Lumpkin 2010; Sekhar 2013). Financial innovation promotes economic growth by enabling for capital mobilization, efficient financial intermediation, capital accumulation, and improved overall financial institution efficiency. As a result, financial innovation is treated as a prime catalyst and key drivers for financial progress (Laeven et al. 2015). Financial innovation, like other innovations, is a continual process of bringing about changes in the financial system through the enhancement and diversity of financial goods and procedures (Sood and Ranjan 2015). According to Demetriades and Andrianova (2005), the emergence of new financial assets and a service in the financial system improves banking-sector performance and capital-market development, resulting in increased economic growth in the host country.

According to Schumpeter (1912, 1982), robust financial systems include efficient financial institutions, diversified financial assets and services, comprehensive financial services coverage, efficient channels for economic resource mobilization, and available credit flows for investment across a country. Outside the framework of formal banking systems, financial innovation made credit available in economies through new and hybrid kinds of financial institutions (e.g., microfinance organizations) (Blair, 2011).

In line with our country context Ethiopia, the financial system is very much behind in the implementation of financial innovations compared to the rest of world and even Sub-Saharan region (Mengistu, 2018). Despite bank's moderate effort to offer financial products to attract clients and provide novel financial service, Ethiopian financial innovation has a long way to go in Ethiopia because the country was ranked the last second for financial inclusion and innovation out of 26 countries that are politically, geographically and economically the same (GPFI, 2016). Ethiopia is an outlier among its peers when it comes to access to and use of digital financial services, according to a 2017 research from the Global System for Mobile Communication Association (GSMA).

In both developed and developing countries different studies have been conducted on the nexus between financial sector development and economic growth. However, the current study adds to the previous literature in numerous aspects. First, to the best of my knowledge, this study is the first attempt to examine the relationship among financial innovation, monetary policy and economic growth in Ethiopia. Although quite a few empirical studies in neighboring countries such as Kenya considered the financial innovation from a different perspective, empirical evidence regarding the contribution of financial innovation to economic growth remains narrowed to specific regions. In particular, there seems to be no study related to financial innovation, monetary policy and economic growth from Ethiopia. But a study was conducted on particularly the impact of financial development on economic growth using ARDL approach and financial repression - economic growth nexus using multivariate

analysis in Ethiopia. This research gap stimulated to discover how financial innovation plays a perilous part in the growth process and monetary policy aspect of Ethiopia. Second, to accomplish the objective, we apply an autoregressive distributive lag (ARDL) bound testing method in this research.

1.2 Statement of the Problem

New financial Technologies are reshaping the financial industry to an extent that has never been before. Electronic money, digital banking, crowd funding platforms, and distributed ledger technology are all challenging banks' position in financing the economy. The types of financial services available, as well as who can use them and how they can be accessed, have all altered as a result of these financial technologies. Peer to peer lending, for example, is a type of alternative finance that allows people to borrow money without having to go through a bank. However, this financial innovation may have an impact on the central bank's ability to implement monetary policy effectively. Financial innovations may lower the demand for banknotes and bank deposits and, requiring a review of monetary policy transmission mechanisms. According to Dabrowski M. (2017), because of an increasing portion of financial transactions are counted outside established banks, financial technology data applications raise new issues for the measurement of monetary aggregates.

When central bank policies and laws restrict the activities and operations of profit making financial institutions and non-financial institutions they promptly look for an alternative way of making higher profit. As a result, they innovate. They create new financial instruments and services, new forms of financial organizations, new financial mechanisms and they even add new features to existing financial products to bring in them newness. This is known as financial innovation. Financial innovations emerge as a result of market participants' continual search for new ways to boost profits. The efficiency of monetary policy will decline as a result of financial innovations. As a result, central banks have reclaimed direct control of financial markets by setting new goals and changing their working procedures. This, in turn, leads to new financial inventions. As a result, monetary policy and financial

innovation are inextricably linked. The impact of financial innovation on economic growth in developing countries has received little attention. Natural resources and agriculture have recently maintained high growth rates in African countries, assisted by improved macroeconomic management (Mlachila, Park &Yabara, 2013). However, there has been no mention of money driving or being tied to growth. Financial innovation has become a key determinant in producing new economic activity and has become an intrinsic aspect of the financial sector's evolution. However, the links between financial institutions and economic growth have attracted a great deal of academic attention during the last fifteen years (Valverde, Paso, &Fernández, 2014). One key debate is whether financial innovation encourages or even requires economic growth. Financial innovation, as is widely known, is an essential promoter of economic progress. Having well-functioning financial institutions (and markets) is considered important for the economy as a whole and the financing of corporations in particular. This study mainly aims to identify whether financial innovation causes economic growth in Ethiopia or not and if so how using Granger Causality test.

While financial innovations can help to improve the efficiency of the financial system, making monetary policy easier to implement, they can also complicate the environment in which monetary policy is implemented (Angeloni, et al, 2003; Noyer, 2008). The financial crisis of 2007-2008 demonstrated that financial innovation is not a smooth process. As a result, the problems that central banks face are aimed not only at achieving efficiency, but also at ensuring financial system stability. Ethiopia's present financial crisis serves as a reminder that financial innovation is a bumpy road. To allow digital financial services, the government is currently focusing its reforms through the NBE on digitizing financial services and enhancing financial market infrastructure (DFS). The purpose is to promote financial sector innovation and use DFS to achieve financial inclusion and policy relief. Ethiopia has witnessed a number of financial innovations in the recent period. The launch of Tele - money commenced in 2021 spearheaded by the Ethiopian government is one of the pivotal examples. The other aim of the study is to identify whether these wave of financial innovations have

impacted on the transmission mechanism of monetary policy and economic growth, and if so how using Granger Causality test. Generally, the aim of this study is to investigate the relationship between financial innovation and economic growth in Ethiopia, as well as to investigate the implications of financial innovation on monetary policy.

So far, the existing literature implies that financial innovation fosters economic growth; however, the causation and extent to which financial innovation generates high growth rates in emerging nations has yet to be determined (Levine, 1997). Surprisingly, there has not been much research on the relationship between financial innovation and economic growth in Africa and none for Ethiopia. This study bridges a knowledge gap regarding the relationship between financial innovation and economic growth in Ethiopia. Literature implies that financial innovation has a positive or negative association with growth, which stems from the finance-growth nexus. Financial innovation, implicitly, has both a positive and negative impact on growth. This study establishes the causal and directional relationship between financial innovation and economic growth, financial innovation and monetary policy in Ethiopia empirically. These can be achieved using the Autoregressive Distributed Lag (ARDL) bounds tests and Granger causality tests on financial time series data of Ethiopia.

1.3 Basic Research Questions

i. What are the long run and short run relationship that exist among financial innovation, monetary policy and economic growth in Ethiopia?
ii. What is the direction of causality among financial innovation, monetary policy and economic growth in Ethiopia?
iii. What are the implications of financial innovation on the growth performance of Ethiopia?

1.4 Objective of the Study

1.4.1 General objective

The general objective of this study is to investigate the linkage among financial innovations, monetary policy and economic growth in Ethiopia.

1.4.2 Specific objective

i. Ascertain whether long run and short run relationship exist among financial innovation, monetary policy and economic growth in Ethiopia.
ii. Determine the nature of causality among financial innovation, monetary policy and economic growth in Ethiopia.
iii. Examine the implications of financial innovation on the growth performance of Ethiopia.

1.5 Hypothesis

Based on the empirical literature on the interaction between financial innovation, monetary policy and economic growth in Ethiopia, the study proposes the following working hypotheses to hold true in this analysis.

$H1_0$: financial innovation has significant positive effect on economic growth

$H1_1$: financial innovation has no significant positive effect on economic growth

$H2_0$: financial innovation has significant positive effect on monetary policy

$H2_1$: financial innovation has no significant positive effect on monetary policy

1.6 Significance of the Study

The study became significant in view of the current development and trend in global financial sector where technology culture is in style and various governments get on with financial innovative and reformative progression. The study examined the nexus between financial innovation, monetary policy and economic growth in Ethiopia. This may improves knowledge gap on the concept of financial innovation and provide more empirical findings on the link between financial innovation and economic

growth, financial innovation and or monetary policy. This becomes fundamental in view of the government involvement and concern in financial inclusion and deepening; more so the level of resources committed by banks to improve financial innovation and enhance their competitive advantage. The study may also relevant for various stakeholders including researchers, practitioners and policy makers. This study can also be used as a basis of further researches.

It can also provide support and useful information for the policymakers by defining the causal link among financial innovation, monetary policy and economic growth. This can assist policy makers in framing the innovation and monetary Policies, and innovation and growth policies of Ethiopia. The strategies that can be developed from these policies can boost growth and positively impact stakeholders and various sectors of the economy. This ultimately facilitates the creation of decent and value adding jobs.

Currently, the Government of Ethiopia (GoE) has been making huge investments in the innovation and digitization of the sector expecting that the demand/consumption will grow. Therefore, this study can remind the GoE particularly the minister of finance and economic development (MoFED), National Bank and ministry of innovation and technology should plan and work together for effective implementation of policies.

1.7 Scope and Limitations of the Study

The researcher aimed at a 'catch-all' measure of financial innovation research and development spending in the financial sector to assess the net relationship between financial innovation and economic growth and evaluate the influence of monetary policy in this relationship. Using a protracted annual time series data of the period spanning from 1980-2018 aimed at finding the causal relationship and the direction of influence among Economic Growth, financial innovation and monetary policy in Ethiopia. This time frame was chosen based on data availability. Despite the fact that this study aims to provide light on the relationship between financial innovation, monetary policy, and economic growth in Ethiopia, it has some limitations. The first

problem arises that the study is limited on time series data of the period spanning from 1980-2018 and was not able to include recent data's beyond 2018 due to inaccessibility of complete and consistent data for some of the variable of interest addressed in this study. Apart from this inconsistency of the data's from organizations to organizations was also another problem. Due to this reason and to avoid such inconsistency the study obliged to tie on few source of data and the captioned span of year. However, there are also financial innovation proxies such as mobile banking that affecting growth that are not addressed in this study due to inaccessibility of the data and could be considered as the limitations of this study.

1.8 Organization of the Study

The rest of the thesis is organized into five chapters. Chapter two discusses theoretical review, empirical review of previous studies and conceptual framework of study. Chapter three outlines analysis of financial innovations, monetary policy and performance of economic growth in Ethiopia. Chapter four discusses model specification, data types and sources, and also estimation techniques. Chapter five focuses on data analysis and interpretation of the outputs. Chapter six outlines the summary of the findings, conclusions, recommendations and further research direction.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2. Review of Theoretical Literature

2.1 Definition, and Concepts of Financial Innovation

The term “innovation” has been used to characterize the advances in the technological solutions, new combinations of productive means and generating the above the average rates of return thereby boosting the dynamic development of the overall economy (Targalski, 2006, p. 7).

The major sources of innovations can be analyzed either by the demand theory or by the supply theory of the two perspective innovation from its beginning. Innovations are emerged as the response to the demand of business entities due to their aspiration for competitive advantage in their business environment (the demand-driven innovations), according to the demand theory. However, the internal needs of the business entity focus at improvement in its activity or the changes in its environment requiring the proper adjustment in its business strategy affected this demand (Błach, J., 2011).

The supply side theory of innovation which is the second approach states that, innovations from its beginning created by the innovation providers and then they are implemented in the business entities (known as the end-user of innovations or the supply driven innovation) (Błach, J., 2011).

The evolution of financial innovation is long and has had far reaching impact. This financial innovation can be classified as any financial instruments (besides traditional shares and straight bonds), any financial institutions (besides traditional banks) and any financial markets (besides the traditional markets for the straight bonds and shares), for a certain period of time. The new financial instruments debt contracts and the high liquid markets in the 17th and the 18th century were introduced to gather capital required to finance the oceanic expedition and trading voyage. Then, the investment banks together with the new accounting methods were also introduced in the 19th century to evaluate the profitability of railroad companies and to provide

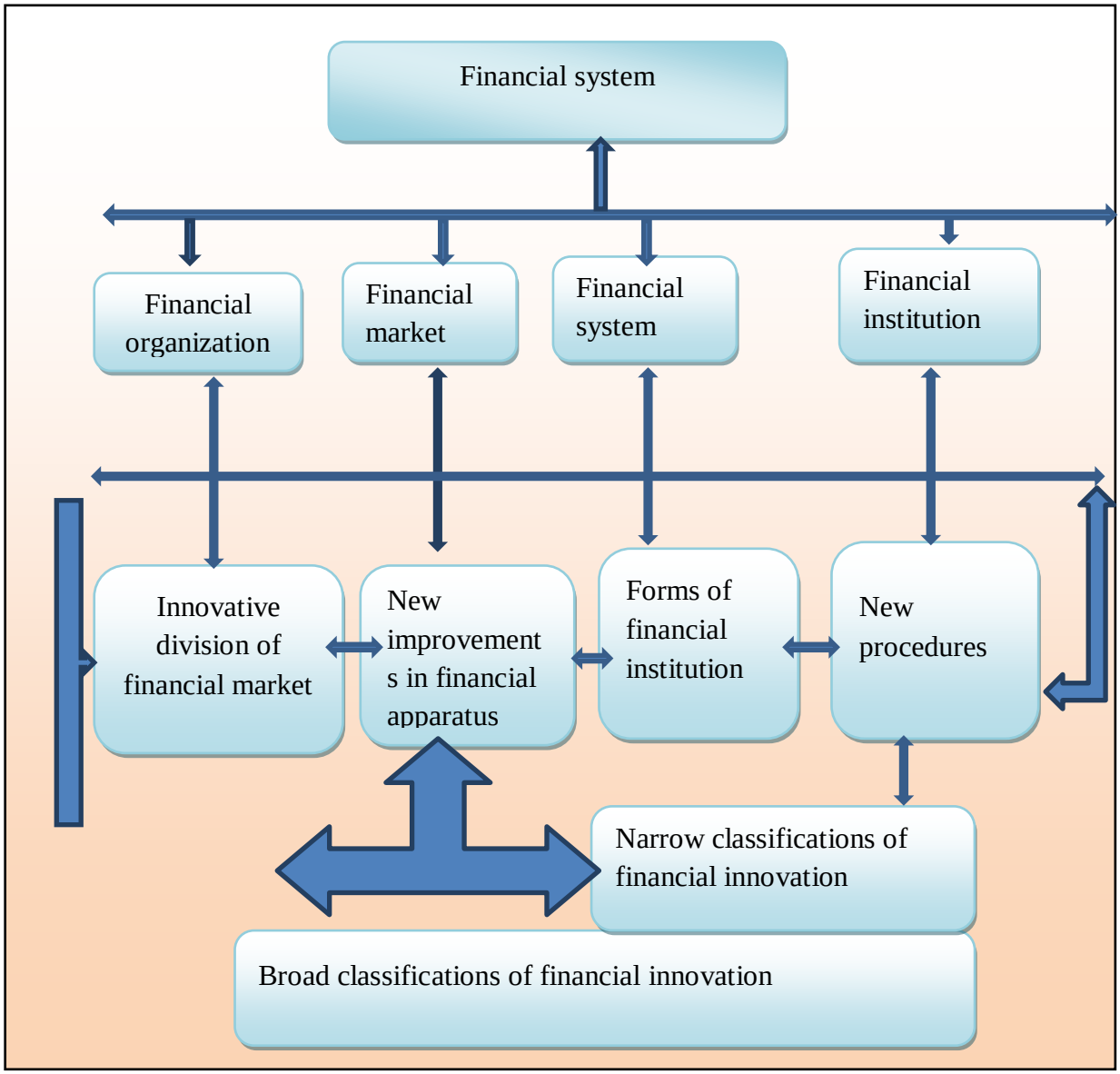
fund for them .Next, the private equity companies were also commenced to analyze and finance high-tech investment project , in the 20th century. The developments of the new forms of investment companies - the pharmaceutical corporations analyzing and funding the bio-tech innovative solutions, at the beginning of the 21st century (Michalopoulos, Leaven and Levine, 2009).

Hence, financial innovations are not new concept rather their importance has increased lately, as since the mid-1990's there had been a boost in the pace and range of financial innovations (Llewellyn, 2009, p. 1). The starting from the definition is very important in order to give analysis about the role of the financial innovations in the modern financial system. As because of the absence of the agreed definitions of the financial innovations, as in the case of the technological ones, the systematization of this term is required. In the most common conventional definition, financial innovations are presented in the narrow meaning, product innovations are mainly explained (see popular definition of financial innovations presented in: Al-Kaber, 2010, p.135-136; Anderloni and Bongini, 2009, p. 41- 43; Fabozzi and Modigliani, 2003, p. 27-28; Frame and White, 2009, p. 3).

It is worth noting that if any financial instruments other than traditional shares and straight bonds can be considered as the financial innovations, these new developments fail into two categories: These are (a) equity-linked innovations and (b) debt-linked innovations. The most well-known approach of the financial innovations definition describes that they can be classified as: (a) process innovations, (b) product innovations, and (c) risk- shifting innovations (Llewellyn, 2009, p. 4). The product innovations which is the first class comprises of new financial instruments, contracts, techniques and markets. The process innovation which is the second group focuses on improvements in the processes of securities distribution, transaction payments or assets valuation. Whereas, the risk-shifting innovations are developed by the separation or combination of various individual instruments for the purpose of generating new instruments containing different risk characteristics. There have been distinguished two classes under the last category of financial innovation. These are: (a) the post-contract innovations, and (b) the instrument innovations (Llewellyn,

2009, p. 5). In order to achieve a particular set of characteristics, a new instrument is designed and created as in the case of the first type and they are characterized as the ex-ante innovations. Whereas the second type of innovations – the risk characteristics is changed after the original instrument is used and they can be characterized as the ex-post innovations.

Those mentioned above are the most common and well known approaches on the way to the definition of the financial innovations presented in the financial literature. However, based on the definition of the financial system the new definition of the financial innovations can be developed. Therefore, this broad definition can describe financial innovations as changes in the functioning and the new solutions and advancements in: (a) financial institutions, (b) financial markets), (c) financial instruments and (d) regulations linked with their activity (see figure 2.1). The interconnectedness of these classes of financial innovations is multidimensional and can be designated as the spiral of innovations (compare: Gubler, 2010, p. 1-49). This means that the new financial organizations develop the new financial instruments (products and services) that are operated in the new financial markets and this new resolution need new conventions shortly. Modifications in the market conditions together with the changes in the legal surroundings escort to the formation of new instruments and then establishment of the new markets and organizations focusing in these new improvements (Błach, J., 2011).



Source*: Note*[1]

Figure 2.1: Financial innovations in the broad and narrow meaning

[1]Reprinted from "financial innovations and their role in the modern financial system identification and systematization of the problem", by Błach, J. (2011), *Financial Internet Quarterly*‘*’e-Finanse”*, 7(3), 13-26".

In a nutshell, to sum-up and conclude the term "financial innovations" can be functional in two meanings (see figure 2.1):

A) The narrow approach of financial innovation states that, the financial innovations are defined as any new advancement in financial instruments (exclusively new instruments, amalgamation of traditional instruments, improvement of traditional instruments, new application of existing instruments, etc.).

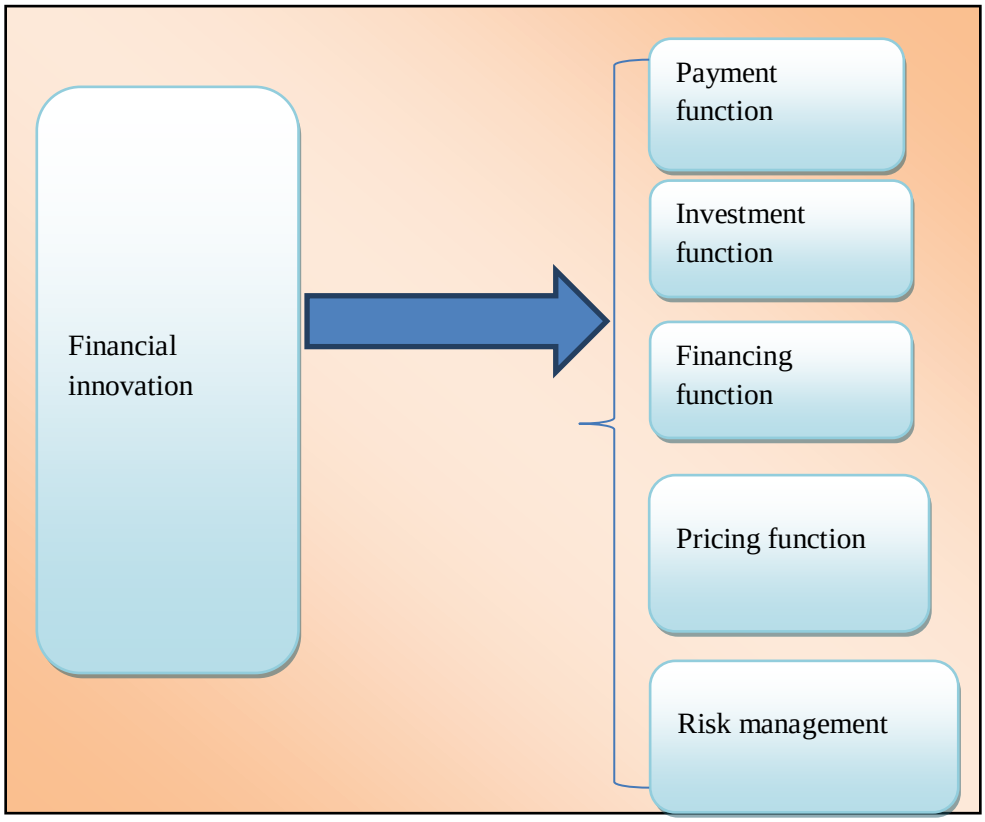
B) The broad approach of financial innovation states that, the financial innovations comprises of any new advancements in any elements of the financial system (markets, institutions, instruments and regulations).

2.1.1 Financial Innovations

Financial innovation has wide classification according to the Economic Council of Canada categorized in to three based on their function. These are three: (a) risk management instruments, (b) market-broadening instruments and (c) arbitraging instruments and processes (see Al-Kaber, 2010, p. 137; Fabozzi and Modigliani, 2003, p. 27). A market-broadening instrument boosts the liquidity of the financial markets thereby improving the availability of funds to deficit units and guarantee access to new investment access to surplus units. Risk management instruments permits the transfer of financial risk to those market participants who are less adverse to it or better prepared to handle with it. Arbitraging instruments and processes permits the accessibility of market participants getting an advantage from differences in costs and returns between markets.

According to Bank for International Settlements (BIS) financial innovations can be categorized in to five groups based on their functions. These are: (a) price-risk transferring, (b) credit-risk transferring, (c) liquidity-generating, (d) credit-generating and (e) equity-generating instruments (Fabozzi and Modigliani, 2003, p. 27). The price-risk transferring presents market participants with more efficient means for dealing with price or exchange rate risk. A credit-risk transferring instrument permits the transfer of risk of default. Liquidity generating instruments can boost the liquidity

of the market thereby enabling deficit units to look for additional sources of funds and gives the opportunity for market participants to avoid unfavorable law convention. While, Credit-generating instruments boosts the amount of debt funds available to the deficit units and finally, the equity-generating instruments provides the access to the additional sources of equity capital. The major functions of the financial innovations can be elaborated as follows: (a) payment function (boosting the liquidity of the financial system), (b) investment function (boosting the variety of investment opportunities better adjusted to the risk-return profile of the investor), (c) financing function (boosting the availability to the sources of funds – either equity or debt capital, both for longer and shorter periods), (d) pricing function (improving the process of assets valuation and risk pricing by the elaborated statistical methods) and (e) risk management function (increasing the possibilities of transferring risk between system participants (Błach, J.,2011).



Source: Own formulation

Figure 2.2: Functions of the financial innovations

2.1.2 Definition and Concepts of Monetary Policy

Monetary policy is the central bank's policy for controlling the availability, cost, and use of money and credit through monetary instruments such as open market operations, bank rates; cash reserve ratios (CRR), and statutory liquidity ratios (SLR), among others, in order to achieve specific goals of boosting economic development in a price-stabilized environment. Monetary policy instruments have an indirect impact on economic activity through their impacts on financial markets. The demand for and supply of reserves held by depository institutions are primarily influenced by policy instruments. As a result, central banks influence the rate of growth of the money supply, the level of interest, security prices, and credit availability in the economy by operating these instruments, affecting investment, consumption, imports, exports, government spending, total output, income, and price levels(Belke, A., and von Schnurbein, B. ,2012)

2.1.3 Financial Innovation and Monetary Policy

The literature on financial innovation continues to evolve as new financial instruments, financial services, and operational approaches enter the market. Only a few studies have focused on emerging countries, despite the fact that the limited research available has mostly focused on the growth of the financial system in industrialized countries. Existing research has looked at the links between financial innovation, monetary policy, growth, and inflation in general, as well as some of the links between specific financial innovation products, macroeconomic variables, and monetary policy transmission mechanisms in particular. This section gives you a quick rundown of some theoretical and empirical research on developing economies (Gramley, L. E., 1982)

The first body of research looks at how electronic money affects the central bank's ability to control the money supply. On this point, the literature is divided, with one school of thought claiming that growing the use of electronic money will make it more difficult for central banks to regulate and measure the monetary base (see

Kobrin, 1997; Friedman, 1999). The other side is more upbeat, believing that anxieties about the future of monetary policy are exaggerated (see Bert, 1996; Helleiner, 1998; Freedman, 2000; Goodhart, 2000; and Woodford, 2000). Helleiner (1998), for example, claims that "new forms of electronic money are unlikely to constitute a substantial threat to the sovereign state's power."

It is likely that financial innovation has the ability of affecting central banks' and monetary authorities' monetary policy decisions. Monetary policy is essentially monetary activity, and the financial sector acts as an interface between central bank policy and the real economy through the monetary policy transmission mechanism. As a result, changes in the structure and environment of financial markets can affect communication mechanisms (Goodhart, C., 1986).

The introduction of electronic payment systems, or more specifically money, is undoubtedly one of the economic innovations that have had a direct impact on the mechanism of money transmission. This rising usage of alternative forms of money may eventually replace traditional forms of money, such as bank demand deposits and other sorts of liquid deposits, altering and in fact bank deposits. Sector activity that weakens the relationship between changes in and undermines the currency transmission mechanism. The decline in reserves held by central bank financial institutions can also result from a decline in demand for traditional forms of money. Increasing the efficiency of interbank transactions as a result of technological advances in payment systems may reduce the obligation of central banks to hold additional reserves for preventative purposes (Donovan, K., 2012).

Indeed, some innovations have the potential to alter the economic response to monetary policy and disrupt the information content of the indicators that central banks habitually monitor and use to make policy decisions. The more easily accessible information becomes as a result of technology advances, the more warped the mediators of the asymmetric information environment become, and the larger the comparative advantage of banks. There are industries where official money and financial statistics (MFS) significantly distort the behavior of monetary sums, but

these operations are not counted in MFS. When implementing monetary policy, central banks may find that the available economic and financial data do not adequately reflect the true state of the economy. Against this background, MFS monetary aggregates need to be redefined to monitor larger aggregates, including liquid equipment (Panetta, F., 2018)

2.1.4 Financial Innovation and Transition Mechanisms of monetary policy

Financial innovation provides profit-seeking institutions with new opportunities. It has an impact on market structure, financial behavior of economic players, and the sorts of financial items sold. This raises doubts about the effectiveness of monetary policymaking. Innovative sources of instability, like as off-balance-sheet activity and the usage of derivatives, can contribute to this uncertainty. The "innovative characteristics of banking and finance invalidates the fundamental presupposition of the Orthodox Quantity Theory of Money to the effect that there is an unchanging "money" item whose velocity of circulation is sufficiently close to being constant: thus, changes in the money supply have a linear proportional relationship to a well-defined price level," according to (Minsky, 1992). He also noted that when financial limitations arose, businesses reacted by innovating. Financial innovation is one way for businesses to keep increasing and securing the amount of debt they can take on. However, as the economy heats up and innovation happens, the policy tools put in place by monetary authorities begin to have a negligible impact on restraining these enterprises' profit-seeking tendencies.

Furthermore, in the paper inside the black box, the author highlights the link between financial innovation and its impact on monetary policy channels in terms of balance sheet operations and profit potential. Because of the changes that have happened as a result of financial innovation, it has been challenging to examine the bank-lending channel. As a result, the credit view's bank-lending channel's effectiveness has decreased. Monetary policy has an impact on "the external finance premium" by "changing the supply of intermediated credit, especially commercial bank loans", (Bernanke and Gertler, 1995). Banks strive to supply credit and "specialize in

overcoming informational issues and other credit market frictions", (Bernanke and Gertler, 1995). As can be seen, banks play a vital role in supplying credit to borrowers, and any disruption in the flow of bank loans might cause borrowers to lose access to credit. "The demand for banks' managed liabilities is not perfectly elastic," Mishkin writes in his report (Bernanke and Gertler1995). "During tight-money periods, when open market interest rates rise, the prime rate climbs even more, and borrowing terms become more onerous," according to his model (Bernanke and Gertler,1995). This link was discovered during a period when monetary policy was restrictive. As a result, the effects of financial innovation may not have been completely accounted for, as additional financial approaches were developed to hedge against interest rate risk and the impact of reserve requirements as the economy grew. "The pattern of interest rate spreads and terms of loan is consistent with the bank lending channel," Mishkin writes in his report (Bernanke and Gertler, 1995). "Financial liberalization and innovation, on the other hand, have reduced the importance of the traditional bank lending channel" (Bernanke and Gertler, 1995).The balance sheet channel appears to have a greater impact since rising interest rates diminish the value of bank securities and deplete bank capital, making it more difficult for banks to get cash and limiting their ability to provide loans (Bernanke and Gertler, 1995). We'll look at how banks' profit objectives lead them to take hazardous actions and take speculative positions. Finally, according to Mishkin, "increasing bank holdings of volatile securities and derivatives instruments may have enhanced the sensitivity of bank lending to interest rates via the balance sheet channel in the United States" (Bernanke and Gertler, 1995).

We've observed before that monetary policy has a greater impact on smaller institutions than on larger institutions. The "agency costs of lending endogenously alter with monetary policy" when monetary policy is implemented (Black and Rosen, 2007). When the Federal Reserve takes a contractionary monetary policy measure, it reduces borrowers' net worth, which raises borrowers' costs and raises agency costs (Black and Rosen, 2007). However, this is mostly a situation affecting smaller businesses and institutions because lenders prefer to invest in less risky businesses

and hence seek out safer alternatives, which are often huge, high-net-worth businesses. Small enterprises are assumed to be riskier than larger firms, but it is important to remember that monetary policy does not constrain the profit-seeking nature of these financial institutions. Small community banks, Minsky claimed, were vital in ensuring economic stability, but monetary policy impacts their lending habits more than giant too big to fail banks, who may easily dilute regulatory regulation through innovation. Smaller banks may also appear to have weaker balance sheets since they have less access to liquidity and limited capitalization, thus they cut the supply of their loans during monetary contraction (Black and Rosen, 2007)."The lending of small banks with illiquid balance sheets should be particularly sensitive to changes in monetary policy because expanding wholesale liabilities is costly for them," according to research using bank size and liquidity to classify institutions (Black and Rosen, 2007). When monetary policy is tight, "banks reallocate their loan supply away from small enterprises and towards large firms," according to the balance sheet channel (Black and Rosen, 2007). This is referred to as an excellent flight. In essence, banks are eager to issue safer loans during a period of monetary tightening since larger enterprises are regarded to be safer than smaller firms with lower net worth and hence greater agency charges. The aggregate bank loan supply is reduced in the bank lending channel during periods of tight monetary policy, but the balance sheet theory claims that the bank loan supply is reallocated from small enterprises to large firms during periods of tight monetary policy (Black and Rosen, 2007). Small businesses are less diversified and have riskier balance sheets, which lowers their net value. In this instance, major banks will prefer to lend to larger businesses.

2.1.5 Definitions and Concepts of Economic Growth

Economic growth is defined as improving a country's ability to create the commodities and services that its citizens want (Peterson, 1988: 612). Todaro and Smith (2003: 793), describe economic growth as the gradual rise in an economy's capacity through time, which increases the country's production and income. Economic growth, according to Gillis et al (1987: 7), can alternatively be described as

an increase in income and products per capita, Gross National Product divided by total population.

However, according to Kuznets (1974: 165, 167-169), economic growth should not be limited to changes in the level of output or income, but should also include major structural changes and, as a result, significant changes in the social and institutional conditions under which the increase in output or income is achieved. In his famous work, he described economic growth as a long-term increase in a country's capacity to deliver increasingly diverse economic commodities to its population, based on improving technology and the institutional and ideological changes that it necessitates.

According to Bowden (1992: 812), economic progress for any country is dependent on the organization and development of a better labor force (better utilization of labor, education, attitudes, skills, and so on) as well as the acquisition of more and better capital (building more power plants, factories, and producing or importing more machines and equipments). Economic growth has traditionally been divided into three categories. These elements include capital accumulation, labor force increase, and technological advancements. Capital accumulation is the process of increasing the stock of capital in an economy, whereas labor force expansion occurs when the population of the economy grows. Improved technology, on the other hand, is defined as the increasing application of new scientific knowledge in the form of inventions and improvements in the physical and human capital sectors.

2.1.6 Monetary Policy and Economic Growth

It’s certain that the major goal of monetary policy focused on the maintenance of domestic price and exchange rate stability in addition to their crucial role in sustainable economic growth and the success of external sector progress. There are theories on economic growth and also on monetary policy which have an effect on the economy. Monetary policy can be defined as those rules and regulations of the top monetary authority such as the national bank of Ethiopia (NBE) and the Federal Ministry of Finance and economic development (MoFED) aimed at adequate control

of aggregate money supply, interest rate and credit availability in order to achieve certain desirable macroeconomic objectives of the government. The major area of focus of the monetary policy relies so much on the relationship between the rates of interest rate and the aggregate money supply. It creates the opportunity to the use of various tools in controlling either one or both variables so as to influence and direct outcome like economic growth, inflation, exchange rates and unemployment. Monetary policy is an important tool of reviving an economy toward a path of growth; hence it has an impact on macroeconomic variables. When we consider about economic growth; reductions of poverty, controlling income inequality, reduction of unemployment etc are important issues put under consideration. Monetary policy has played a role in affecting economic growth that motivates many resource managers (including the governments) to use it foremost among others (Chipote and Makhetha-Kosi, 2014). To the Classical economists, money plays a catalytic role in the real sector or economic activity so money does not matter in an economy as it directly influences on the prices only. Money does not play a role in the economic system and is considered as a veil, i.e., monetary forces have no impact on real income, output and employment in an economy. But, to the classical economist money is determined by labour, capital, state of technology, accessibility of natural resources, and saving habits of the populace among others. Furthermore, the main function of money is to serve as a medium of exchange thereby determines the general level of prices. The assumptions of the classical economists show that the increase in money supply will lead to a direct and proportional increase in price level. The assumption can be elaborated by the Fishers quantity theory causation. Given we have: MV = PT (M =money supply, V = Velocity, P= Price level and T= transaction level. Classical economists consider that the boost in the money supply does not have an impact on the real GDP rather it increases price. This conclusion shows that change in money supply will not change the macroeconomic variables (Hengan, 2005; Mason, 1996; Anyanwu, 1993). However, Keynes asserted that the increase in the money supply influences price but not directly and proportionately which had been contrary to the classical economists. Keynes stress that under the Keynesian Quantity theory of

money, money does play active role in the economic system by affecting the real sector.

Classical economists hypothesize that MV = PT

↑MS → ↑P

↓MS → P↓

Where: MS is money supply; P = Price level.

Keynes hypothesizes that: ↑MS → ↓r → ↑I →↑YON →↑COST → ↑ PRICE.

As shown, the relationship is not direct but money supply affects price through chain of causation, i.e., an increase in money supply (MS) will lead to a decrease in interest rate (r) given liquidity preference thereby an increase investment because of the marginal efficiency of capital (MEC), this will in turn increase income, output and employment through the multiplier effect (k) and in turn leads to increase in cost because of elasticity before increasing the price level (Keynes, 1936). The contemporary monetary policy theory which is the neo-Keynesian focuses on the portfolio adjustment process. When the central bank buys securities in the open market, it sets in motion substitution and wealth effects; given the fact that public portfolio is made up of different types of assets such as bonds, equities, savings, mortgage among others. If the government buys securities through open market operation, it will lead to a rise in prices of securities leading to a fall in its yield,i.e., securities owner sells their assets to the Central Bank because they get more profit. As a result, they have more money than desired which leads to readjustment of portfolio composition so as to lessen their money holdings. The neo-Keynesians argued that financial assets are the closest substitute for money because of these substitution and adjustment effects. This means that increasing the money supply has an impact on economic activity through increasing the output of capital goods industries. According to the monetarists excess money balances are employed to obtain both financial assets and real assets like houses, land, and consumers' durables among others. Consequently, whenever the Central Bank purchases securities, their

values rise, their yields fall, and demand for financial and real assets rises. As a result when the demand increases, their value increase, and the rise in the values of real assets encourages production which on the other hand increases the demand for resources required for their production. Apart from this the demand for services also rises with increase in the prices of real assets. An expansionary monetary policy through its substitution effect boosts the demand, prices and spending for financial and real assets and services.

According to classical economist, money supply has a major impact on price however Keynes explains that the transmission effect of money supply and associated changes in other macroeconomic variables and repositioning output, income, employment and price using their causation effect. The neo-Keynesian model extended this by adding the modification and adjustments on the portfolio during monetary policy action by the monetary authority. Execution of monetary policy, such as buying securities, impacts on the financial and real assets, according to the monetarists. This implies that monetary policies (both expansionary and contractionary) have an impact on both financial and real assets. Classical economists believe in full employment of resources, and as a result, any change in the money supply has a direct impact on price. Monetarists, on the other hand, agree with Keynes that the economy does not operate at full employment in the short run, and have concluded that expansionary monetary policy is beneficial in the long run. Therefore, monetary policies (both expansionary and contractionary) indirectly impacts economic growth and finally prices, according to Keynes.

2.1.7 Financial Innovation and Economic Growth

Innovation is a necessary component of economic progress since it introduces new notions, procedures, and explanations for existing problems. Most importantly, it improves the organization's competitiveness and generates greater value. It is defined as all financial, high-tech, methodical, and profit-making activities that are required to build new markets with value-added financial resources (OECD, 2004). Innovation encompasses not just the creation of new items, but also actions that serve as

remedies to economic problems (Kotsemir and Abroskin, 2013). According to McGuire and Conroy (2013), financial innovation improves the value of financial products and services, capital accretion and allocation practices (Allen, 2011; Uddin, Rahman, and Quaosar, 2014), financial development practices (Ozcan, 2008), and the effectiveness of financial organizations (Allen, 2011; Uddin, Rahman, and Quaosar, 2014). As a result, financial organization competency has an impact on financial development through improved transaction methods that speed up international and national trade (Sabandi and Noviani, 2015). Institutional innovation accelerates the process in the financial system, with developments such as mobile and internet banking services (Hargrave and Vandeven, 2006; Raffaelli and Glynn, 2013), NGOs, microfinance organizations, and high-tech organizational procedures (Hargrave and Vandeven, 2006; Raffaelli and Glynn, 2013). All of the innovations expand the economy by inclosing individuals in the course of economic improvement (Glaeser, Porta, Lopez-de-Silanes, and Shleifer, 2004; Siddiqui and Ahmed, 2009). The existing literature shows that there is a strong relationship between the development of the financial sector and economic growth (Ndlovu, 2013; Sunde, 2013; Asghar and Hussain, 2014; Comin and Nanda, 2014; Duasa, 2014; Jedidia et al., 2014; Khoutem, Thouraya, and Kamel, 2014; Kyophilavong, Uddin, and Shahbaz, 2016). This relationship exists because of the proficient system permits the efficient utilization of economic resources. Financial innovations are not new ones, as they have been convoying high-tech innovations from the establishment (Laeven, Levine and Michalopoulos, 2015). It is usually recognized that technical and financial changes are inevitable, and they grow over time. On the one hand, financial innovation provides a tool for investing in high-tech projects when traditional resources are unavailable due to risk. Financial markets, on the other hand, promote adjustments with different types of risk factors in this system, and to be reformed according to market requirements as high-tech and economic development lead to more major complexity of company practices. This means that without financial advances, high-tech and economic advancement would stagnate, and nation-state wealth would plummet. This form of innovation introduces and promotes new financial institutions, devices, and technologies to the system (Sood and Ranjan, 2015).

Different advances, such as the development of the capital market and the banking sector, can help the financial industry to improve. Through efficient resource distribution, capital production, and the establishment of arelationship between deficit and surplus divisions, the efficient capital market and banking sector contribute to economic expansion (Ndako, 2010). According to Adusei (2013), well-structured financial organizations and capital markets are critical for acceptable ecological improvement since they allow for productive investment (Mhadhbi, 2014; Orji, Ogbuabor, and Anthony Orji, 2015). All of these have a substantial impact on economic growth; nevertheless, financial success has a significant impact on economic conditions (Adusei, 2013). According to Uddin, Kyophilavong, and Sydee (2012), the development of financial expansions could be a source of economic progress and also aid in poverty reduction. The growth of markets is viewed as a method of making efficient use of financial resources (Kerr & Nanda, 2014).

2.1.8 Monetary Policy Development in Ethiopia and the Financial Sector

The explanations of monetary policy transmission range across schools of thought and identify a variety of different channels of monetary policy transmission mechanisms theoretically. Monetary policy changes are directly transferred into price movements, according to the classical quantity theory of money. Monetarists, lead by Milton Friedman, believe that money is important and that monetary policy is communicated through interest rates, exchange rates, or both. Early Keynesians argued against the effectiveness of monetary policy, believing that it operates through bank lending and balance sheet channels. Again, the medium school (Real business cycle) regards money as neutral, i.e., they do not believe that money is unimportant, nor do they reject the impact of monetary policy on the economy. They contend, however, that there is reverse causation between other significant economic factors like asset price and money supply (Meltzer, 1995). The monetary policy transmission mechanism, according to Mishkin (1995), includes interest rates, currency rates, asset prices, and credit channels.

In Ethiopia, monetary policy was started in 1963, in accordance with the establishment of the National Bank of Ethiopia (NBE) by proclamation 206 of 1963. After the fall of the imperial empire, the country became a communist dictatorship (1974-1991). The central bank previously exercised strict control over monetary variables like as interest rates, which were intended to limit private sector engagement in the economy. With the change of administration in 1991, the country's political economy underwent significant changes.

Now a days the central Bank is aiming to achieve three key goals: maintaining price and exchange rate stability, fostering a healthy financial system, and performing other functions that are beneficial to Ethiopia's economic progress. Three objectives are included in the country's monetary policy framework. The ultimate goal is to maintain price and exchange rate stability while also supporting the country's economic growth; the intermediate goal is to keep the money supply growing at a rate that matches the nominal GDP growth rate; and the short-term goal is to keep the money supply growing at a rate that matches the nominal GDP growth rate. An operational target is the growth of base money, often known as reserve money (NBE, 2009). To attain its goals, the NBE is now using a variety of monetary policy instruments. Open Market Operations (OMO), Standing Central Bank Credit Facility, Reserve Requirements, Setting Floor Deposit Rates, Direct Inter-Bank Borrowing or Lending Mechanism, Credit Control, and Moral Suasion are some of NBE's monetary policy measures. The bank employs these instruments either singly or in combination, depending on the policy goal to be met (NBE, 2009).

According to the National Bank of Ethiopia (2017/18), Ethiopia had 17 insurance firms with a total of 352 branches. All insurance businesses, with the exception of the Ethiopian Insurance Corporation (EIC), are privately held. The remaining capital, which was held by private insurance businesses, was preserved by the Ethiopian Insurance Organization, a single publicly owned corporation. Addis Ababa is home to 53.6% of Ethiopia's insurance branches. As of June 2017, 35 Ethiopian National Bank-approved microfinance companies have served over 2.3 million customers and disbursed about 7 billion Birr in loans. In addition, they saved over 3.8 billion Birr.

2.2 Review of Empirical Literature

2.2.1 The Relationship between Financial Innovation and Economic Growth

A well-organized financial system, which includes instruments, institutions, financial markets, and regulations, is a prerequisite for a modern economy (Mannah-Blankson& Belnye, 2004). Efficient financial intermediation promotes economic growth by facilitating trade finance and reducing investment risk through diversification (Cheng &Degryse, 2014; Shittu, 2012). The association between financial innovation and economic growth has little empirical proof.

Product innovation, regional gross domestic product, investment, and total savings all have a positive association, according to Valverde et al. (2007). By stressing the dynamic role of financial innovation in the development of economic growth, Laeven et al. (2015) constructed a model in which financial and technology industrialists interact to influence economic progress. They discover that organizations, regulations, conventions, and methods that stifle financial innovation stifle technological advancement and economic prosperity.

Only a few empirical studies have examined the relationship between financial innovation and economic growth in developing nations. The negative association between financial innovation and economic development in the long run, but a favorable relationship in the short run was revealed by works of Idun and Aboagye (2014).Not only this they also show the bidirectional causality between them.

Financial innovation, according to Mwinzi (2014), has a large and favorable impact on economic growth. Financial intermediaries play a significant part in the growth process by moving financial capital from net savers to net borrowers, thereby persuading investment and hence economic development, according to the theoretical point of view of financial intermediation.

Time series analysis, such as Granger-type causality tests and vector autoregressive equations, has also been used by certain academics to investigate causation. Though

the results of some of these researches on causality are equivocal, the majority of them show that financial development leads to stronger growth. Using a VAR analysis, Xu (2000), disproves the idea that finance simply follows growth. Similarly, Chritopoulous and Tsionas (2004), show that there is a causal relationship between finance and growth using panel data.

King and Levine (1993a), discovered that there is a positive association between financial indicators and growth, and that financial development is significantly correlated with subsequent rates of growth, capital accumulation, and economic efficiency, supporting the supply flowing theories. They accurately point out that policies affecting the efficiency of financial intermediation have a first-order impact on growth.

The supply flowing concept has been supported by the majority of African country studies (Ghali, 1999; Bolbol et al. 2005; Abu-Bader and Abu-Qarn, 2008; Kargbo and Adamu, 2009; Abdelhafidh, 2013, Odhiambo (2002 and 2009c)). Ghali (1999), used two metrics of financial development to determine whether finance helps to economic growth in Tunisia (the ratio of bank deposit liabilities to GDP and the ratio of bank claims on the private sector to nominal GDP). The findings showed that there is a long-term consistent relationship between financial development and per capita real production, with a causation that goes from finance to growth.

Odhiambo (2002), investigated the effects of financial reforms and savings on Kenya's economic progress. Using a dynamic model, he discovered that the more appealing financial services are, the greater the investment and, as a result, the higher the growth rate. As a result, he came to the conclusion that finance leads to growth. Finally, Odhiambo (2009c), set out to see if financial development in Kenya as a result of interest rate liberalization leads to economic growth. He discovered that interest rate reforms promote financial development, which has an impact on economic growth in both the short and long run.

For the period 1970–2008, Kargbo and Adamu (2009), looked at the relationship between financial development and economic growth in Sierra Leone. Their findings

support the theory of finance-led growth. They also demonstrate that investment is a critical route via which financial development feeds economic expansion. Al-Awad and Harb(2005), use a panel co-integrated analysis to look at the relationship between finance and growth in 10 southern and eastern Mediterranean countries (SEMCs) from 1969 to 2000. The findings suggest that finance and growth have a long-term relationship.

Using an ordinary least square regression approach, Ndebbio (2004), finds that financial sector development has a minor impact on per capita growth in Nigeria. He blamed the outcome to a lack of well-functioning capital markets and shallow finance. According to Nnanna (2004), banking sector development in Nigeria had no substantial impact on per capita growth. Nzotta and Okereke (2009), found that financial deepening did not promote Nigerian economic growth.

Afangideh (2009), on the other hand, discovered that a developed financial system alleviates growth financing limitations by expanding bank lending and investment activity, resulting in an increase in production. Agu and Chukwu's findings differ significantly from those of other Nigerian researchers. They employed the augmented Granger causality test to establish the direction of causality between financial deepening and economic growth in Nigeria between 1970 and 2005. Depending on the financial deepening variable chosen, the findings indicate evidence to support both demand- and supply-leading models.

Mwinzi (2014), found that financial innovation has a considerable, beneficial impact on economic growth in Kenya. According to the findings, mobile transactions have a significant impact on economic growth. Financial innovation has been linked to money demand (Kasekende and Opondo, 2003; Mannah-Blankson and Belnye, 2004) and savings (Mannah-Blankson, and Belnye, 2004). Ansong, Marfo Yiadom and Asmah(2011), financial innovation has been shown to have a favorable association with money demand or saving in research.

Sibindi and Bimha (2014), looked into the banking sector's development and economic growth, whereas Jecheche (2011), looked into the stock market and

economic growth. There have been no studies that have sought to evaluate the association between financial innovation and economic growth. Sibindi and Bimha (2014), established a long-run association between economic growth and banking sector development using broad money (M2) to GDP as a proxy for banking development. Tyavambiza and Nyangara (2015), discovered a strong negative influence of money supply on economic growth using liquid liabilities (M3) as a share of GDP. Granger causation from money supply to economic growth was discovered which is unidirectional.

2.2.2 The Relationship between Financial Innovation and Monetary Policy

Arrau and De Gregorio (1993), examined the money demand equations in Chile and Mexico. There is an important permanent component in the demand for money not captured by traditional variables but by financial innovation as the result revealed, which is modeled as an unobservable shock with long-term implications on money demand. Viren (1992), empirically examined the relationship between financial innovations and currency demand. The results revealed that credit card transactions have a strong offsetting effect on currency demand.

A comparable research done by Al-Sowaidi and Darrat (2006), investigated the effects of financial innovations in Bahrain, the UAE and Qatar on the long-run money demand. Despite the rapid speed of financial innovation in the three countries, the study found no undue shifts in the equilibrium money demand relationship. The findings were robust to the measure of the money stock narrow or broad.

Cho and Miles (2007), found a downward trend in velocity in Korea, which was attributed to monetization of the economy. As payments systems evolve or cash management improves, it is predicted that velocity should boost over time. Financial liberalization permits greater interest to be paid on many categories of money and may allow agents to reduce cash amounts. The underlying rationale in the perverse sign found in the Korean case is based on the notion that as income rises, so does the willingness to hold M2. The coefficient of real GDP was more than one, implying that the Korean economy is highly monetized.

Sichei and Kamau (2012), conducted a similar analysis using Kenyan Data. They measured financial innovation by using the number of ATMs as a proxy. Their finding revealed that there is no significant effect of innovations on the demand for money. However, this study only looked at one type of financial innovation, which is also not widespread across the country. While recognizing that the data for alternative more inclusive measures like M-Pesa may not have been available and sufficient in terms of observations to allow reasonable empirical study, the authors did not look into other financial innovation metrics that have been studied previously. They did, however, show the insecurity of money demand after 2007. This instability was also demonstrated by Weil et al., 2012.

Wegayehu Tsegaye(2021), examined the impact of financial innovation on money demand in Ethiopia by using VECM estimation method by taking the ratio of broad to narrow money supply and credit provided to the private sector by banks as percentage of GDP for financial innovation proxy variable. The empirical findings of this study revealed that, when utilizing the VECM coefficient estimate approach, financial innovation has a positive, but not significant, association with both short and long run money demands. However, incorporating financial innovation into money demand functions challenges Ethiopia's well-defined money demand specifications.

Despite the availability of studies in both developing and developed nations, Ethiopian literature is scarce. Alemayehu (2011), used a VAR methodology to examine the monetary policy transmission mechanism in Ethiopia using quarterly data from 1970 Q3 to 2004 Q2 and discovered that monetary aggregate and credit channels as the best channel, while exchange rate channel not operate in Ethiopia. Nuru (2009), found effective direct monetary aggregate and exchange rate channels, weak credit channel, and inactive interest rate channel using the same methodology and quarterly data from 1998 Q3 to 2010 Q2. This indicates, inconsistency in terms of the findings they have. Furthermore, the existing studies of Ethiopian monetary policy transmission mechanism used VAR approaches that only include domestic monetary policy and non-policy variables.

2.3 Conceptual Framework of the Study

Based on the literature review above, the conceptual framework for this study is shown in figure (2.3) below. This study run a Granger causality test based on our understanding of previous empirical studies to examine the directional causality between variables. The following six hypotheses are put to the test. Furthermore, the causality among financial innovation, monetary policy, economic growth along with the other macroeconomic variables shown as follows:

A. Financial innovation Granger-cause macroeconomic variable and vice versa.

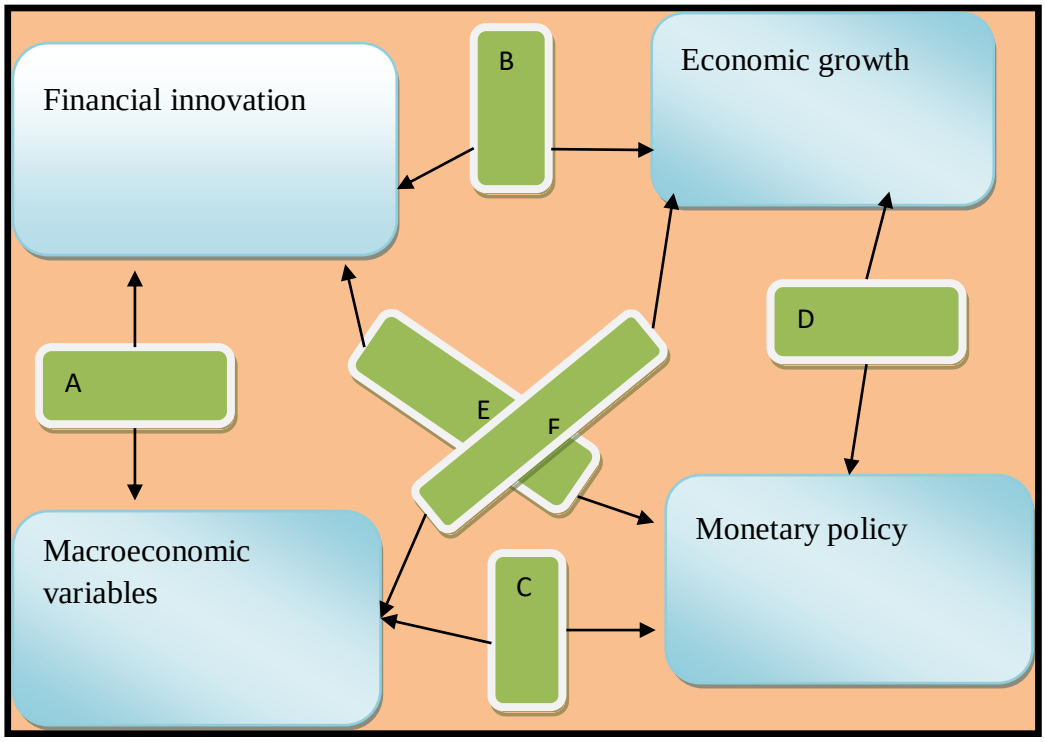
B. Financial innovation Granger-cause economic growth and vice versa.

C. Macroeconomic variable Granger-cause monetary policy and vice versa.

D. Monetary policy Granger-cause economic growth and vice versa.

E. Macroeconomic variable Granger-cause economic growth and vice versa.

F. Financial innovation Granger-cause monetary policy and vice versa



Source: Own formulation

Figure 2.3: Conceptual framework of the study

Key:

- Financial innovation(captured by M2/M1 and DCPS)
- Monetary policy (Captured by EXR and IS)
- Economic growth (RGDPPCGr)
- Macroeconomic variables(explanatory variables: GFCF,GEX,CPI,TOP)

CHAPTER THREE: ANALYSIS OF FINANCIAL INNOVATIONS, MONETARY POLICY AND PERFORMANCE OF ECONOMIC GROWTH IN ETHIOPIA

3. Economic Performance of Ethiopia; an Over View

3.1. Introduction

How governments manage their macroeconomic environment has a huge impact on the well-being of economic players in a given economy. Internal and external balances are the two most important goals that policymakers strive for in macroeconomic management. Internal balance is the government's goal to achieve rapid income growth while maintaining stable prices, whereas external balance is primarily to ensure balance of payments stability. It has proven difficult to achieve both of these objectives at the same time. According to various researchers, growth and inflation are mutually exclusive. Empirical studies have been undertaken to support and refute these claims. In Ethiopia, both of these trends have lately coexisted. Public image problem is the one that Ethiopia has faced. For decades, just the word of the nation evoked visions of starvation and violence. A new Ethiopia is rising from adversity, and the International Monetary Fund (IMF) predicts that Ethiopia will be the fastest-growing economy in Sub-Saharan Africa in 2018. According to the IMF World Economic Outlook, growth in 2018 would be 8.5%, substantially above that of advanced nations. As a result, it's critical to comprehend the factors at work behind these macroeconomic shifts. As a result, this chapter examines macroeconomic overview in Ethiopia in different régimes.

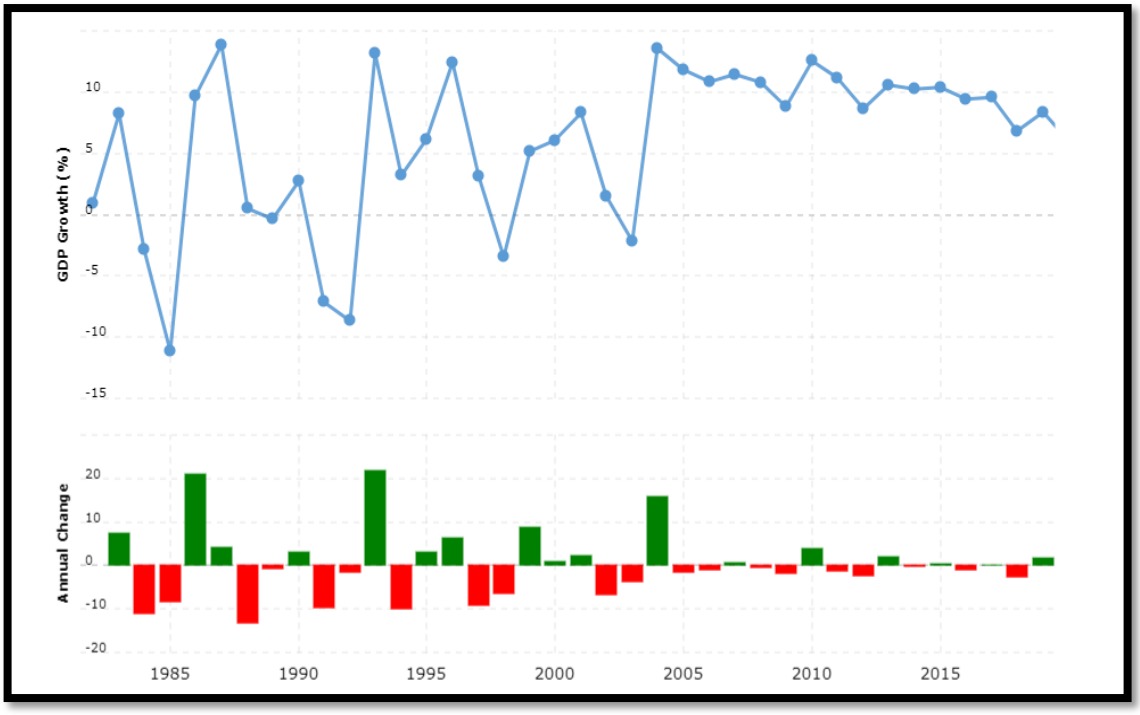
3.2. Economic growth

Ethiopia passed three policy transitions, the imperial regime prior to1974, the Derg (socialist) regime post 1974 and the EPRDF regime post 1991onwards. The three different regimes each have exclusive economic policies and political view having unique impact on macro-economic performance of the country.

The ‘Imperial Regime’ of emperor Hailesillassie I, which is in between 1930-1974, made an attempt to modernize the country through the expansion of modern schools

and health facilities, the promulgation of a constitution, the development of infrastructure, and the beginning of medium-term planning. The regime's political process was unpredictable and violent, that has detrimental/negative impact on the macro performance of the country, and follows a market-based economic policy. The regime of derg follows centralized economic system spanning from 1974/75-1990/91. During the reign regime of the socialist, government intervention in all types of economic activities and nationalization of all types of property lead to failures of the total economy. After the collapse of the derg regime in 1991/92 onwards, the new government (EPRDF) liberalized the economic system. During the regime of EPRDF relatively good economic performance has been registered though its experienced fluctuations.

Ethiopia's economic growth pattern is not only diversified, but also changeable. An investigation of the trends in economic growth reveals a very obvious irregularity, which is the result of consecutive natural and external shocks, given that the majority of the population is dependent on rain-oriented primitive agriculture.

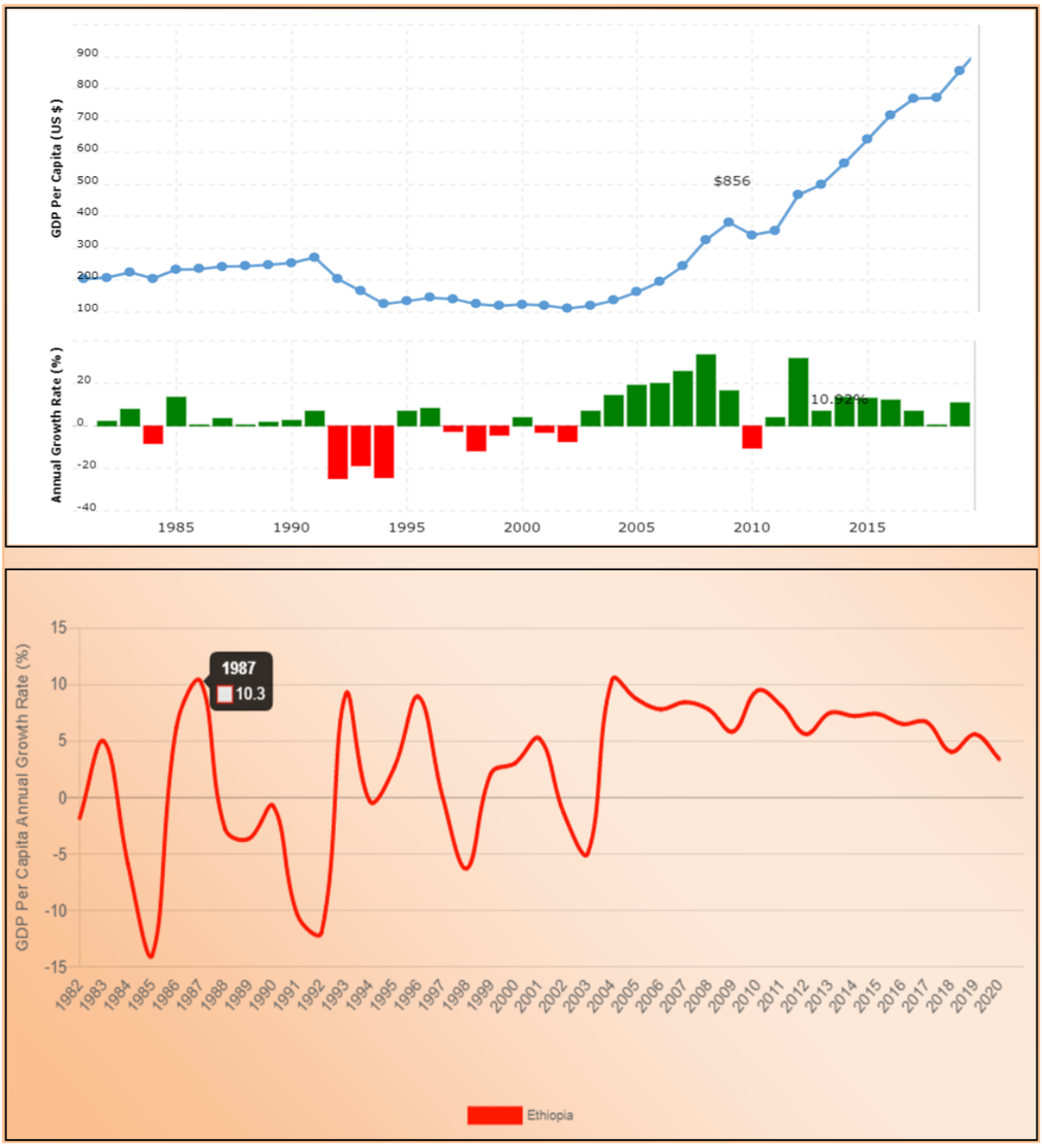


Source: world Bank

Figure 3.1: Trends of Ethiopian GDP growth rate from 1980-2018.

As shown in figure (3.1) the Ethiopian economy performed relatively well between 2004 and 2015,which is registering average GDP growth rate of 13.59 in 2004 and 10.39% in 2015. The peak growth of the period was 13.86% in 1987 and the lowest was registered in 1985 which was -11.14%. The high growth of 1987 is mainly due to the following factors: high growth in agriculture, low inflation and the negative growth in 1985 which served as a lower base or recovery. The fluctuation in the level of output most probably is natural factors, though policies might as well have been important to a lesser degree. Ethiopia GDP growth rate for 2017 was 9.56%, a 0.13% increase from 2016, and GDP growth rate for 2018 was 6.82%, a 2.75% decline from 2017.

Relatively, the growth performance after the reforms spearheaded by the EPRDF has also been moderate and volatile, because of the early periods of political instability and continuous drought because the agricultural sector is highly rain dependent (dependent on nature).



Source: World Bank

Figure 3.2: Trends of Ethiopian GDP per capita[2] and trends of GDP per capita annual growth rate[3]

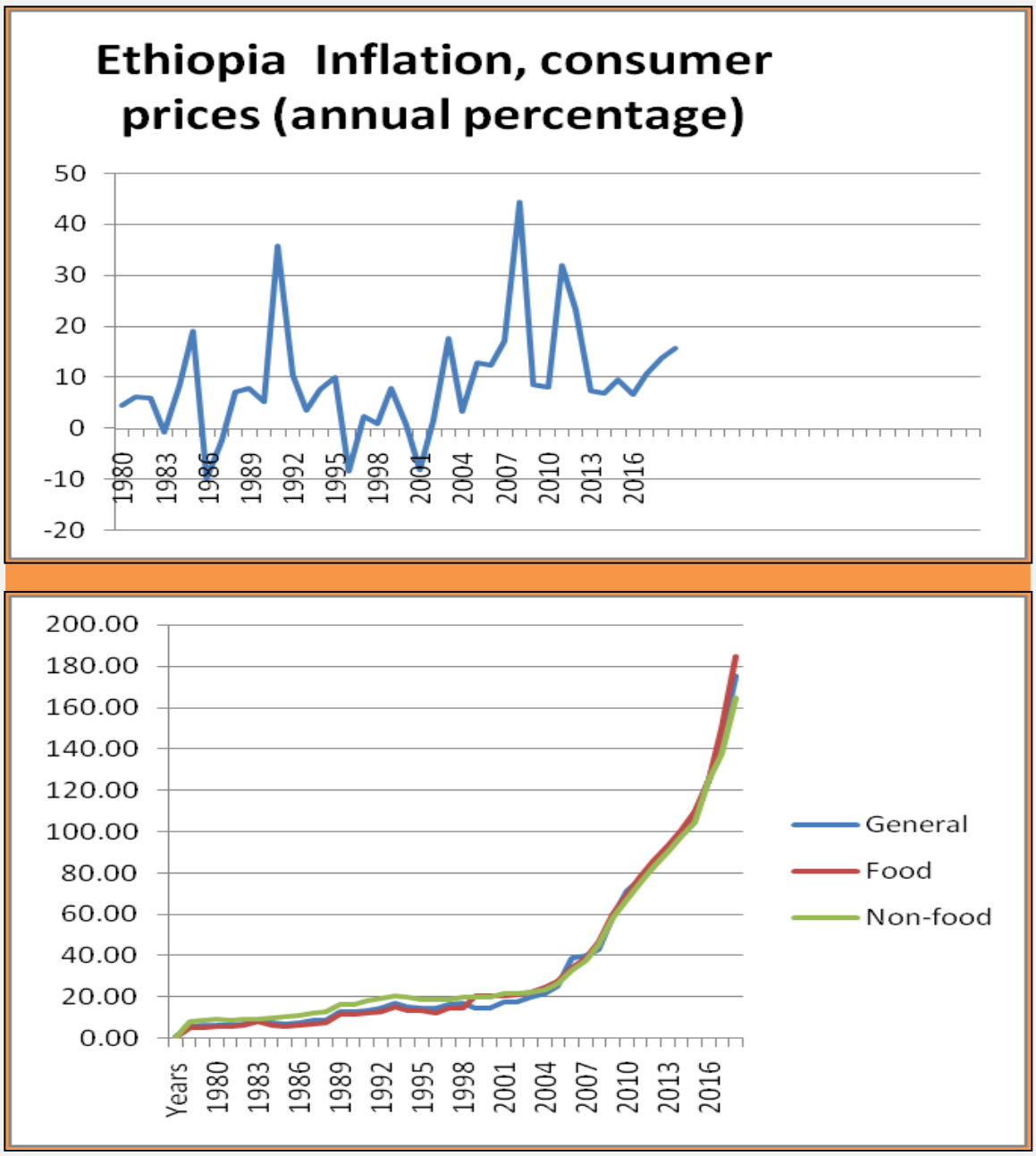
[2] Trends of Ethiopian GDP per capita (the top figure) and

[3] trends of GDP per capita annual growth rate(the bottom figure)

As shown from the figure (3.2) the Ethiopian economy performed relatively better in 1987 registering GDP per capita annual growth rate of 10.3% and 10.4% in 2004 which is after the EPRDF comes to power. In the recent 2018 the Ethiopian GDP per capita annual growth rate was 4.1% a stable decrease starting from 2013. The peak GDP per capita of the period was 10.4% in 2004 and the lowest was registered in 1985 which was -13.9% and -11.9% in 1992 as shown in the figure (3.2) above. The high growth of 2004 is mainly due the stable population growth. During the derg regime a comparatively peak GDP per capita was registered in 1987 which is 10.3%. The Ethiopian GDP per capita for 2018 was $772, a 0.39% increase from 2017 and GDP per capita for 2017 was $769, a 7.17% increase from 2016. As we can see the percentage increase in different periods was fairly well and stable GDP per capita improvement after the reforms made spearheaded by the EPRDF.

3.3. Country Level General Consumer Price Index and Its Components

According to Fisher (1996), inflation can be used to gauge macroeconomic stability. This could be related to the fact that maintaining macroeconomic stability in a system where the general price level is always rising is extremely challenging. In Ethiopia, price increases were primarily linked to decreases in output (particularly agricultural harvest), and years of high production were accompanied by price decreases.



Source: Own computation

Figure 3.3: Trends of Ethiopian inflation, consumer price (% annual) and the trends of consumer price index and its components from 1980-2018

Non-food inflation rose by 2.1 percentage points to 9.2% over the same time period. Similarly, headline inflation jumped to 14.7 % in 2017/18 from 8.8 % the previous year, thanks to a 6.7 percentage point increase in food and non-alcoholic beverage inflation and a 4.9 percentage point increase in non-food inflation. Annualized food and nonalcoholic beverage inflation increased to 17.9% and 11.0%, respectively, from 11.2 % and 6.1%.

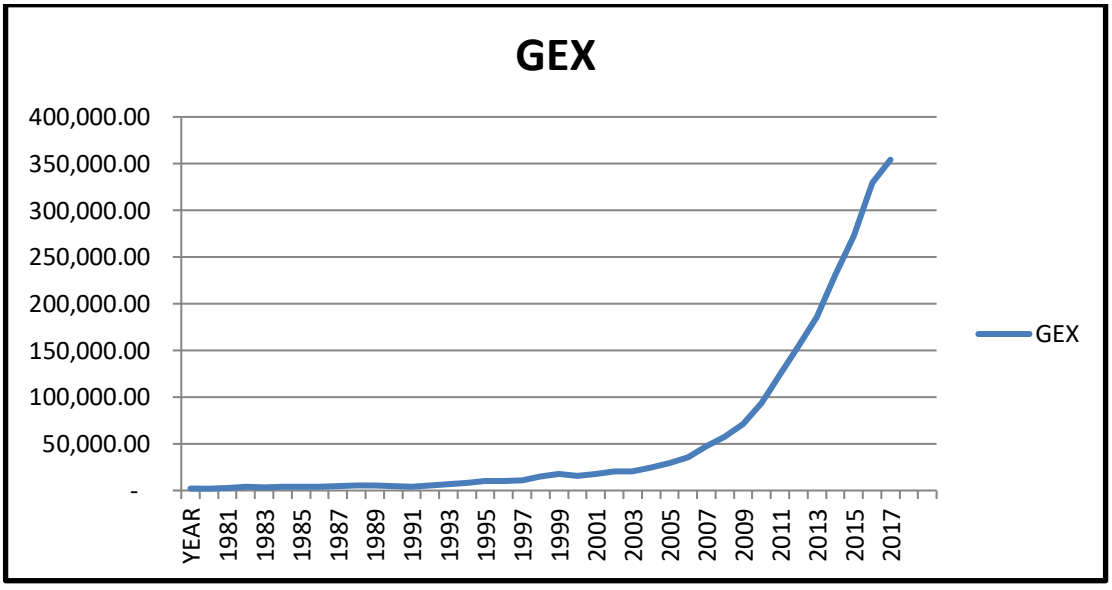
Since August 2017, inflation has relapsed and has remained outside the National Bank of Ethiopia's single-digit policy objective. According to a data released by the Central Statistical Agency (CSA), average year-on-year inflation in January 2018 was 13.4% higher than in January 2017, owing to price increases in both food and non-food products. In the same month, food inflation increased by 18%, owing to price increases in commodities such as bread and cereals, fruits and vegetables, meat, and food products. Food prices are rising despite the fact that the harvest season is supposed to bring them down. Non-food inflation has been reasonably constant at 8.4%. In Ethiopia, inflation has not decreased since February 2016 and increased after 2016. Inflation is frequently used as a measure of a country's macroeconomic stability. The main driver of inflation in Ethiopia is regarded to be a macroeconomic imbalance between demand for and supply of products, as well as low agricultural output. Price pressure is also thought to be exerted by broad money expansion and the depreciation of the Birr against the US dollar.

3.4 Fiscal developments

Governments may aim to affect the trajectory of economic activity through fiscal, monetary, and/or exchange rate policies in order to achieve the most important macroeconomic objectives of internal and external balance. Fiscal and monetary policies are the most important tools available to policymakers in most developing countries with fixed exchange rates. Fiscal policies (income and expenditure policies) are used by governments to try to influence macroeconomic activities.

3.4.1 Trends in public expenditure

Over the last decade, Ethiopia's remarkable socioeconomic transformation has been marked by: a shift in expenditure from recurrent to capital; a significant devolution of resources from the Federal Government to Regions; and a clear prioritization of infrastructure spending, while maintaining education spending at 4% of GDP. Ethiopia's government has also increased investment in pro-poor areas, including health and social protection. As a result, Ethiopia boasts Africa's largest social safety net program and has achieved remarkable health outcomes through the use of cost-effective approaches. Recent capital investments have resulted in a significant increase in capital stock, with capital spending at the sector level showing increased service capacity. In order for increasing expenditures to translate into enhanced service coverage and delivery, the existing public investment-led strategy must be reinforced by increased budgetary resources for operations and maintenance. As Ethiopia seeks to become a middle-income country, and the changing global climate suggests that external assistance will be reduced, domestic taxing efforts must support this transition.



Source: Own computation

Figure 3.4: Trends of Ethiopian public expenditure

From the figure (3.4) total general government expenditure was Birr 354.2 billion, up 7.6% from the previous year, due to a 19.1% increase in current expenditure in 2018. Current spending was 210.5 billion Birr, and its proportion of total expenditure was 59.4%. Capital spending was Birr 143.7 billion, a 5.8% yearly drop, and a 40.6% share of total expenditure.

3.5. Monetary developments

3.5.1 Money supply[4] and domestic credit [5]

The major weapon utilized by governments to implement stabilization measures is the money supply. Changes in the money supply have an impact on growth, unemployment, and inflation. The government's influence over the money supply is limited due to the underdevelopment of the money market and the virtual absence of a financial market; yet, commercial banks and the general public have a role in influencing money supply.

Ethiopia has had an economic monetary policy since the formation of the state bank during the imperial period. In 1963, Proclamation No. 206 established the Ethiopian National Bank. The bank, on the other hand, was restored in 1976 by Proclamation No. 99, with a monetary and banking role consistent with the socialist economic principles of the country. Ethiopia was ruled under a centrally organized command regime for more than two decades (1974-1991). During this period, the government tightly controlled macroeconomic variables such as interest rates, exchange rates, and the pricing of important products.

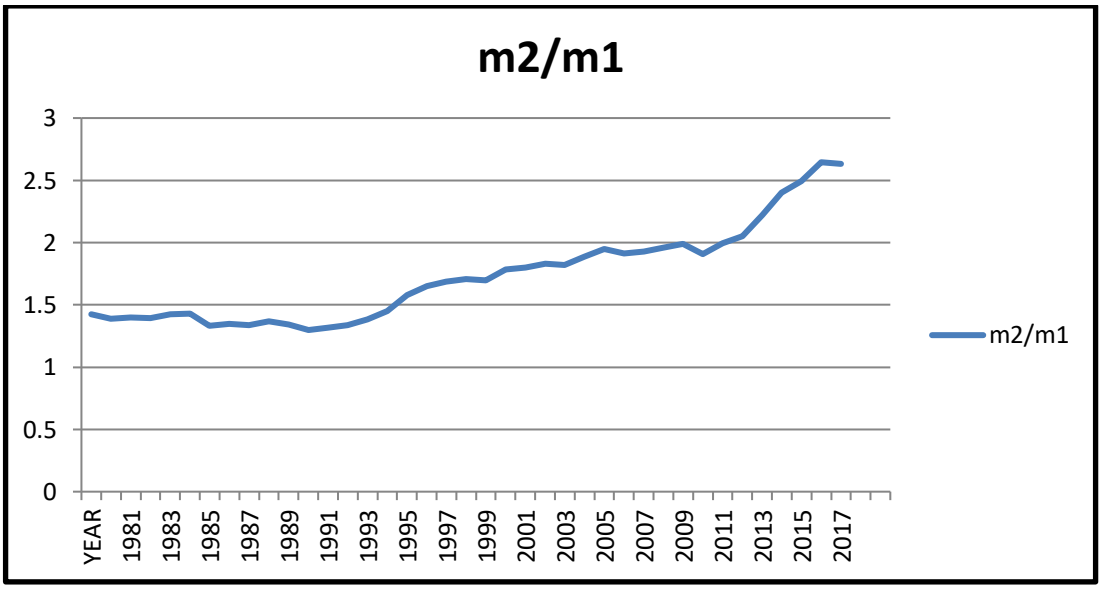
As a result of this, there was a macroeconomic imbalance and low economic performance. The EPRDF established a liberal economy system after the overthrow

[4]Narrow money (M1) includes currency in circulation and demand deposits while broad money (M2) includes (M1), savings deposits and time deposits. Official M2 data excludes loans from microfinance institutions as well as credit from DBEs. I included credit from microfinance institutions in my calculation of money supply (M2) growth.

[5]Domestic credit to the private sector refers to financial resources supplied by financial corporations to the private sector in the form of loans, purchases of non-equity securities, trade credits, and other accounts receivable that create a claim for repayment.

of the Derge dictatorship in 1991. From 1989 until 1991/92, broad money grew at a rate that was much faster than yearly nominal GDP growth. Despite the negative interest rate on deposits, quasi-money (interest-earning deposits) increased on average, showing that the private sector was compelled to save as a result of policies that reorganized private spending.

The economy's liquidity expanded by 28.9% in fiscal year 2017/18, reaching 573.4 billion Birr. Broad money expansion has been encouraged by increases in both domestic credit and international assets. Domestic credit increased by 28.7% over the previous fiscal year. Currencies in circulation and demand deposits have both climbed by 10.8 and 27.6%, respectively. As a result, narrow money has grown by 21.4%. Savings and time deposits increased by 35.2% and 27.3%, respectively. During this fiscal year, both the National Bank of Ethiopia and commercial banks saw a growth in foreign assets. The value of foreign assets has surged by 76.7%. It was, however, rebound from the severe drop of the previous two years (NBE, 2017/18).



Source: Own computation

Figure 3.5: Trends of money supply in Ethiopia

According to figure (3.5) broad money supply has expanded at a quicker rate than narrow money supply across the study's time frame. Not only has the money supply increased through time, but so have the growth rates of M1 and M2. M2 grew at a quicker rate than M1 over the most of the 1980-2018 period due to faster increases in savings deposits. The decline in saving deposits in 2006/07 corresponds to a decline in the growth rate of M2 below M1, indicating the relevance of savings deposits in the money supply. M2/M1 ratios have been steadily increasing, with significantly higher growth in 2002/03 (due to the drought that year) and after 2015/16 (due to rapid money supply growth).

3.5.2 An Overview of the Conduct of Exchange and Monetary Policy in Ethiopia

As the country's central bank, the National Bank of Ethiopia (NBE) is responsible for maintaining the stability of the exchange rate of the Birr, the country's legal tender currency, versus other currencies. As a result, when the Ethiopian Birr was pegged to the US dollar in the 1970s and 1980s, the NBE utilized to maintain the Birr's exchange rate steady by making foreign money available to the market at a fixed rate.

Following the inception of the auction system on May 1, 1993, and the subsequent replacement of the auction system by the daily interbank foreign exchange market in October 2001, demand and supply variables were given more leeway in determining the exchange rate. As a result, the NBE has attempted to maintain the exchange rate constant through government interventions, primarily by changing the quantity of foreign currency given to the market. Changes in the NBE's exchange rate and reserve holdings reflect pressures in the foreign currency market as a result of these factors.

IMF's financial programming plan (IMF) is the basis for Ethiopia's monetary control approach. This incorporates based on predicted GDP growth and targeted inflation, establish a ceiling for money supply growth as well as a floor for international reserves and ceilings for the National Bank of Ethiopia's net domestic assets and net domestic government funding.

Finally, the National Bank of Ethiopia controls the supply and demand for money through a combination of direct and indirect monetary policy methods. Setting a floor rate for savings and time deposits, credit ceilings on government borrowings from the banking system, reserve requirements, and open market activities, including the selling of Treasury Bills, are examples of these.

When it comes to Ethiopian currency rate trends and performance, the Ethiopian birr (ETB) has been falling in value for several years up to now. During the socialist era (1973/74 to 1991/92), the currency was kept at a steady exchange rate of $1 USD to 2.07 ETB. The most major exchange rate overshooting happened in 2010/11, when the ETB birr lost 19.98% of its value (exchange rate increased from 12.89 to 16.11). See the exchange rate trend summary (see more Appendixes I)

The birr/USD rate was fixed at 2.5 from 1945 to 1971, but was revalued to 2.3 in December 1971, then to 2.07 in 1973, and remained the same until October 1992. During the ruling regime of the EPRDF dominating Ethiopia, particularly in 1992/93, in order to tackle concerns linked to the fixed exchange rate, the Ethiopian currency was devalued by 51.5%. Furthermore, from 1992/93 to 2002/03, the ETB lost nearly all of its worth. From 2002/2003 to the present, Ethiopia's currency has depreciated dramatically; the birr has lost about 150% of its value. In October 2017, the National Bank of Ethiopia (NBE) devalued the birr by 15% versus the US dollar, removing overvaluation and boosting competitiveness. Economic actors believe the step will help to boost the country's export industry, which has been slowing. It also aims to reduce debt and eliminate currency shortages. International financial institutions such as the World Bank and the International Monetary Fund have praised Ethiopia's economic successes (IMF). The World Bank accused Addis Ababa of depreciating the Birr in one of its economic studies approximately a year ago. Inflation hit double digit levels in the fourth quarter and first half of 2018 as a result of the 15% currency depreciation in October 2017.

In the spring of 2019, Ethiopian inflation was 12.9%. The NBE regulated the currency rate between January 2009 and January 2016, officially depreciating the Birr

by approximately 97% against the US dollar. In October 2017, the National Bank of Ethiopia (NBE) devalued the birr by 15% against the US dollar, removing overvaluation and enhancing competitiveness. In May 2019, the official currency rate was 28.71 Birr per dollar.

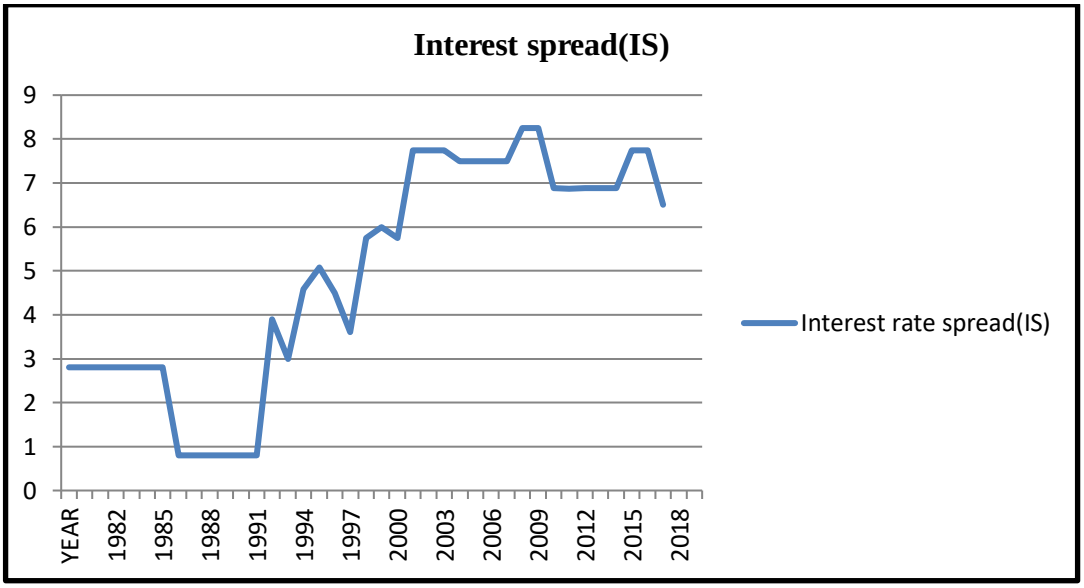
In a nutshell, the government should avoid permanently depreciating its currency since it puts stakeholders at risk. Large business firms often save money in the hopes that the government would devalue the birr. In fact, this circumstance causes a foreign currency shortage in the market, and enterprises in the import and export sectors tend to speculate in the market and hang onto their goods, exacerbating the aforementioned problem.

3.5.3 Interest rate

Ethiopia's financial sector remains underdeveloped. There are only a few financial assets available on the market. As a result, while researching interest rate variations, the most significant rates of interest to analyze are lending and deposit rates. With the exception of central government loans, the government establishes a minimum deposit rate and a maximum lending rate for savings and time deposits. According to NBE (2006/07), in January 1998, the minimum deposit rate was dropped from 7% to 6%, whereas the maximum lending rate was eliminated, and the central government borrowing rate was reduced from 12% to 6%. In another year, in March 2002, the minimum deposit rate was reduced to 3% once more, whereas the central government borrowing rate was reduced further in August 2002 and February 2005 to 5% and 3%, respectively.

Since October 2017, the minimum interest rates that banking institutions pay on savings and time deposits has been raised to 7.0%. Since then, commercial banks have changed their interest rate structures accordingly. At the end of the fiscal year, the weighted average savings and time deposit rates were 8.0%, while demand deposit rates remained steady at 0.04%. Likewise, the basic average loan interest rate rose from 13.5% to 14.25%. Given the reported inflation rate of 21.6%, both deposit and lending rates' actual rates of interest remained negative. As a result, the average

real interest rate for savings and time deposits was negative 13.6%, while lending was negative 7.3%.



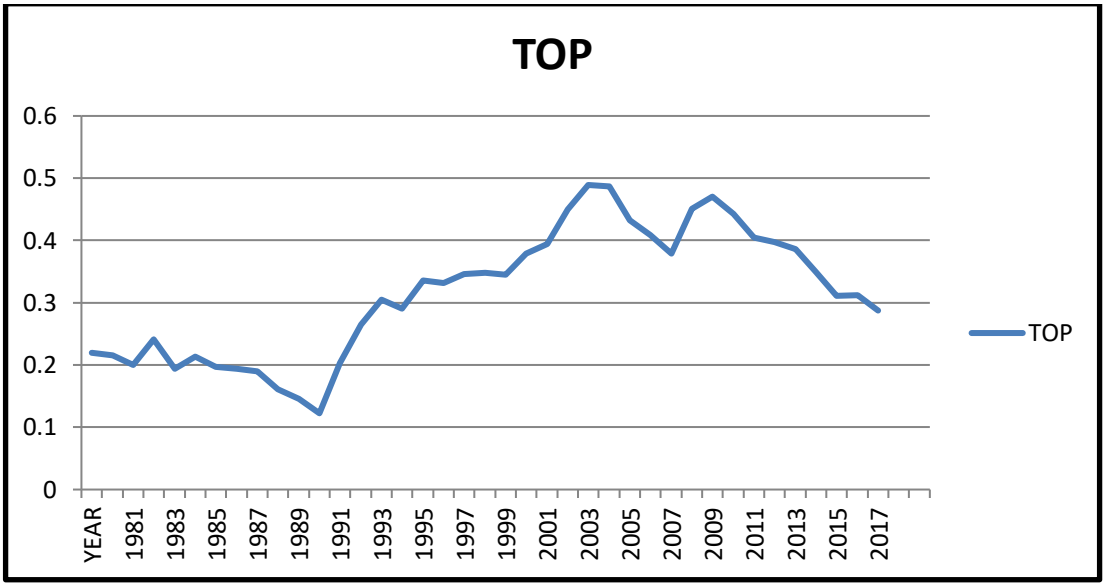
Source: Own computation

Figure 3.6: Trends of interest spread

The central bank of Ethiopia raised the minimum and maximum deposit interest rates in the 2017/18 fiscal year to 7.0 and 9.0%, respectively, from 5.0 and 5.75% the previous year at the same time. As a result, the average interest rate on savings accounts at the conclusion of the fiscal year was 8.0%. Similarly, the basic average loan interest rate increased to 13.5% in fiscal year 2016/17 from 12.75%. Weighted annual average interest rates on time and demand deposits, on the other hand, have changed slightly, reaching 8.09% and 0.04%, respectively. Because headline inflation outpaced interest rates, all actual interest rates were negative. Annual headline inflation rose to 14.7% in 2017/18, up from 8.8% the previous year. As a result, the average real interest rate for a savings deposit was 6.7%, for a time deposit it was 6.6%, and for a loan interest rate it was 1.2% (NBE, 2017/18).

3.6 Economic Policy and Trends of Trade

Both the imperial and military governments sought inward-looking development policies that centered trade policy on import substitution. When the two regimes are compared, the imperial period's inward-looking policy is far more loose than the military régime's. Long periods of overvaluation of the native currency, high tariff rates, significant foreign exchange control, non-tariff barriers, and heavy export taxes characterized both periods. Despite the fact that both regimes pursued an import substitution strategy and considered exports to be secondary, both made efforts to promote and diversify the country's exports, as evidenced by the Imperial Government of Ethiopia's (IGE) three different five-year development plans and the Derge's ten year perspective plan.



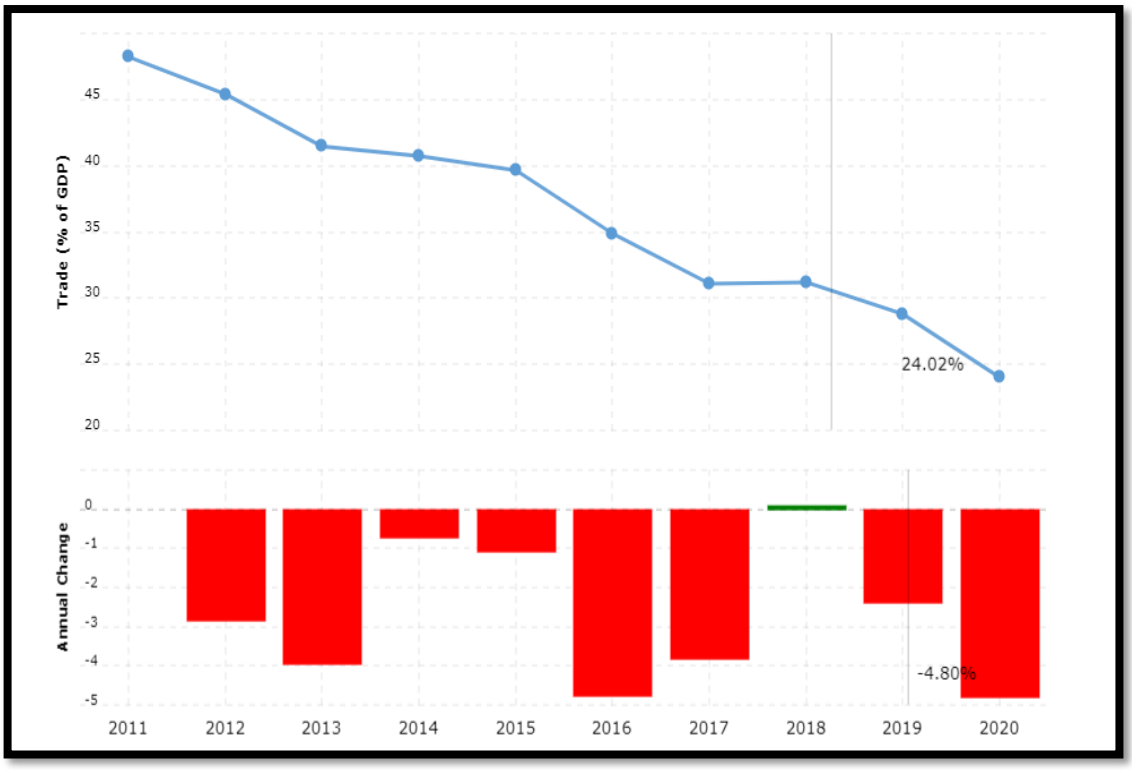
Source: Own computation

Figure 3.7: Trends of trade openness[6]

The above figure (3.7) reveals that trade openness remained stable over the majority of the pre-reform period (1980-81), mainly due to restrictive trade policy. Whereas from the periods 1985 to 1991, trade openness show a continual decline that could be in connection with recurrent drought and civil war. However, trade openness has

[6] Trade openness which is measured as total (import + export)

increased with the exception of the period during 1998, after the reform period (1991/92), that could be a reduction due to the Ethio-Eritrean conflict and a decline after 2013 due to the continuous political instability in the region. There was a sharp increase in openness due to the policy reform following the stabilization policy of the WB and IMF, as well as the liberalization of the trade regime. Furthermore Ethiopia trade to GDP ratio for 2018 was 31.20%, a 0.1% increase from 2017 and Ethiopia trade to GDP ratio for 2017 was 31.10%, a 3.8% decline from 2016 as shown in the figure below.



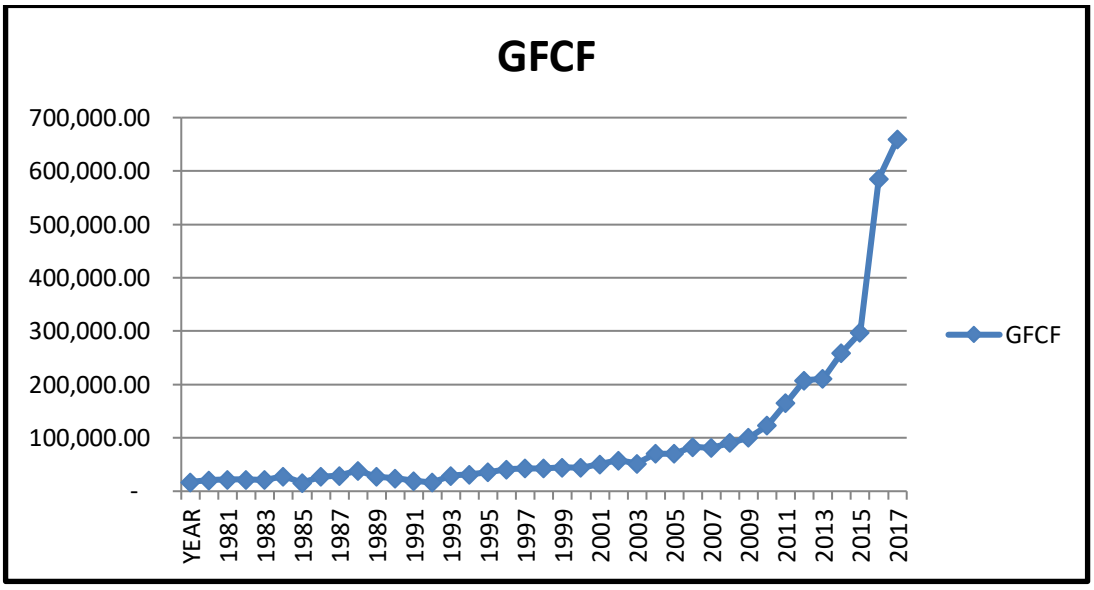
Source: world Bank

Figure 3.8: Trend of Trade to GDP beginning from the Ethiopian millennium

3.7 Trends of Gross fixed capital formation

Positive and long-term macroeconomic success is dependent on investment and its financing. Figure (3.8) depicts the development of these aggregates during the period of the post-Derg and highlights two significant facts. First, the immediate period preceding the reform saw a negative trend in gross capital creation, reflecting the

worsening state of the economy during the Derg's final days. During the post-Derg period, this decreasing tendency has accelerated (witness the rift associated with violent political change). It should be observed, however, that the amount of investment is quite low even by African standards. The second essential element to note regarding investment in the post-Derg period is the growing prominence of private investment, which is a direct outcome of the liberalization policies adopted. Nonetheless, public investment is critical in the post-Derg era. After the EPRDF came to power the level of gross fixed capital formation is in an increasing state due to the changing liberalization policies and the evolution of fine tech across the region(see more figure 3.9).



Source: Own computation

Figure 3.9: Trends of gross fixed capital formation

CHAPTER FOUR: METHEDOLOGY AND MODEL SPECIFICATION

4. Introduction

The rationale of this section is to present the hypothesis underpinning this research thereby to introduce the research approach and the empirical techniques which are applied. This chapter elaborates the scope and limitations of the research design, and situates the research amongst existing researches.

4.1 The Research Design

This study tasted and analyzed the dynamic causality relation among financial innovation, monetary policy and Economic Growth/GDP assuming other things remained constant (ceteris paribus condition). This study employed explanatory research design in order to show the extent and nature of cause-and-effect relationships.

4.2 Data Source and description of variables

With the help of EViews statistical tool, the study used the Autoregressive Distributed-lag (ARDL) model and Error Correction Model (ECM), which are substantially more efficient in the event of small and finite sample size. Unlike the vector autoregressive (VAR) model, which is only designed for endogenous variables, the ARDL model allows for mixed order of integration and employs both endogenous and exogenous variables.

This study employed protracted financial time series data of Ethiopia for the period spanning from 1980-2018 taken from the World Bank (WB), NBE and international monetary fund (IMF).

Description of Variables

Variables

RGDPPCGr = Real gross domestic product per capita growth rate (in Millions)

CPI = growth in consumer price index (inflation rate)

GEX=total final government expenditure (in Millions)

GFCF=gross fixed capital formation (in Millions)

M2/M1=broad to narrow money ratio (Millions)

DCPS =total domestic credit to the private sector (Millions)

TOP= Trade openness which is measured as total (import + export) / GDP

EXR = nominal exchange rate (unit of birr per dollar)

IS= interest rate spread the difference between lending and deposit rate

4.3 Method of Data Analysis and Estimation Techniques

The study employed quantitative method of analysis for the collected data. All estimations were carried out using EViews econometric software. To prove Co-integration and, as a result, estimate the direction of causation between variables, the researcher used the bound testing autoregressive distributed lag (ARDL) technique proposed by Pesaran and Shin (1995, 1999), Pesaran et al. (1996), and Pesaran (1997).

This method is particularly preferred since it provides various benefits. Firstly, unlike other co integration strategies, it may be utilized whether the regressors are exclusively order zero I(0), exclusively order one I(1), or a combination of both as long as they are co integrated, and it is also a simple and straightforward approach. In other words, unlike Johansen's (1988) multivariate co integration methodology, the ARDL method avoids categorizing variables as I(1) or I(0) and has better small sample characteristics (Narayan & Smyth, 2005). Second, it gives a way for concurrently examining the short and long term impacts of a single variable on the dependent variable.Third, it has better small sample properties that are best suited to this study (Pesaran and Shin, 1999; Pesaran et al, 2001; Pesaran, 1997; Alemayehu et al, 2015), the Johansen co-integration procedures, on the other hand, require huge

data sets for validity(Pesaran and Shin, 1999; Pesaran et al, 2001; Pesa (Pesaran et al., 2001; Narayan, 2004). Fourth, the ARDL approach allows for multiple optimum lag lengths for distinct variables, which is not achievable with Johansen-type models.

Furthermore, because it is constructed in a dynamic ECM form derived from ARDL, it can handle both short-term dynamics and long-term equilibrium relationships (Banerjee et al, 1993). This ECM allows for the integration of short-run dynamics with long-run equilibrium without affecting long-run information (Pesaran& Shin, 1999). Aside from the foregoing, endogeneity is less of an issue in the ARDL framework since it is free of residual correlation (Jalil et al., 2013). The ARDL approach distinguishes between dependent and explanatory factors and allows for estimate even when the explanatory variables are endogenous (Pesaran and Shin, 1999; Pesaran et al, 2001; Pesaran, 1997;Alemayehu et al, 2015).Identifying the stationary of the variables has been considered a prerequisite for many econometric approaches, since it may aid in the selection of the best method. The following three tests can be used to determine the stationarity of each variable. The three are the ADF, PP, and KPSS tests. After determining the stationarity of the variables, the bounds test approach to co-integration proceeds to estimate the ARDL model using the appropriate lag-length selection criterion. A reference from Pesaran and Shine (1999), a maximum of two lag lengths should be chosen for annual data, as mentioned in Narayan (2004).As a result, the lag length that minimizes AIC is two. We used AIC to estimate the optimal lag because it is best fit for data with a small sample size, such as the data in this study. Apart from that, among the criteria offered, AIC creates the least risk of underestimate (Liew et al., 2004), cited by Tsadkan (2013).

In ARDL, there are two phases that are practiced. The first phase focuses on computing the F-statistic to determine the significance of the lagged values of the variables in the error correction form of the underlying ARDL model to see if they have a long-run relationship. For a given significance level, there are two sets of asymptotic critical values to test co integration (Pesaran et al, 2001). The set with the lower value is computed using I(0) regressors, whereas the set with the higher value

is computed using I(1) regressors (1). The null hypothesis (no cointegration) can be rejected if the estimated F statistics is greater than the upper critical value. However, if it falls below the lower critical value accept the null hypothesis. Finally, the inconclusive case if the F-statistics value falls between the lower and upper critical value.

The second phase is only carried out if the first phase is met, i.e. the variables have a long-term relationship. Estimating the long run model by selecting the orders of the ARDL model using the Akaike information criterion (AIC) and estimating an Error Correction Model (ECM) using the long-run estimates is the second step of this research. This allows for the estimation of the dependent variable's speed of adjustment to independent factors. Estimation of adjustment coeficient between -1 and 0 shows that partial adjustment is present. Furthermore, if the result is less than -1, the model is over adjusting in the current period, whereas a positive value indicates the system is moving away from equilibrium over time.

To begin, using the ordinary least squares method, we must determine whether or not there is a long-run relationship between the variables, with each variable acting as a dependent variable in turn, and an F-test for each regression model to confirm the existence of a long-run relationship.

4.4 Theoretical Model

Financial innovation is a never-ending process that involves the creation of new financial institutions, improved financial services, new financial assets, and improved payment mechanisms (Velu&Khanna, 2013). Because there is no agreed-upon measure of financial innovation, researchers will utilize several proxy variables to assess its impact on economic growth. Financial innovation, according to Laeven et al. (2015), comprises not just new financial instruments, products, or institutions, but also more common place financial advances such as new financial reporting techniques, data processing enhancements, and credit scoring.

As a result, the proxies for financial innovation should cover a broad range of elements of the financial system. The ratio of broad money to narrow money, M2/M1, was utilized as a proxy for financial innovation in this study (Ansong, Marfo-Yiadom, &Ekow-Asmah, 2011; Arrau, De Gregorio, Reinhart & Wickham, 1995; Mannah-Blankson&Belnye, 2004). M2/M1 influences the desire for actual cash balances, income, and money demand interest elasticity (Ansong et al., 2011; Bara et al., 2016). Furthermore, broad money reveals a wider range of money replacements than narrow money (Mannah, Blankson&Belnye, 2004). According to the study, this will have a favourable impact on economic growth. The second is Domestic credit to the private sector (DCP), which refers to the credit services provided to the private sector for investment in loan, securities, and other receivables (Ansong, Marfo-Yiadom, &Ekow-Asmah, 2011; Laeven et al., 2015). The ratio of capital to assets was used to determine a bank's financial strength (Tan &_Floros, 2013). A financial organization with high capital adequacy is generally thought to be safe and capable of meeting all of its financial obligations. By providing additional cash to the private sector, this has a good effect and relationship with domestic loans to the private sector. According to the economic growth theory, capital adequacy will boost economic growth. So we expect that there is a significant and positive impact of this variable on economic growth (Werner, 2016). The researcher adopted the following as control variables for financial innovation: Gross fixed capital formation (GCF), trade openness (TOP), government expenditure (GEX), interest spread_(IS)the difference between lending and deposit rate), nominal exchange rate_(ER) and Consumer price index_(CPI).Some of these variables were transformed into their logs form for further assessment, and to avoid heteroscedasticity (Gujarati, 2004).

4.5 The Empirical Model

4.5.1. The Extended Aghion, Howitt, and Mayer-Foulkes(AHM) Model

This study adopted a financial innovation model that was developed by Laeven et al. (2015), which extended Aghion, Howitt and Mayer-Foulkes'_ (AHM) regression framework and consequently used by (Bara et al., 2016). Laeven et al. (2015) used a model that states that "economies without financial innovation will stagnate,

regardless of their initial degree of financial development," to study the impact of financial innovation on endogenous growth. The AHM model is founded on the Schumpeterian growth paradigm, which asserts that improved products and services benefit entrepreneurs. This can be confirmed by broadening the AHM regression definition to include not just financial progress but also financial innovation. Take the AHM regression framework for example:

$$g - g_0 = b_0 + b_1F + b_2(y - y_1) + b_3F(y - y_1) + b_4X + u$$

Where$g - g_0$is average growth rate of per capita income relative to U.S. growth over the period 1960–1995.F is financial development (measured as credit to the private sector as a share of GDP),$y - y_1$is log of per capita income relative to U.S. per capita income, X is set of control variables and u is an error term.

According to Levine et al. (2000), AHM concludes that b1 is insignificant and different from 0, whereas b3 is negative and significant, indicating that the amount of financial development increases the rate at which economies converge to the technical frontier, which is consistent with their theoretical model.

Our model utilizes the AHM framework but differs in one significant way: it prioritizes financial innovation over financial development. According to our concept, earlier financial breakthroughs define the level of financial advancement in each period. To test the concept, Laeven et al. (2015), Bara and Mudxingiri (2016), and Bara et al. (2016) updated the AHM model to include financial innovation and financial development. All of the scholars emphasized financial innovation. They assumed in their models that any period's financial development is the product of previous financial advances. According to AHM framework, Bara et al. (2016) developed the following model:

$$g - g_0 = b_0 + b_1F + b_2(y - y_1) + b_3F(y - y_1) + b_4X + b_5f + b_6f(y - y_1) + u$$

The dynamic regression model that will be projected in this investigation is as follows:

$$YXy_{t-1} = Ff_i \_\_\_\_\_ (1)$$

$$\overbrace{RGDPPCGr_t}^{Y} = \left(\overbrace{GEX_t, CPI_t, IS_t, EXR_t, TOP_t,}^{X} + \overbrace{RGDPPCG_{t-1}}^{y_{t-1}} - \overbrace{GFCF_t}^{F} + \overbrace{M2/M1_t, DCP_t}^{f_i} \right) \_\_\_\_\_ (2)$$

From the above equations (1) and AHM framework, developed by Bara et al. (2016) we have the following:

Y= real GDP per capita growth rate which is the dependent variable,

F= financial innovation, which is the variable for the control of financial development

X =vector of control variables,

fi= financial innovation variables and

y_{t-1} denotes the lagged variable of real GDP per capita growth rate.

The linear form of equation (2) becomes:

$$RGDPPCGr_t = \alpha_0 + \alpha_1 GEX_t + \alpha_2 CPI_t + \alpha_3 TOP_t + \alpha_4 EXR_t t + \alpha_5 IS_t + \alpha_6 RGDPPCG_{t-1} + \alpha_7 GFCF_t t + \alpha_8 lnM2/M1_t + + \alpha_9 lnDCP_t + \varepsilon_t \_\_\_\_\_ (3)$$

Where ln is the natural logarithm; $RGDPPCGr_t$ is real gross domestic product per capita growth rate; (M2/M1) is ratio of broad to narrow money; GEX is government expenditure; CPI is consumer price index; TOP is trade openness; EXR is the nominal exchange rate; IS is the interest spread (the difference between lending and deposit rate); GFCF is the gross fixed capital formation and DCPS is domestic credit to the private sector.

A generic ARDL model for variables X, Y and Z can be written as follows:

$$\Delta Y_{t-1} = \emptyset + \gamma_1 Y_{t-1} + \gamma_2 X_{t-1} + \gamma_3 Z_{t-1} + \sum_{i=1}^{n1} \theta_{1,i}, \Delta Y_{t-1} + \sum_{i=1}^{n2} \theta_{2,i} \Delta X_{t-1} + \sum_{i=1}^{n3} \theta_{3,i} \Delta Z_{t-1} + \varepsilon_t \quad (4)$$

Where$\gamma_1, \gamma_2, \gamma_3$are long run coefficients whose sum is equivalent to the error correct term in VECM model and $\theta_{1,i}$, $\theta_{2,i}$, $\theta_{3,i}$ represents short run coefficients.

Prior to estimating the chosen model, using ordinary least squares, the Akaike Information criterion (AIC) or the Schwarz Bayesian criterion (SBC) is used to choose the order of the lags in the ARDL Model. Because of its advantages for small sample sizes (Tsadkan, 2013), we employ the Akaike Information Criterion (AIC) in lag selection. The suitable lag length is critical in the ARDL model since it allows us to deal with over parameterization and save degrees of freedom (Taban, 2010), as cited in Tsadkan (2013). For annual data, Pesaran and Shin (1999), suggested a maximum of two lags. Finally, the lag length that minimizes the AIC is chosen.

To ensure homoscedasticity, some of the variables were transformed to logarithms. Following that, we started our empirical testing by determining the stationarity of all of the variables we were considering. This is required in order to proceed with Co-integration testing later. Our variables should ideally be I (1), meaning that they become stationary after the first difference.

The generalized ARDL model for testing the relationship between financial innovation, monetary policy and economic growth incorporated in this study shown as follows:

$$\Delta(RGDPPPCGr)_t = \alpha_0 + \alpha_1\Delta(\mathrm{GEX})_{t-1} + \alpha_2\Delta(\mathrm{CPI})_{t-1} + \alpha_3\Delta(TOP)_{t-1} + \alpha_4\Delta(EXR)_{t-1} + \alpha_5\Delta(\mathrm{IS})_{t-1} + \alpha_6\Delta(RGDPPCG)_{t-1} + \alpha_7\Delta(\mathrm{GFCF})_{t-1} + \alpha_8\Delta ln(\mathrm{M2/M1})_{t-1} + \alpha_9\Delta ln(\mathrm{DCP})_{t-1} + \theta_0(RGDPPCG)_{t-1} + \theta_1(GEX)_{t-1} + \theta_2(CPI)_{t-1} + \theta_3(TOP)_{t-1} + \theta_4(EXR)_{t-1} + \theta_5(IS)_{t-1} + +\theta_6(GFCF)_{t-1} + \theta_7 ln(M2/M1)_{t-1} + \theta_8 ln(DCP)_{t-1} + \varepsilon_t \quad (5)$$

Where Δ denotes the difference operator,ε_t denotes the error term otherwise assumed as white noise, θ_1- θ_8 denotes the long run coefficients. Under the null hypothesis of no cointegration, basically the bounds test is based on the joint Wald test or F-test, which has is non-standard asymptotic distribution. The null hypothesis for no co-integration between the variables in equation (5) is:

$H_0= \theta_0= \theta_1= \theta_3= \theta_4= \theta_5= \theta_6= \theta_7= \theta_8=0$. (no long run relationship among the variables) against the alternative one:

H_1= Not H_0. The F-test does not have a standard distribution since it is dependent on the following: (a) whether the variables in the model are I(0) or I(1), (b) the number of regressors used in the estimation, and (c) if the ARDL model has an intercept and/or a trend (Narayan, 2004). To determine whether there was a long-run relationship between the variables, Equation (5) had to be calculated using OLS. The F or Wald test, as presented by Pesaran et al. (2001) for bound test, is the suitable statistic to examine the significance of the lagged level of the variables under inquiry.

4.5.2 Co-integration and Error Correction

The ECM model is a statistical model used to specify economic dynamics in which the pull and push forces restore the equilibrium relationship whenever a disequilibrium occurs. It is intended to capture both the short-term and long-run dynamics of co-integrating variables. As a result, the co-integrating term is also known as the error correction term since the departure from long run equilibrium is gradually addressed by a series of partial short run modifications. As a result, co-integration requires the presence of an error correcting representation, and any divergence from equilibrium causes the system to revert to the long term route.

The testing approach is based on F-statistics, which are compared against critical values proposed by Pesaran et al. (2001), to reject or accept the null hypothesis. Pesaran et al. (2001), propose two sets of asymptotic critical values to assess whether variables in levels contained in a given model have a long run relationship. There are two sets of critical value bounds for all regressor classifications: upper critical bound value and lower critical bound value. Pesaran et al. (2001), stated that the upper bound critical values are used to describe critical values in the I(1) series, whereas lower bound critical values are used to explain critical values in the I (0) series.

The decision rule, if the calculated F-statistic surpasses the upper critical value, there is a long run relation among the variables and there is no co integration, if the calculated F-statistics falls below the lower critical value. If the derived F statistic is between the upper and lower bound critical values, inference is inconclusive and we need to know the sequence of integration of subordinate variables before we can make a decisive inference (Pesaran et al., 2001).

After establishing the long run relationship we have to estimate the following long run ARDL (n1, n2, n3, n4, n5, n6, n7, n8, n9) equilibrium model as follows:

$$(RGDPPPCGr)_t = \alpha_0 + \sum_{i=1}^{n1} \alpha_{1,i} (\mathrm{GEX})_{t-i} + \sum_{i=0}^{n2} \alpha_{2,i} (CPI)_{t-i} + \sum_{i=0}^{n3} \alpha_{3,i} (TOP)_{t-i} + \sum_{i=0}^{n4} \alpha_{4,i} (EXR)_{t-i} + \sum_{i=0}^{n5} \alpha_{5,i} (\mathrm{IS})_{t-i} + \sum_{i=0}^{n6} \alpha_{6,i} (RGDPPCG)_{t-i} + \sum_{i=0}^{n7} \alpha_{7,i} (\mathrm{GFCF})_{t-i} + \sum_{i=0}^{n8} \alpha_{8,i} \ln\left(\frac{\mathrm{M2}}{\mathrm{M1}}\right)_{t-i} + \sum_{i=0}^{n9} \alpha_{9,i} \ln(\mathrm{DCP})_{t-i} + \varepsilon_t \quad \text{(6)}$$

The Error Correction Model (ECM) is specified if there is co-integration. Short-run economic growth adjustment is, nonetheless, required for policy goals. Due to this reason a dynamic error correction model (ECM) is also described to account for the speed of adjustment.

The specification for the short-run dynamic parameters estimated by the error correction model is specified as follows:

$$\Delta(RGDPPPCGr)_t = \alpha_0 + \sum_{i=1}^{n1} \alpha_{1,i}\Delta(\mathrm{GEX})_{t-i} + \sum_{i=0}^{n2} \alpha_{2,i}\Delta(CPI)_{t-i} +$$
$$\sum_{i=0}^{n3} \alpha_{3,i}\,\Delta(TOP)_{t-i} + \sum_{i=0}^{n4} \alpha_{4,i}\,\Delta(EXR)_{t-i} + \sum_{i=0}^{n5} \alpha_{5,i}\,\Delta(\mathrm{IS})_{t-i} +$$
$$\sum_{i=0}^{n6} \alpha_{6,i}\,\Delta(RGDPPCG)_{t-i} + \sum_{i=0}^{n7} \alpha_{7,i}\,\Delta(\mathrm{GFCF})_{t-i} + \sum_{i=0}^{n8} \alpha_{8,i}\,\Delta\ln\left(\frac{\mathrm{M2}}{\mathrm{M1}}\right)_{t-i} +$$
$$\sum_{i=0}^{n9} \alpha_{9,i}\Delta\ln(\mathrm{DCP})_{t-i} + \gamma \mathrm{ECM}_{t-1} + \varepsilon_t \quad \text{_____(7)}$$

Where, α_1 to α_9 be the model's short-run dynamic coefficients of convergence to equilibrium ECM_{t-1} is the error correction term that confirms the existence of co integration/long-run relationship among the variables when the coefficient on this term is negative and statistically significant. γ=is the speed of adjustment parameter with a negative sign.

$$ECT_t = (RGDPPPCGr)_t - \alpha_0 + \sum_{i=1}^{n1} \alpha_{1,i}\,(\mathrm{GEX})_{t-i} - \sum_{i=0}^{n2} \alpha_{2,i}(CPI)_{t-i} +$$
$$\sum_{i=0}^{n3} \alpha_{3,i}\,(TOP)_{t-i} - \sum_{i=0}^{n4} \alpha_{4,i}(EXR)_{t-i} - \sum_{i=0}^{n5} \alpha_{5,i}(\mathrm{IS})_{t-i} -$$
$$\sum_{i=0}^{n6} \alpha_{6,i}\,(RGDPPCG)_{t-i} - \sum_{i=0}^{n7} \alpha_{7,i}(\mathrm{GFCF})_{t-i} - \sum_{i=0}^{n8} \alpha_{8,i}\ln\left(\frac{\mathrm{M2}}{\mathrm{M1}}\right)_{t-i} -$$
$$\sum_{i=0}^{n9} \alpha_{9,i}\ln(\mathrm{DCP})_{t-i} \text{ _____ (8)}$$

This long-run and short-run estimation is of most importance in this technique, as it is on the basis of this that inference can be drawn as to whether financial innovation has a significant impact on monetary policy and economic growth in Ethiopia

4.6 Econometric Approach

4.6.1 Stationarity Test

Basically, identifying the property of the time series data is essential before estimating a model. A time series process, with mean, variance and covariance are constant over time, is weakly stationary and the value of the covariance is determined by the distance between two time periods, not by the time at which the covariance is measured (Verbeek, 2004:258). (Verbeek, 2004), states that a stochastic process is said to be strictly stationary if the joint probability distribution is independent of time.

4.6.2 The Unit Root Test

The application of non-stationary variables in analysis gives rise to false and unreliable results, and will not be relevant and authentic in forecasting or making prediction. To this effect, unit root is employed to ascertain the stationarity of the variables under investigation. However, a regression result will not be spurious if the non-stationary series are cointegrated. To test whether time series variables are stationary or non stationary numerous tests are usually employed; the Dick-Fuller (DF), the Augmented Dick-Fuller (ADF) test, and Phillips-Peron test. In this paper we attempt is to employ DF and ADF test.

4.6.3 Dickey- Fuller Test (DF)

Dick-Fuller (DF) test can be tested in three ways:

$$\Delta y_t = \delta y_{t-1} + u_t \quad \text{_____} \quad (9)$$

$$\Delta y_t = \alpha + \delta y_{t-1} + u_t \quad \text{_____} \quad (10)$$

$$\Delta y_t = \beta_1 + \beta_2 t + \delta y_{t-1} + u_t \quad \text{_____} \quad (11)$$

Where; - $u_t \sim IID\ (0, \sigma^2)$; t is a time trend; equation (9) represent a random walk without drift if $\delta = 0$, (10) represent a regression with intercept and (11) represent with intercept and time trend. In each of the three cases,

The hypothesis to be tested will be:

H_0: δ=0, there is a unit root, the time series is non-stationary

H_1: δ<0, there is no unit root, the time series is stationary

If the computed absolute value of the *t*-statistic exceeds the ADF critical values, we do not accept the null hypothesis that δ = 0, in which case the time series is stationary and vice versa.

The DF test is based on a simple autoregressive of order one, AR (1) process with a white-noise disturbance.

The DF test regression permits variables with only one lag, the error terms maybe serially correlated, and may be biased and are not valid (Davidson and Mackinnon, 1999; Gujarati, 2004). This problem can be mitigated by ADF test because it corrects for serial correlation by adding lagged-difference terms (Greene, 2003).

4.6.4 The Augmented Dickey- Fuller Test (ADF Test)

The ADF test modifies the DF test to account for any serial correlation in the error components by incorporating lagged differences. The ADF test can be:

$$\Delta y_t = \delta y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + u_t \quad (12)$$

$$\Delta y_t = \beta_1 + \delta y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + u_t \quad (13)$$

$$\Delta y_t = \beta_1 + \beta_2 t + \delta y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + u_t \quad (14)$$

Where: - Equations (12, 13, 14) represents regression without intercept, regression with intercept and regression with intercept and trend respectively.

u_t = a pure white noise error term;

y_t= any variable in the model to be tested for stationary; *t* = is a trend; and Δ = the difference operator;

The null and alternative hypothesis in the ADF test is stated as, $\delta=0$ for the null hypothesis and $\delta<0$ for the alternative hypothesis. The rejection of the hypothesis demonstrates that the series is stationary and lacks a unit root (Enders 1995). In other words, if the *t* value or *t*-statistic is less than the critical values, the null hypothesis (H_0) is rejected and the series is deemed stationary. If the t-statistic is less negative than the critical values, the series is non-stationary, and the null hypothesis is accepted.

4.6.5 Co-integration Test

To determine whether or not there is a long-run linear relationship between the variables, the co-integration test is employed. For ensuring weakly stationary or non-

stationary series with a unit root, first differencing appears to provide adequate methods. However, the technique of first differencing has a drawback in that it tends to neglect the data's long run features (Kennedy, 1992).

4.6.7 The Engle-Granger (Two Step Algorism) Co-integration Test

By doing so and reviewing previous topics such as the unit root and co-integration, we can determine the direction of causality. To this effect, the study employed the Granger Causality test. Let us consider two variables (let's say P and Q), the Granger Causality test representation is as follows:

If P is influenced by both lagged values of the two variables (P and Q), this implies Q Granger causes P (Q→P) and if Q is influenced by its lag and the lagged values of P, this implies P Granger causes Q (P→Q). By saying this, if the two variables are granger cause each other, P Granger causes Q and Q Granger causes P, this implies bidirectional causality. However, if the causality exists only in one direction, this implies uni-directional causality. If the causality between the variables doesn't exist, then the variables are independent of each other. Because of its simplicity, particularly used for small samples, the study selected and employed Pair wise Granger-causality test over the other alternatives, as cited in Seung-HoonYoo(2004).

Pair wise Granger Causality test hypothesis:

H_0 = no granger Causality,

H_1 = the null hypothesis is not true,

Note: Reject the null hypothesis if the Probability Value of F-Statistic is less than 0.05.

4.7 Post Estimation Diagnostic Tests

4.7.1Normality, Serial Correlation, Heteroscedasticity/ARCH and Stability test

Once the model has been estimated, there are some diagnostic tests that are pivotal for ensuring that the results obtained from ARDL estimation can be used for

forecasting or not. The following are some of the most important post estimation tests performed on the residual of the model. These are:

(i) Breusch-Pagan/Godfrey Lagrange Multiplier (LM) test
(ii) Jarque-Bera test for residual normality, and
(iii) Autoregressive Conditional Heteroscedasticity/ARCH test in the residuals and test for model stability.

The study employed autocorrelation test, since this test helps to detect the presence of any relationships between the current values of the regression residuals and any of its lagged values (Brooks, 2002). To test for the existence of serial correlation the study employed Breusch-Pagan/Godfrey Lagrange Multiplier (LM) test, H_0 = there is serial correlation, rule if prob. Chi-Square (2) < 0.05 or 5% we can reject H_0.

Furthermore, the study employed the Jarque-Bera normality test that helps to know whether the regression errors are normally distributed or not. Under the null hypothesis of normally distributed errors, the test statistic has a Chi- Square distribution and if the p-value is less than 0.05, Jarque-Bera statistic is significant, implying that the null hypothesis of normality is rejected at the 5% level of significance (Brooks, 2002: 181). Added to this, the study also employed heteroscedasticity test that helps to detects that the presence of whether the variance of the errors in the model are constant or not. If the null hypothesis shows that the P-value is less than the 5% level of significance that the residuals are homoscedastic and independent of the regressors, implying that there is no problem of misspecification with regard to heteroscedasticity, i.e., if the P-value is less than 0.05 the test statistic is significant, implying that the null hypothesis of homoscedasticity and no misspecification will be rejected (Brooks, 2002: 445).

In addition, this study employed the Cumulative sum of recursive residuals (CUSUM) and Cumulative sum of squares of recursive residuals (CUSUMSQ) that helps to detect the ARDL model's validity. The CUSUM test used to detect the stability of coefficients in a multiple linear regression model or tests if coefficients of the regression are changing routinely and abruptly.

CHAPTER FIVE: RSEULTS AND DISCUSSION

5.1. Unit Root Test

As stated in the methodology section of the thesis, a unit root test employing the standard Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are employed to establish the order of integration of the series under investigation. The test was carried out for two different cases. It is first tested with constants but no trends, then with constants and trends.

The results of the unit root test using the Augmented Dickey and Fuller (1981) and Phillip and Perron (1988) tests for the variables in this investigation are as shown in the Table 5.1 below. The variable RGDPPCGr, is stationary at level I (0) while ln(M2M1), ln(DCPS),GEX, GFCF, TOP, EXR and IS become stationary after first difference and thus I (1) but none of the variables are integrated of order 2.

Table 5.1: Unit root tests (Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests)

	Level				**1st difference**				**I**
	Constant		Constant and trend		Constant		Constant and trend		
	ADF	PP	ADF	PP	ADF	PP	ADF	PP	
RGDPPCGr	-5.779	-5.786	-7.042	-7.106	-	-	-	-	I(0)
	(0.000)*	(0.000)*	(0.000)*	(0.000)*					
CPI	6.298	6.656	2.577	2.859	-2.219	-1.876	-4.115	-4.067	I(1)
	(1.000)	(1.000)	(1.000)	(1.000)	(0.203)	(0.339)	(0.013)	(0.0148)*	
LDCPS	2.085	2.040	-0.083	0.042	-3.410	-3.382	-4.409	-4.088	I(1)
	(0.999)	(0.000)*	(0.993)	(0.995)	(0.016)*	(0.018)	(0.013)	(0.014)*	
EXR	1.874	3.500	-0.353	0.331	-2.906	-2.893	-3.837	-3.704	I(1)
	(0.999)	(1.000)	(0.985)	(0.998)	(0.054)	(0.055)*	(0.025)*	(0.034)*	
GEX	-2.357	9.458	-2.300	5.314	-3.259	-1.226	-3.550	-2.330	I(1)
	(0.160)	(1.000)	(0.422)	(1.000)	(0.025)*	(0.652)	(0.051)*	(0.408)	
GFCF	2.012	17.703	6.410	8.806	5.055	-4.090	4.165	-5.085	I(1)
	(0.998)	(1.000)	(1.000)	(1.000)	(1.000)*	(0.002)*	(1.000)*	(0.001)*	
IS	-1.159	-1.100	-1.950	-1.971	-6.949	-6.939	-6.840	-6.831	I(1)

	(0.681)	(0.705)	(0.608)	(0.597)	(0.000)*	(0.000)*	(0.000)*	(0.000)*	
M2/M1	2.407	2.182	-0.867	-1.121	-4.222	-4.256	-4.778	-4.778	I(1)
	(1.000)	(0.999)	(0.949)	(0.911)	(0.002)*	(0.001)*	(0.002)*	(0.002)*	
TOP	-1.394	-1.264	-0.574	-0.810	-4.772	-4.725	-4.858	-4.773	I(1)
	(0.574)	(0.635)	(0.974)	(0.955)	(0.000)*	(0.000)*	(0.002)*	(0.002)*	

Source: Own computation

Note: 1.RGDPPCGr: Real Gross Domestic Product Per Capita growth rate, IS: interest rate spread, EXR: Nominal Exchange rate CPI: Consumer Price Index, M2/M1: Broad-to-Narrow Money ratio, GEX: Government Expenditure, GFCF: Gross Capital Formation, DCPS: Domestic Credit to Private Sector, TOP: Trade Openness, FI: Financial innovation

Note 2: Values reported () in brackets are the associated probabilities of coefficients and * sign shows significance at 5% level **Note 3:**MacKinnon (1996) critical values, taken as the rejection of the null hypothesis. When verifying the stationarity of all variables, the Akaike information criterion (AIC) is employed to determine the lag length. The * sign shows the rejection of the null hypothesis of non-stationary at 5% significant level.

5.2 Determining the Optimal Lag Length (k) for the model

In most economic research, determining the optimal lag length of an autoregressive process for a time series is a key econometric activity. Using Akaike Information Criteria (AIC), this study calculated the model's Optimal Lag Length (k). The optimal lag order is determined using the Final Prediction Error (FPE), the Akaiki Information Criterion (AIC), sequential modified Likelihood Ratio test statistics (LR), the Schwarz Information Criterion (SC), and the Hannan-Quinn Information Criterion (HQ) by applying the VAR lag order selection criterion. All test statistics indicate that the ideal lag length is two except for the Schwarz Information Criterion (SC), where the maximum (*) is situated. Therefore, the optimal lag length that best fits our model is 2. This is done by applying the maximum lag of 6.

Table 5.2: VAR lag order selection criterion

LagLogL	LR	FPE	AIC	SC	HQ
0 -537.0507	NA	53.27570	29.51626	29.90810	29.65440
1 -163.0697	545.8101	7.99e-06	13.67945	17.59789*	15.06088
2 -22.59478	136.6783*	7.49e-07*	10.46458*	17.90964	13.08931*

* indicates lag order selected by the criterion.

Source: Own computation

5.3 F-Bounds Co-integration Test Results

Following the estimate of regressions, the ARDL bounds testing is used to determine if the variables under investigation are co-integrated or not. The F-Bounds Co-integration test was employed in this investigation. The F-Bounds Co-integration test yielded the following results.

Table 5.3: F bound Co-integration estimation result

	F-statistics	Critical value lower at 95%	Critical value upper at 95%	Decision rule
Model 1	14.82834	2.32	3.5	Co integration
Model 2	19.81718	2.32	3.5	Co integration

Source: Own computation

Based on table 5.3 above, for both models (model 1 and 2), the variable are co-integrated, according to the F-bound test. This means, if the F-statistic value is greater upper bound value, we can say that the variables are co-integrated. As shown 5.3 above, the findings of the study for both model 1 and model 2 revealed that the F-statistic_(model 1) = 14.83, the lower bound I(0) = 2.32 and upper bound I(1)= 3.5 and the F-statistic_(model 2) = 19.82, the lower bound I(0) = 2.32 and upper bound I(1)= 3.5 respectively at 5% Significance level. The estimation result confirms that the variables are co-integrated. This implying that there is long-run relationship among variables.

5.4 Long run model estimation

This finding suggests that real GDP per capita growth rate, domestic credit to the private sector, broad to narrow money ratio, nominal exchange rate, gross fixed

capital formation, trade openness, consumer price index, government expenditure, and interest spread all have a long-run relationship. The estimated long-run relationship between the variables is estimated after validating the presence of a long-run co-integration relationship between the variables, and the estimated coefficients are provided in Table 5.4 (a & b) below. The study identified 2 modes; these are the two proxy variables of financial innovation (Broad to narrow money ratio and domestic credit to the private sector).

Table 5.4(a): The Estimated Long Run Coefficients using the ARDL Approach selected based on Akaike information criterion by taking LDCPS as FI variable.

Model 1: LDCPS as FI variable

ARDL Long Run Form and Bounds Test
Dependent Variable: D(RGDPPCGR)
Selected Model: ARDL(2, 0, 1, 2, 0, 0, 0, 0)

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-0.010145	0.004161	-2.438047	0.0225
EXR	0.002663	0.011877	0.224244	0.8245
GEX	-2.95E-06	1.15E-06	-2.571378	0.0168
IS	-0.005559	0.010914	-0.509352	0.6152
LDCPS	0.020208	0.033911	0.595918	0.5568
GFCF	2.20E-06	4.11E-07	5.350775	0.0000
TOP	0.322532	0.345553	0.933380	0.3599

EC = RGDPPCGR - (-0.0101*CPI + 0.0027*EXR -0.0000*GEX -0.0056*IS + 0.0202*LDCPS + 0.0000*GFCF + 0.3225*TOP)

Source: Own computation

Model 1: **Domestic credit to the private sector (DCPS) as a proxy for financial innovation**

Model – 1 is developed by considering DCPS as proxy variable for financial innovation. I found that DCPS had a positive impact on economic growth but the coefficient is statistically insignificant in the long run as depicted from table 5.4(a)

above and the result is consistent with the empirical studies of Bara and Mudxingiri (2016). However, Ndlovu (2013), Tyavambiza and Nyangara (2015), and Michalopoulos et al. (2011) found a positive association between them that was significant. In contrast, Idun and Aboagye (2014) found that DCPS as a measure of financial innovation had a long-term negative impact on economic growth using data from Ghana. According to economic development theory, a well-functioning financial sector accelerates the capital accumulation process, resulting in economic development (Kyophilavong et al. 2016). Ethiopia's banking system has played a vital role in economic development through facilitating financial advancements. In the long run, DCPS one of the financial innovation proxy, show their positive association but insignificant at 5% significance level. The insignificant of DCPS could be due to the fact that, "credit is not well developed and adequately disseminated throughout the economy to influence economic growth", (Bara et al., 2016). In similar fashion, DCPS has positive relation but insignificantly with economic growth in Ethiopia in the short run.

As shown in table 5.4(a) above the ARDL long run form and bounds test result revealed that a percentage change in GFCF affect Economic growth positively and significantly in the long-run. This could be due to the reason that the annual capital goods accumulation boosts the national output or revenue significantly. Capital accumulation is required to provide individuals with productive tools. If the population continues to increase without net capital accumulation, the growing population will be unable to obtain the requisite tools, instruments, machines, and other production tools, resulting in a significant reduction in their capacity to create. The finding of this estimation is consistent with economic growth theories such as, the Keynesian theory of growth and Solow's theory of growth, not only this but also consistent with the study of Biswas and Saha (2014) in India; Iqbal and Zahid (1998) in Pakistan; Ndambiri H.K. et al. (2012) and Patrick Enu et al. (2013) in Africa; Weeks et al. (2004) and in Ethiopia, Tadesse (2011).

This means that, in the long-run a 1% increase in GFCF increases economic growth by about 2.20E-06% but the proxy for financial innovation, DCPS and growth has no

long run relationship. The percentage change in CPI affects economic growth negatively and significantly in the long-run. This means that, in the long-run 1% increase in CPI decreases economic growth by about 0.010%. In the same manner, GEX has negative and significant relationship with economic growth, where a 1% increase in GEX decreases economic growth by about 2.95E-06%.This finding is in line with the studies of Tofik (2012) and Teshome (2006). They found that government spending has a large negative influence on the Ethiopian economy, implying that unproductive and inefficient government spending that does not contribute value to the economy dominates (like wages and salaries, rent, debt servicing and transfer payments). This study's conclusions in connection with the official development assistance (ODA) are similar to those of Rajan and Subramanian (2005), Ekanayake and Chatrna (2008), Mallik (2008), and Tasew (2008). (2011).

Table 5.4(b): The Estimated Long Run Coefficients using the ARDL Approach selected based on Akaike information criterion by taking LM2/M1 as FI variable.

Model 2: LM2/M1 as FI variable

ARDL Long Run Form and Bounds Test
Dependent Variable: D(RGDPPCGR)
Selected Model: ARDL(2, 0, 1, 1, 2, 1, 0, 2)

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-0.008776	0.003169	-2.769643	0.0118
EXR	0.016789	0.010042	1.671834	0.1101
GEX	2.15E-07	1.22E-06	0.176594	0.8616
IS	0.028815	0.017180	1.677243	0.1091
LM2/M1	-0.742891	0.327122	-2.270992	0.0343
GFCF	1.48E-06	3.04E-07	4.869232	0.0001
TOP	0.248090	0.483501	0.513113	0.6135

EC = RGDPPCGR - (-0.0088*CPI + 0.0168*EXR + 0.0000*GEX + 0.0288*IS
-0.7429*LM2/M1 + 0.0000*GFCF + 0.2481*TOP)

Source: Own computation

Model 2: The ratio of broad to narrow money (M2/M1)

As shown in table 5.4(b) above the ARDL long run model and bounds test result revealed that a percentage change in GFCF affect economic growth positively and significantly in the long-run. This means that, in the long-run a 1% increase in GFCF increases economic growth by about 1.48E-06% but the second proxy for financial innovation, LM2/M1 and CPI affect economic growth negatively and significantly in the long-run. This means that, in the long-run a 1% increase in LM2/M1 decreases Economic Growth by about 0.74%, this could be due to the fact that in the long run, an increase in the ratio did not translate into economic growth. In fact, as the ratio rises, so does growth. The result is somehow surprising, because an increase in the ratio should actually be promoting economic growth. This shows that the increase in money supply did not result in immediate economic growth. The long-term association between financial innovation and economic growth is negative. Added to this, a 1% increase in CPI decreases Economic Growth by about 0.001%.

Tyavambiza and Nyagara (2015) used the M3 to GDP ratio to show that broad money has a detrimental influence on economic growth, which is consistent with this study's findings. Nonperforming loans, according to Romer (2010, 2012), are a factor that has a detrimental influence on economic growth because financial institutions lose faith in their customers' credit worthiness. Credit to household's leads to consumption, but credit to enterprises is positively connected with economic growth (Beck et al., 2012). Providing more of the former could lead to negative economic growth. Ogunmuyiwa and Ekone (2010), discovered that the money supply M2 and economic growth had a negative relationship.

Many macroeconomic theories predict that increasing the money supply will lower interest rates in the economy. A rise in the money supply means that more money is accessible in the economy for borrowing. According to the law of demand, an increase in supply tends to lower the cost of borrowing money. When borrowing money becomes easier, consumption and lending (and borrowing) rates tend to rise.

Higher rates of consumption, lending, and borrowing can be linked to a rise in an economy's overall output, expenditure, and, presumably, GDP in the short run. Although this is a common expectation (and one that economists predict), it is not always the case.

A rise in the money supply's long-term impact is more difficult to anticipate. Historically, a rise in the money supply, or anything that results in a large amount of liquidity entering the economy, has had a strong tendency to artificially enhance the prices of assets such as homes and equities. This misallocation of capital can result in waste and speculative investments, leading to a quick rise in asset prices followed by a contraction or an economic recession, or a major drop in economic activity.

During the expansionary monetary policy, the required reserve rate and discount rate get reduced, and therefore, productivity and profitability increase. As a result of the increased money supply, the investment and consumption patterns are revitalized, resulting in increased revenue. Increasing the money supply also lowers the cost of funds, resulting in cheaper funds. As a result of these repercussions, the borrower's capacity to pay the outstanding debt on time increases, and the bank's credit risk exposure decreases. Money supply and nonperforming loans are negatively connected in this case. However, during periods of economic stagnation or recession, financial intermediaries' credit risk rises as the economy struggles to sustain targeted levels of employment, prices, and outputs. On the other hand, increased economic activity leads to an increase in cash volume for both households and corporations during an economic boom. Again, increased lender and borrower confidence encourages new investment, and increased borrower income enhances their ability to repay outstanding debt. In the absence of nonperforming loans, the money supply and growth are positively associated.

Furthermore, an increase in money supply causes the value of the birr to fall, making foreign items more expensive and domestic goods cheaper. For example; Steel, vehicles, and construction materials, for example can all be more expensive. As a result of the higher material and construction costs, home building and real estate

prices rise. The money supply has an inflationary effect on economic growth in this case.

5.5 Estimation of ARDL model (short run) and Error correction results

The conditions necessary for the ARDL regression model are met according to the pre-estimation test. As a result, the ARDL regression model was used to analyze the causation between financial innovation, monetary policy, and economic growth in this study. As stated above the study identified 2 modes; these are the two proxy variables of financial innovation (Broad to narrow money ratio and domestic credit to the private sector).The optimal length of the model is 2, if the optimal lag length is 2, then the maximum lag length of the short-run model (the model in first differences) will be smaller than two or at most one. This is because the short-run model is set up in first differences.

Table 5.5(a): Estimating short run ARDL model using AIC by taking LDCPS as financial innovation variable. Model 1: LDCPS as FI variable

Dependent Variable: RGDPPCGR
Selected Model: ARDL(1, 0, 1, 1, 0, 0, 0, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RGDPPCGR(-1)	-0.167705	0.181600	-0.923488	0.3639
CPI	-0.012380	0.004416	-2.803232	0.0093
EXR	0.041074	0.020328	2.020519	0.0534
EXR(-1)	-0.036625	0.020523	-1.784629	0.0856
GEX	1.86E-05	4.65E-06	4.005381	0.0004
GEX(-1)	-2.10E-05	4.64E-06	-4.518352	0.0001
IS	-0.009282	0.016659	-0.557174	0.5820
LDCPS	0.006707	0.046046	0.145657	0.8853
GFCF	2.83E-06	4.85E-07	5.845409	0.0000
TOP	0.484742	0.517181	0.937278	0.3569
C	-0.126655	0.337852	-0.374885	0.7107

Prob.*: the significance of each variable at 5% level of significance.

Source: Own computation

According to the results revealed in table 5.5 (a), the percentage change in GEX affect economic growth positively in the short-run. The finding of the short run effect at level is consistent with the Keynesian theory that there is an improvement of economic growth with the increasing government spending (Vane, 2005).

In the same manner the percentage change in LDCPS and TOP affect economic growth positively but insignificantly at 5% level, whereas GFCF has significant relationship with growth in the short run at level, which is1% increase in GFCF increases economic growth by 2.83E-06%. On the other side, CPI and IS are negatively associated with economic growth, however, CPI is significant whereas IS became insignificant at 5% significance level. A percentage change in CPI decreases economic growth by -0.012%, the occurrence would be because as inflation increases, the purchasing power of money decreases thereby reducing growth, especially if it becomes hyperinflationary. Added to this, monetary proxy variables EXR has positive and significant relationship with growth, in the short-run.

The log of domestic credit to the private sector (LDCPS), which is the first proxy to financial innovation has a positive but statistically insignificant impact on economic growth in the short run, this could be due to the fact that an increase in bank credit without consideration of its distribution in the economy may give false analysis that the economy is increasing. However, the estimation result in table above indicates that high access to credit has no relationship to economic growth in the short-run. Furthermore, if the results could have been heavily influenced by the study era; for example, if Ethiopia compensates its public expenditure through seigniorage, this leads to hyperinflation. Added to this the finding is consistent with the empirical research work (Michalopouloset.al. 2011; Ndlovu, 2013).

Table 5.5(b): Estimating short run ARDL model using AIC by taking LM2/M1 as financial innovation variable. Model 2: LM2/M1 as FI variable

Dependent Variable: RGDPPCGR
Selected Model: ARDL(1, 0, 1, 1, 1, 1, 0, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RGDPPCGR(-1)	-0.343801	0.194916	-1.763842	0.0905
CPI	-0.012411	0.003958	-3.135936	0.0045
EXR	0.051337	0.021756	2.359683	0.0268
EXR(-1)	-0.041783	0.022326	-1.871464	0.0735
GEX	1.46E-05	4.97E-06	2.929749	0.0073
GEX(-1)	-1.53E-05	5.35E-06	-2.867326	0.0085
IS	0.002322	0.018855	0.123152	0.9030
IS(-1)	0.027696	0.020848	1.328468	0.1965
LM2M1	-0.010642	0.497965	-0.021371	0.9831
LM2M1(-1)	-0.867508	0.474352	-1.828825	0.0799
GFCF	2.84E-06	4.67E-07	6.073959	0.0000
TOP	-0.174071	0.665423	-0.261594	0.7959
TOP(-1)	0.739649	0.617399	1.198008	0.2426
C	0.091203	0.108966	0.836985	0.4109

Prob.*: the significance of each variable at 5% level of significance.

Source: Own computation

The second proxy variable for financial innovation is LM2/M1, has a negative coefficient and insignificant sign in the short run at level and at the first lag period. This suggests that increased money supply and financial innovation have a negative impact on Ethiopia's economic growth. Added to this the insignificance of money supply could be due to the fact that, the rise in the money supply did not translate into economic growth in the short run. This outcome is consistent with (Bara et al., 2016 and Ogunmuyiwa and Ekone, 2010).

The variables GEX, EXR and GFCF have positive and significant relationship with growth, whereas CPI has negative and significant relationship with growth as the result revealed from table 5.5(b), which is a 1% increase in government expenditure increases economic growth by 1.46E-05%, 1% increase in EXR increases economic growth by 0.051%, 1% increase in GFCF increases economic growth by 2.84E-06%,

respectively. On the other side, TOP is negatively associated with Economic Growth and statistically insignificant at 5% level of significance.

Table 5.6: ARDL Error Correction Regression Result

	Coefficient	*t*-statistic	Standard error	Prob.
Model 1: CointEq(-1)*	-1.512515	0.122189	-12.37846	0.0000
Model 2: CointEq(-2)*	-1.879661	0.128483	-14.62961	0.0000

CointEq= co- integrating equation, which is the ECM

Source: Own computation

The estimated coefficient on the error correction term indicates how quickly the equilibrium is restored over time. The coefficient of the error correction term and its prob-value are indicators of the presence of long-run relationship (Pahlavani, Wilson, & Worthington, 2005). These results reveal that both of the models_ (models 1 and 2) fulfill the criterion proposed by Pahlavani et al. (2005) about the error correction term. It indicates that the ECT (-1) value has a negative sign. According to the report from the table 5.6, the error correction coefficient, estimated for both models, is highly significant, has the correct negative sign and implying a very high speed of adjustment to equilibrium but in an oscillatory manner. Furthermore, the coefficient of the error term (ECT-1) indicates that when there is a shock to a steady state relationship, the deviation from the long run equilibrium level of real GDP per capita in the current period is corrected by 151 % and 188 % in the next period for models 1 and 2, respectively, to restore equilibrium. The estimation result is somehow exceptional because the magnitude of the ECT term is usually between 0 and -1, but this is not benchmark, it can be between -1 and -2 (Hassan, Zaman, &Gul, 2015;Narayan & Smyth, 2006;Pahwa, 2017;Shittu, Yemitan, &Yaya, 2012;Sinha &Shahbaz, 2018;Zhang, Wang, & Wang, 2018). The value of ECT spanning between -1 and -2 implies that the ECT does not directly converge to equilibrium but there is fluctuation around the long-run value in a dampening and oscillatory manner, before rapidly converging to long-run equilibrium ,however, once this process is complete, convergence to the equilibrium path is rapid (Narayan and Smyth 2006).

5.6 Pair wise grander causality test

After examining, in the earlier sections, the unit root and co-integration in the time series setting, the next step is to know the existence of causality between variables. And for this purpose this study applied Pair wise Granger Causality test.

The long-run causality to be ascertained according to ECT should be negative and statistically significant. It is revealed (Table 5.6) that in the equation of RGDPPCGr both models error correction term (ECT) is negative and statistically significant. These findings indicate that there is long run causality between economic growth and other determinants, namely, the proxy of monetary policy_(Nominal Exchange rate and interest spread), Macroeconomic variables_(consumer price index, trade openness, government expenditure, gross fixed capital formation), and financial innovation proxy variables(the ratio of broad to narrow money and domestic credit to the private sector). According to Appendix VII, at 5% level of significance there is unidirectional causality running from financial innovation proxy variables to economic growth, i.e.,(LDCPS→RGDPPCGr and LM2/M1→RGDPPCGr),Monetary policy proxy variables to growth,i.e.,(EXR →RGDPPCGr), financial innovation proxy variables to Monetary policy proxy variables, i.e., which is (LDCPS→EXR, LM2M1→EXR), macroeconomic variables such as (GFCF, GEX, CPI, EXR) Granger-causes RGDPPCGr, (LDCPS and GFCF) Granger-causes GEX, (EXR and GEX) Granger-cause CPI. Furthermore, there exist bidirectional causality between GEX and GFCF.

5.7 Hetroscedasticity Test/ARCH

In order to check the presence of heteroscedasticity, this study employed Breusch-Pagan-Godfrey Test. Accordingly, the result obtained from the test for both models shows that there is no problem of Heteroscedasticity because the Prob. Chi-Square (P-value=0.42>0.05 and P- value=0.94>0.05 for models 1 and 2 respectively) is greater than the 5% significance level. Therefore there is no heteroscedasticity problem and accept the null hypothesis of homoscedasticity.

Table 5.7 (a): Model 1: Heteroskedasticity Test_ (Breusch-Pagan-Godfrey)/ARCH

F-statistic	1.008002	Prob. F(16,20)	0.4863
Obs*R-squared	16.51729	Prob. Chi-Square(16)	0.4175
Scaled explained SS	4.382261	Prob. Chi-Square(16)	0.9981

Table 5.7(b) : Model 2: Heteroskedasticity Test_(Breusch-Pagan-Godfrey)/ARCH

F-statistic	0.347824	Prob. F(12,24)	0.9698
Obs*R-squared	5.481451	Prob. Chi-Square(12)	0.9399
Scaled explained SS	2.027067	Prob. Chi-Square(12)	0.9994

Source: Own computation

5.8 Serial Correlation Test

The Breusch-Godfrey Serial Correlation LM test was utilized for the examination of the autocorrelation test. Both models do not have an autocorrelation problem. The Prob. Chi-Square (P-value=0.06>0.05 and P-value =0.07>0.05 for model 1 and 2 respectively) which is greater than 5% level of significance. Therefore accept the null hypothesis of no serial correlation.

Table 5.8(a): Model 1: Breusch-Pagan/Godfrey Serial Correlation LM Test

F-statistic	1.561484	Prob. F(2,18)	0.2370
Obs*R-squared	5.470341	Prob. Chi-Square(2)	0.0649

Table 5.8(b) Model 2: Breusch-Pagan/Godfrey Serial Correlation LM Test

F-statistic	1.827518	Prob. F(2,22)	0.1844
Obs*R-squared	5.271336	Prob. Chi-Square(2)	0.0717

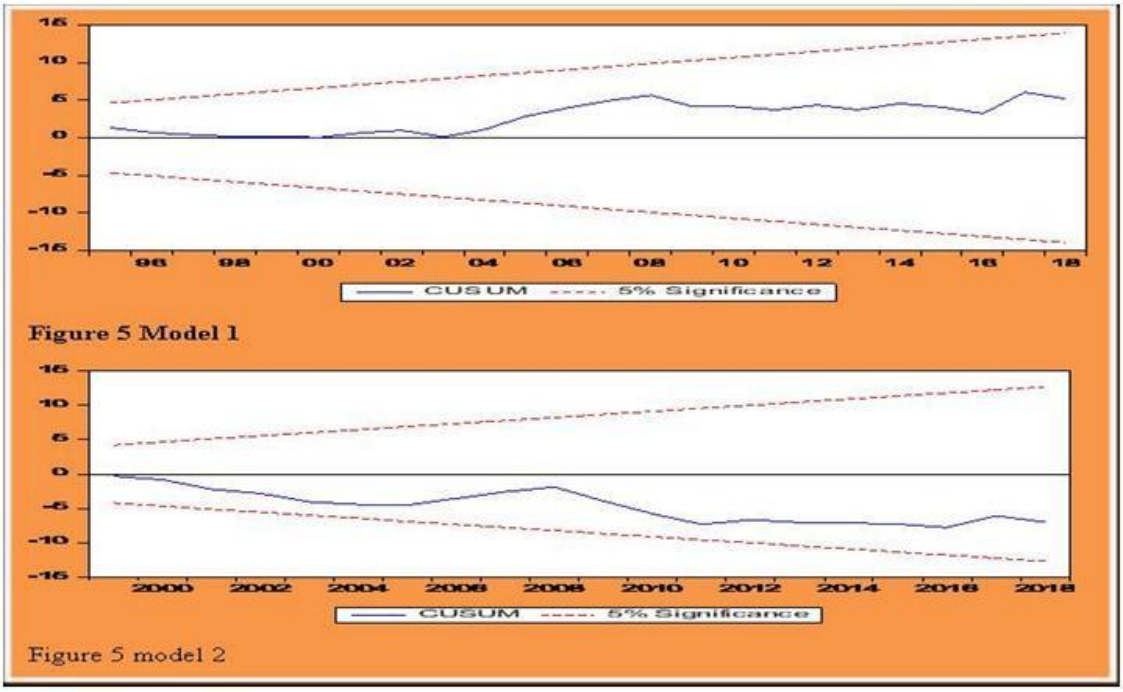
Source: Own computation

5.9 Stability Test

The cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) tests were used to assess the stability of long run

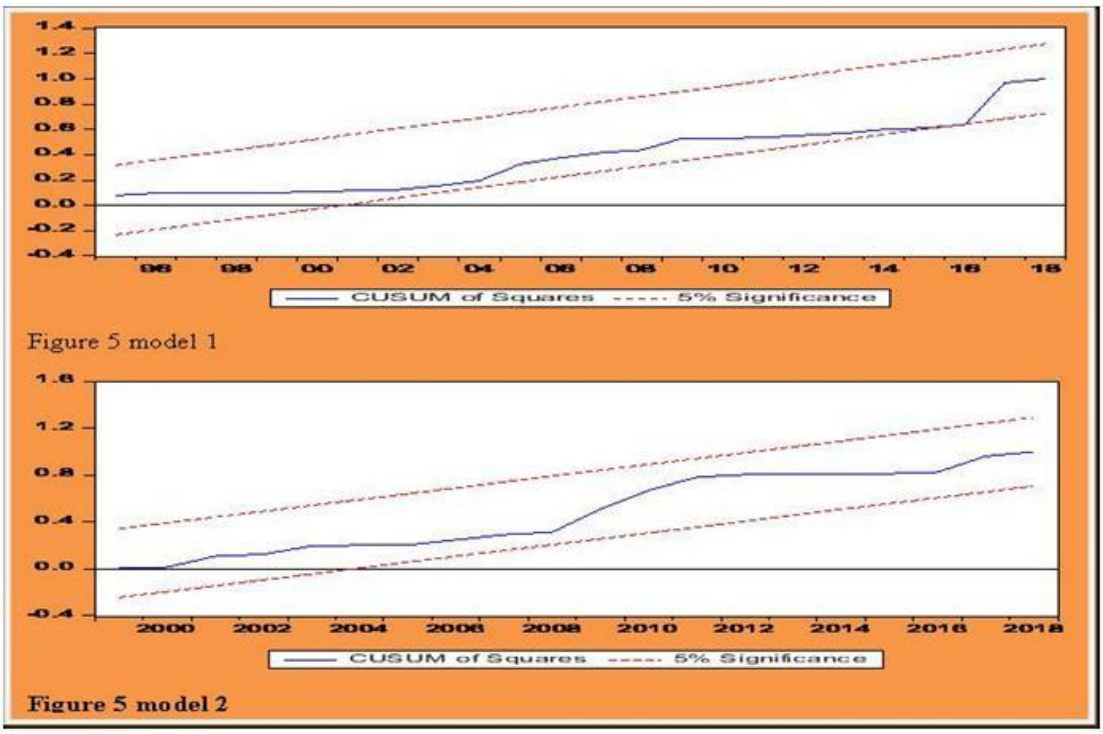
estimates in addition to the diagnostic tests mentioned above. Both Pesaran and Shin (1999, 2001) advocate such tests. The CUSUM square tests are used to determine whether the model's parameter estimates are stable or not. The computed coefficients are said to be stable if the plot of CUSUM and CUSUMSQ statistic moves between the critical boundaries (5% significance level). Because the lines are within the bounds of the 5% significance level, there is no structural break (instability), as shown in graph figure 5.1.

As can be seen from the figure for both models, the CUSUM test plot did not cross the critical boundaries. Likewise, the CUSUMSQ test demonstrates that the graphs do not cross the lower and upper critical limits. As a result, we can conclude that the estimated results are stable and that no structural break exists. Consequently the results of the estimated model are consistent, reliable and efficient.



Source: Own computation

Figure 5.1(a): Plot of cumulative sum of recursive residuals (CUSUM)

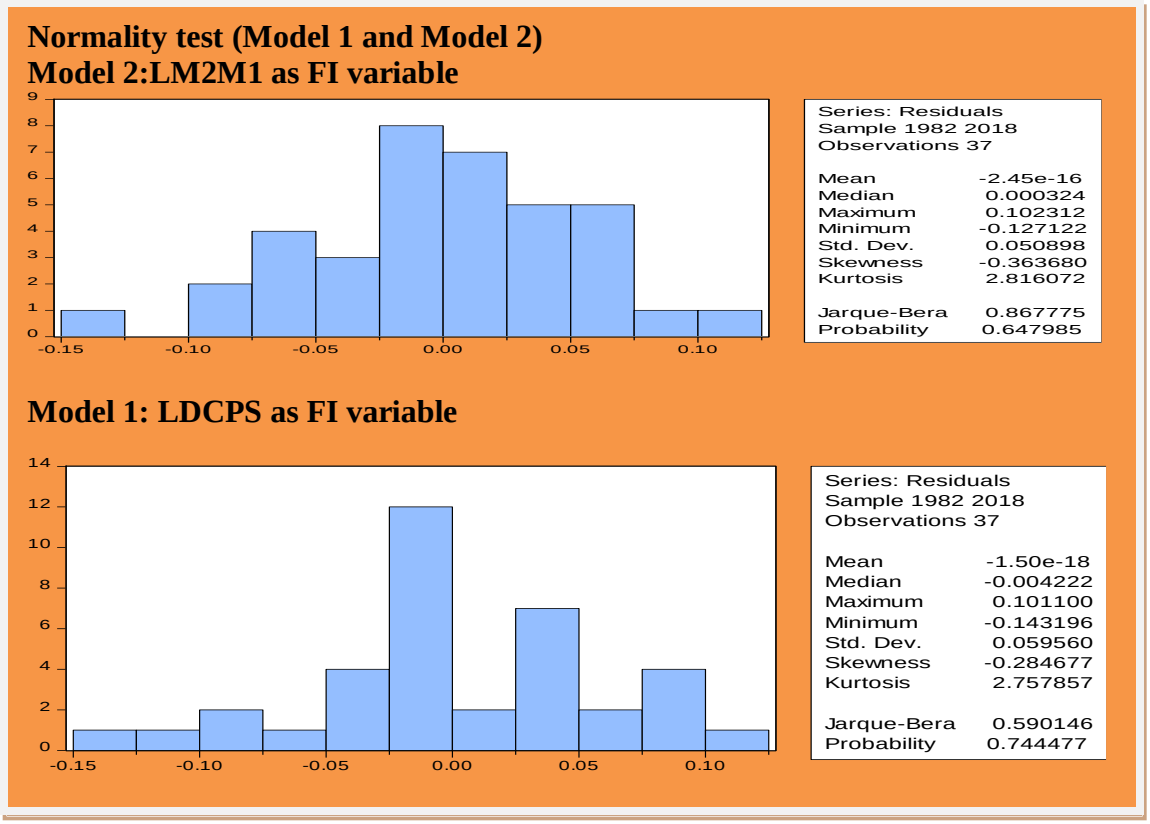


Source: Own computation

Figure 5.1(b): Plot of cumulative sum of squares of recursive residuals (CUSUMSQ)

5.10 Normality test

When the estimated probability value (estimated level of significance) is greater than the 5% significance level, the residual or error term is normally distributed. The probability value of this study is 64% for model 2 and 74% for model 1, which is considerably over the required standards for normality testing, as revealed in the Jarque-Bera test (figure 5.2). As a result, the study's error term is normally distributed. Because the p-value for the Jaque-Berra normalcy test is greater than the standard significance level (i.e. Model 2: 0.64>0.05 and Model 1:0.74>0.05), the null hypothesis that the residuals are normally distributed cannot be rejected.



Source: Own computation

Figure 5. 2: Plot of Normality Test

CHAPTER SIX: CONCLUSION, RECCOMENDATION AND RESEARCH IMPLICATIONS

6.1 Conclusion

With this study, the researcher examines the relationship among financial innovation, monetary policy and economic growth (real GDP per capita growth rate) in Ethiopia by taking two proxy variables to capture financial innovation (using the broad to narrow money ratio and domestic credit provided to the private sector).

The objective of the study is to explore new insight about financial innovation along with economic growth and monetary policy, which use for the first time testing on the Ethiopian economy to capture the nexus with economic growth and monetary policy. For empirical investigations, the study employed newly developed ARDL bound testing and the error correction model (ECM) to capture long-run Co-integration among financial innovation, monetary policy, and economic growth.

Firstly, the study tried to test the time series properties of the variables before applying the ARDL model and all the variables of interest fulfill stationarity properties using the ADF and PP tests. As a result, all the variables of interest became stationary at first difference with trend and intercept except real GDP per capita growth (the dependent variable stationary at level). Secondly, after testing the stationarity property , the study intend to estimate the optimal lag length (k) which is one of the critical point in econometric modeling using VAR lag order selection criterion. Using the Akaike Information Criteria (AIC), this study determined the model's Optimal Lag Length (k) which as 2.

Thirdly, this study applied the ARDL model also known as bound test approach and error correction model (ECM). As a result the bound test (F-statistic) value is larger than the upper bound critical value, which indicates there is a long run relationship between real GDP per capita, and its determinants (such as financial innovation proxy variables, gross fixed capital formation, trade openness, interest spread, nominal exchange rate, consumer price index, and government expenditure)during the study period. At last, to check the verifiability and/ adequacy of the estimated model the

study employed some diagnostic tests such as serial correlation, normality, and hetroscedasticity test. Moreover, the study employed cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) test to test the stability of the model estimates. As a result the diagnostics tests revealed that there is no evidence of serial correlation, the residual is normally distributed and no evidence of hetroscedasticity problem. Added to this, the model estimates are stable and has no structural break. This study also runs the Granger causality test under the pair wise Granger causality framework to capture the directional causality between financial innovation, monetary policy and economic growth in Ethiopia.

The empirical findings of this study revealed that gross fixed capital formation ,is found to have positive impact on Ethiopian economic growth during the study period spanning from 1980-2018 and statistically significant both in the short run and in the long run. The positive association of gross fixed capital formation with growth is true for both proxy variables of financial innovation. The results of the ARDL bounds test differ depending on the measure of financial innovation utilized and the time period (short or long run).The financial innovation proxy variables, domestic credit to private sector (LDCPS), has a positive association with economic growth in the short run but the association of LDCPS was insignificant in the short run. In the short run, the ratio of broad to narrow money (LM2/LM1) has a negative effect on growth, although was insignificant. Furthermore, the ratio of broad to narrow money (LM2/M1) has negative and statistically significant relationship with growth in the long run. The government expenditure has negative relationship with growth in the long run while using domestic credit to the private sector as proxy for financial innovation, however, have positive relationship in the short run for both proxy variables. Consumer price index has negative relationship with economic growth during the study period in both long run and short run for both proxy measures of financial innovation.

The Granger causality tests based on the Pair wise Granger Causality framework revealed that there is a bi-directional causality between macroeconomic determinants

(such as gross fixed capital formation and government expenditure), however there is unidirectional causality running from financial innovation (captured by broad to narrow money ratio and domestic credit to the private sector) to economic growth in Ethiopia during the study period. The study found out that there is unidirectional causality running from monetary policy (captured by interest spread and exchange rate) to growth, financial innovation to monetary policy. Macroeconomic variables such as (gross fixed capital formation, government expenditure, consumer price index, nominal exchange rate) Granger-causes economic growth (RGDPPCGr). In addition one of the financial innovation proxy variable, which is domestic credit to the private sector and gross fixed capital formation Granger-causes government expenditure.

In a nutshell, in the short run financial innovation has no association with growth for both proxy measures of financial innovation; however, financial innovation has negative association with economic growth in the long run, when we consider broad to narrow money ratio as financial innovation proxy measure. The causality result shows that in the long run, financial innovation can lead economic growth, a stable monetary policy can lead growth and financial innovation products can affect the monetary policy operation.

6.2 Recommendations and Research implication

In a nutshell, the outcomes of this study suggested that future research should focus on the long-run equilibrium relationship between financial innovation, monetary policy, and economic growth in Ethiopia. So, it is recommended that future research should include longer time series data sets than the data used in this study.

In investigating the relationship between financial innovation, monetary policy, and economic growth: this study incorporates two proxy variables. Therefore, it is recommended that further research should incorporate additional proxy variables for financial innovation such as mobile banking penetration; market based financial developments, improved financial products, new technological products_(such as

ATM, internet banking) etc that would play a role in capturing financial innovation and the nexus with growth.

Because gross fixed capital formation has a positive relationship with growth, the Ethiopian government should take steps to increase investment, particularly private investment, which is the "key driver" that drives demand, creates capacity, increases labor productivity, introduces new technology, allows for creative destruction, and generates jobs. This will help the country's economy thrive.

Finally, because inflation has a negative influence on economic growth, the government should implement appropriate monetary policy interventions to lower inflation, which has a negative impact on economic growth.

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APPENDIXES

Appendix I: Annual Exchange rate 1980-2018

Period	average Birr/USD
1980/81-1992	2.0700
1992/93	2.8048
1993/94	5.7744
1994/95	6.2505
1995/96	6.3178
1996/97	6.5007
1997/98	6.8817
1998/99	7.5111
1999/00	8.1426
2000/01	8.3279
2001/02	8.5425
2002/03	8.5809
2003/04	8.6197
2004/05	8.6518
2005/06	8.6810
2006/07	8.7943
2007/08	9.2441
2008/09	10.4205
2009/10	12.8909
2010/11	16.1178
2011/12	17.2536
2012/13	18.19471
2013/14	19.0748

2014/15	20.0956
2015/16	21.1059
2016/17	22.4137
2017/18	26.1082

Appendix II :VAR Lag Order Selection Criteria

Endogenous variables: RGDPPCGR CPI EXR GEX IS LDCPS LM2M1 GFCF TOP
Exogenous variables: C
Date: 05/15/22 Time: 17:52
Sample: 1980 2018
Included observations: 37

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-994.5746	NA	2.93e+12	54.24727	54.63912	54.38542
1	-580.1438	604.8448	49366.63	36.22399	40.14244*	37.60543
2	-445.0306	131.4616*	6183.456*	33.29895*	40.74400	35.92368*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Appendix III: ARDL short run estimates LDCPS as FI variable

Model 1
Dependent Variable: RGDPPCGR
Method: ARDL
Date: 05/15/22 Time: 17:56
Sample (adjusted): 1982 2018
Included observations: 37 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): CPI EXR GEX IS LDCPS GFCF TOP
Fixed regressors: C
Number of models evalulated: 4374
Selected Model: ARDL(2, 0, 1, 2, 0, 0, 0, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RGDPPCGR(-1)	-0.225131	0.177699	-1.266928	0.2173
RGDPPCGR(-2)	-0.287384	0.193005	-1.488997	0.1495
CPI	-0.015345	0.004855	-3.160678	0.0042
EXR	0.032935	0.020692	1.591671	0.1245
EXR(-1)	-0.028907	0.021495	-1.344807	0.1913

GEX	1.95E-05	4.54E-06	4.294726	0.0002
GEX(-1)	-1.18E-05	7.50E-06	-1.571277	0.1292
GEX(-2)	-1.22E-05	7.60E-06	-1.602965	0.1220
IS	-0.008409	0.016268	-0.516861	0.6100
LDCPS	0.030565	0.050386	0.606614	0.5498
GFCF	3.33E-06	5.18E-07	6.427215	0.0000
TOP	0.487835	0.504834	0.966328	0.3435
C	-0.308292	0.372180	-0.828340	0.4156

R-squared	0.897745	Mean dependent var	0.057568
Adjusted R-squared	0.846617	S.D. dependent var	0.186256
S.E. of regression	0.072945	Akaike info criterion	-2.128371
Sum squared resid	0.127705	Schwarz criterion	-1.562373
Log likelihood	52.37486	Hannan-Quinn criter.	-1.928830
F-statistic	17.55885	Durbin-Watson stat	2.204016
Prob(F-statistic)	0.000000		

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

Appendix IV: short run estimates LM2/M1 as FI variable

Model 2
Dependent Variable: RGDPPCGR
Method: ARDL
Date: 05/15/22 Time: 17:56
Sample (adjusted): 1982 2018
Included observations: 37 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): CPI EXR GEX IS LM2M1 GFCF TOP
Fixed regressors: C
Number of models evalulated: 4374
Selected Model: ARDL(2, 0, 1, 1, 2, 1, 0, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RGDPPCGR(-1)	-0.462213	0.195479	-2.364513	0.0283
RGDPPCGR(-2)	-0.417448	0.224810	-1.856892	0.0781
CPI	-0.016497	0.004808	-3.430916	0.0026
EXR	0.074663	0.027372	2.727746	0.0130
EXR(-1)	-0.043105	0.025151	-1.713833	0.1020
GEX	1.13E-05	5.07E-06	2.223154	0.0379
GEX(-1)	-1.09E-05	5.84E-06	-1.861670	0.0774
IS	0.006055	0.018434	0.328460	0.7460
IS(-1)	0.023348	0.020105	1.161309	0.2592
IS(-2)	0.024759	0.020500	1.207793	0.2412
LM2M1	0.149143	0.604579	0.246689	0.8077
LM2M1(-1)	-1.545526	0.543635	-2.842950	0.0101
GFCF	2.79E-06	5.10E-07	5.463984	0.0000
TOP	-0.697818	0.677310	-1.030278	0.3152
TOP(-1)	0.085670	0.668473	0.128157	0.8993
TOP(-2)	1.078474	0.698332	1.544356	0.1382
C	0.192908	0.138615	1.391679	0.1793

R-squared	0.925323	Mean dependent var	0.057568
Adjusted R-squared	0.865581	S.D. dependent var	0.186256
S.E. of regression	0.068287	Akaike info criterion	-2.226456
Sum squared resid	0.093263	Schwarz criterion	-1.486305
Log likelihood	58.18944	Hannan-Quinn criter.	-1.965518
F-statistic	15.48874	Durbin-Watson stat	2.288908
Prob(F-statistic)	0.000000		

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

Appendix V: ARDL Long Run Form and Bounds Test LDCPS as FI variable

Model 1
ARDL Long Run Form and Bounds Test
Dependent Variable: D(RGDPPCGR)
Selected Model: ARDL(2, 0, 1, 2, 0, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 05/15/22 Time: 17:57
Sample: 1980 2018
Included observations: 37

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.308292	0.372180	-0.828340	0.4156
RGDPPCGR(-1)*	-1.512515	0.281675	-5.369721	0.0000
CPI**	-0.015345	0.004855	-3.160678	0.0042
EXR(-1)	0.004028	0.018098	0.222587	0.8257
GEX(-1)	-4.46E-06	1.75E-06	-2.553941	0.0174
IS**	-0.008409	0.016268	-0.516861	0.6100
LDCPS**	0.030565	0.050386	0.606614	0.5498
GFCF**	3.33E-06	5.18E-07	6.427215	0.0000
TOP**	0.487835	0.504834	0.966328	0.3435
D(RGDPPCGR(-1))	0.287384	0.193005	1.488997	0.1495
D(EXR)	0.032935	0.020692	1.591671	0.1245
D(GEX)	1.95E-05	4.54E-06	4.294726	0.0002
D(GEX(-1))	1.22E-05	7.60E-06	1.602965	0.1220

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-0.010145	0.004161	-2.438047	0.0225
EXR	0.002663	0.011877	0.224244	0.8245
GEX	-2.95E-06	1.15E-06	-2.571378	0.0168
IS	-0.005559	0.010914	-0.509352	0.6152
LDCPS	0.020208	0.033911	0.595918	0.5568
GFCF	2.20E-06	4.11E-07	5.350775	0.0000

TOP	0.322532	0.345553	0.933380	0.3599
C	-0.203827	0.251374	-0.810854	0.4254

EC = RGDPPCGR - (-0.0101*CPI + 0.0027*EXR -0.0000*GEX -0.0056*IS + 0.0202*LDCPS + 0.0000*GFCF + 0.3225*TOP -0.2038)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	14.31016	10%	1.92	2.89
K	7	5%	2.17	3.21
		2.5%	2.43	3.51
		1%	2.73	3.9
			Finite Sample:	
Actual Sample Size	37		n=40	
		10%	2.152	3.296
		5%	2.523	3.829
		1%	3.402	5.031
			Finite Sample: n=35	
		10%	2.196	3.37
		5%	2.597	3.907
		1%	3.599	5.23

Appendix VI: ARDL Long Run Form and Bounds Test LM2/M1 as FI variable

Model 2

ARDL Long Run Form and Bounds Test
Dependent Variable: D(RGDPPCGR)
Selected Model: ARDL(2, 0, 1, 1, 2, 1, 0, 2)
Case 2: Restricted Constant and No Trend
Date: 05/15/22 Time: 17:58
Sample: 1980 2018
Included observations: 37

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.192908	0.138615	1.391679	0.1793
RGDPPCGR(-1)*	-1.879661	0.327769	-5.734721	0.0000
CPI**	-0.016497	0.004808	-3.430916	0.0026
EXR(-1)	0.031558	0.019534	1.615580	0.1219
GEX(-1)	4.04E-07	2.28E-06	0.177323	0.8610
IS(-1)	0.054162	0.032567	1.663105	0.1119
LM2M1(-1)	-1.396383	0.570750	-2.446576	0.0238
GFCF**	2.79E-06	5.10E-07	5.463984	0.0000
TOP(-1)	0.466326	0.892276	0.522625	0.6070
D(RGDPPCGR(-1))	0.417448	0.224810	1.856892	0.0781

D(EXR)	0.074663	0.027372	2.727746	0.0130
D(GEX)	1.13E-05	5.07E-06	2.223154	0.0379
D(IS)	0.006055	0.018434	0.328460	0.7460
D(IS(-1))	-0.024759	0.020500	-1.207793	0.2412
D(LM2M1)	0.149143	0.604579	0.246689	0.8077
D(TOP)	-0.697818	0.677310	-1.030278	0.3152
D(TOP(-1))	-1.078474	0.698332	-1.544356	0.1382

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-0.008776	0.003169	-2.769643	0.0118
EXR	0.016789	0.010042	1.671834	0.1101
GEX	2.15E-07	1.22E-06	0.176594	0.8616
IS	0.028815	0.017180	1.677243	0.1091
LM2M1	-0.742891	0.327122	-2.270992	0.0343
GFCF	1.48E-06	3.04E-07	4.869232	0.0001
TOP	0.248090	0.483501	0.513113	0.6135
C	0.102629	0.076533	1.340982	0.1950

EC = RGDPPCGR - (-0.0088*CPI + 0.0168*EXR + 0.0000*GEX + 0.0288*IS
-0.7429*LM2M1 + 0.0000*GFCF + 0.2481*TOP + 0.1026)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	19.15940	10%	1.92	2.89
K	7	5%	2.17	3.21
		2.5%	2.43	3.51
		1%	2.73	3.9
			Finite Sample: n=40	
Actual Sample Size	37			
		10%	2.152	3.296
		5%	2.523	3.829
		1%	3.402	5.031
			Finite Sample: n=35	
		10%	2.196	3.37
		5%	2.597	3.907
		1%	3.599	5.23

Appendix VII: Pair wise Granger Causality Tests

Pairwise Granger Causality Tests
Date: 05/12/22 Time: 13:47
Sample: 1980 2018
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CPI does not Granger Cause RGDPPCGR	37	7.82061	0.0017
RGDPPCGR does not Granger Cause CPI		2.19488	0.1279
EXR does not Granger Cause RGDPPCGR	37	6.40522	0.0046
RGDPPCGR does not Granger Cause EXR		2.37440	0.1093
GEX does not Granger Cause RGDPPCGR	37	14.3362	4.E-05
RGDPPCGR does not Granger Cause GEX		27.2591	1.E-07
IS does not Granger Cause RGDPPCGR	37	2.40857	0.1061
RGDPPCGR does not Granger Cause IS		1.54062	0.2297
LDCPS does not Granger Cause RGDPPCGR	37	5.00217	0.0129
RGDPPCGR does not Granger Cause LDCPS		0.30868	0.7366
LM2M1 does not Granger Cause RGDPPCGR	37	5.80657	0.0071
RGDPPCGR does not Granger Cause LM2M1		1.49572	0.2393
GFCF does not Granger Cause RGDPPCGR	37	9.83266	0.0005
RGDPPCGR does not Granger Cause GFCF		0.14065	0.8693
TOP does not Granger Cause RGDPPCGR	37	0.73129	0.4892
RGDPPCGR does not Granger Cause TOP		1.23780	0.3035
EXR does not Granger Cause CPI	37	4.26169	0.0229
CPI does not Granger Cause EXR		2.47149	0.1004
GEX does not Granger Cause CPI	37	0.20888	0.8126
CPI does not Granger Cause GEX		15.8686	2.E-05
IS does not Granger Cause CPI	37	1.29221	0.2886
CPI does not Granger Cause IS		0.05585	0.9458
LDCPS does not Granger Cause CPI	37	6.27609	0.0050
CPI does not Granger Cause LDCPS		0.08967	0.9145
LM2M1 does not Granger Cause CPI	37	2.99257	0.0644
CPI does not Granger Cause LM2M1		1.60912	0.2158
GFCF does not Granger Cause CPI	37	1.56938	0.2238
CPI does not Granger Cause GFCF		0.80423	0.4563
TOP does not Granger Cause CPI	37	0.55584	0.5790
CPI does not Granger Cause TOP		1.41879	0.2568

GEX does not Granger Cause EXR	37	0.97583	0.3878
EXR does not Granger Cause GEX		3.84788	0.0318
IS does not Granger Cause EXR	37	0.11533	0.8914
EXR does not Granger Cause IS		0.66200	0.5227
LDCPS does not Granger Cause EXR	37	2.42489	0.1046
EXR does not Granger Cause LDCPS		3.24057	0.0523
LM2M1 does not Granger Cause EXR	37	0.40273	0.6718
EXR does not Granger Cause LM2M1		7.91837	0.0016
GFCF does not Granger Cause EXR	37	4.50731	0.0189
EXR does not Granger Cause GFCF		1.25343	0.2992
TOP does not Granger Cause EXR	37	0.80093	0.4577
EXR does not Granger Cause TOP		0.41001	0.6671
IS does not Granger Cause GEX	37	0.80930	0.4541
GEX does not Granger Cause IS		0.12549	0.8825
LDCPS does not Granger Cause GEX	37	3.44121	0.0443
GEX does not Granger Cause LDCPS		0.17202	0.8427
LM2M1 does not Granger Cause GEX	37	1.00455	0.3775
GEX does not Granger Cause LM2M1		0.45231	0.6402
GFCF does not Granger Cause GEX	37	71.8144	1.E-12
GEX does not Granger Cause GFCF		12.4615	0.0001
TOP does not Granger Cause GEX	37	2.23287	0.1237
GEX does not Granger Cause TOP		0.86043	0.4325
LDCPS does not Granger Cause IS	37	1.50297	0.2378
IS does not Granger Cause LDCPS		0.35781	0.7020
LM2M1 does not Granger Cause IS	37	1.56341	0.2250
IS does not Granger Cause LM2M1		0.39598	0.6763
GFCF does not Granger Cause IS	37	0.79332	0.4610
IS does not Granger Cause GFCF		1.05195	0.3610
TOP does not Granger Cause IS	37	2.29015	0.1176
IS does not Granger Cause TOP		2.07006	0.1427
LM2M1 does not Granger Cause LDCPS	37	0.71206	0.4982
LDCPS does not Granger Cause LM2M1		4.10472	0.0259
GFCF does not Granger Cause LDCPS	37	0.44797	0.6429
LDCPS does not Granger Cause GFCF		1.81780	0.1788
TOP does not Granger Cause LDCPS	37	0.00236	0.9976
LDCPS does not Granger Cause TOP		0.09783	0.9071
GFCF does not Granger Cause LM2M1	37	2.64300	0.0866
LM2M1 does not Granger Cause GFCF		1.06413	0.3569

TOP does not Granger Cause LM2M1	37	0.36124	0.6996
LM2M1 does not Granger Cause TOP		0.20572	0.8151
TOP does not Granger Cause GFCF	37	1.31828	0.2817
GFCF does not Granger Cause TOP		0.66877	0.5194

DECLARATION

I, the undersigned, declare that this thesis is my original work, and prepared for the first time using our own knowledge and understanding. Besides all sources and information used in this paper are carefully acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

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Name Signature

Addis Ababa University, Addis Ababa, Ethiopia June, 2022