CHAPTRE ONE : INTRODUCTION

1.1. BACKGROUND OF THE STUDY

The debate over the relationship between financial development and economic growth has been active for many years. The basic question of the debate is whether financial development leads to economic growth or financial development is driven by economic growth. Determining the causal pattern between financial development and economic growth has important implications for policy-makers' decisions to adopt the appropriate growth and development polices.

On one hand Economist argues that financial development and economic growth are not causally related; neither of the two has considerable effects on the other, and correlation between them is the result of a historical peculiarity Graff (2016). On the other hand, others argue that financial development and economic growth do have considerable causal relationship; one is the cause for the other. According to demand- following hypothesis the lack of financial growth is manifestation of the lack of demand for financial services. As the real side of the economy develops, its demands for various new financial services materialize, and these are met rather passively from the financial side. Economic growth enhances financial institution to change and deepen, and as well as credit market grow Jung, (1986)

In contrast to the demand following hypothesis, supply leading hypothesis supposes the direction of causation runs from financial development to economic growth. Financial development is the one induces growth. The other view assumes direction of causation is bi direction financial development to economic growth or economic growth to financial development Graff (2016).

As of the causation between financial development and economic growth, determining the measure of financial depth or development is germane. The measure of financial depth also has been controversial among economists. The common ways to measure financial depth are monetary aggregates, such as M1 or M2, mainly because these aggregates are widely available.

According to Arfanuzzaman (2014) Money is remarkably significant for any economy for its necessity and diverse characteristics. If money supply increases by expansionary monetary policy of central bank, interest rate will go down. Consequently, cash flow and lending activities will be prolonged. As a result, investment will gear up and gross output level is also expected to increase defining a positive relationship between money and economic growth. From the perspective of liquidity, money can be classified in two types. One is Narrow money (M1) and another one is defined as broad money (M2). Besides, if monetization of the economy increases, GDP is also expected to increase startlingly. One of the most important determinants of economic growth is variation in the quantity of money. Therefore broad money will be taken as Indicator of financial depth since it consist of narrow money in it.

More recently, credit to the private sector has been favored as alternative measure. The main advantage of this indicator is that, by excluding credit to the public sector, it measures more accurately the role of financial intermediaries in channeling funds to private sector khan and Senhdji (2000).

Therefore, to advance economic growth developing countries, started to liberalize the financial sector following the 1973 McKinnon and Shaw paradigm. This paradigm argues for the liberalization of the financial sector believes that government intervention in the finance sector, in particular through subsidized interest rates and (favored) credit allocation, not only distorts the financial market but also depresses savings and leads to inefficient investment Alemayehu, (2006).

Like many other developing countries Ethiopian financial system was under the control of central government before the reform period of 1991. Particularly, during the socialist Derg regime (1974 to 1991) all private banks were nationalized. The dominant banks during this period were the two

Governments owned banks called Commercial Bank of Ethiopia (CBE) and Development Bank of Ethiopia (DBE) Alemayehu, (2006).

The Commercial Bank of Ethiopia (CBE) was the outstanding provider of credit from period 1981 to 1990, shared 50%(percent) of total credit , and the Development bank of Ethiopia (

DBE) covered 40% (percent) , but only 10 % (percent) of the credit were covered by the construction bank of Ethiopia.

Proclamation No. 84/1994 allowed the private sector to engage in the banking and insurance businesses. Although the proclamation restricted the financial sector only for Ethiopian nationals, it marked the beginning of a new era in Ethiopia's financial sector. Following this proclamation the country witnessed a proliferation of private banking and insurance companies (Alemayehu, 2006). Now 18 banks are working in the country in which 16 of them are private and 2 public owned with 3,187 branches NBE, (2016).

According to data obtained from national bank of Ethiopia (NBE) the total credit disbursed by the banking sector reached 263,901.6 million birr in 2015/16, the average annual rate of growth of new credit disbursement by the banking sector over 2004/05 – 2015/16 period was 26 %. Public banks cover 65% of the total credit disbursed in 2015/16. The commercial bank of Ethiopia (CBE) is the dominant bank in the country as it covered 53% of the total credit disbursed in 2015/16.

Private Banks all together granted 93,181.7 million birr or 35 % of the total fresh credit disbursed during the same fiscal year. The outstanding loan in the banking sector reached at 263,901.9 million birr by the end of 2015/16 which was higher by 21% over the level in 2014/15. Of the total outstanding credit, claims on public enterprises increased by 936% for the period 2008/2009 to 2015/16. In the same fashion claims on cooperatives and private sector surged by 307% and 386% respectively for the same period.

It is evident that both private and public credit has increased throughout the recent period in the country but literature on the relationship and impact of financial depth and Economic growth in Ethiopia is very scant. Therefore, this study will analyze the casual relationship and impact of financial depth on economic growth.

1.2. STATEMENT OF THE PROBLEM

The causal relationship between financial development and economic growth has been analyzed at length in the literature. However, most literatures are contradicted in their findings and conclusion over the question of the casual relationship between the financial depth and economic growth.

Empirical studies like Chang and Steven (2006) concluded the causation between financial development and economic growth is a uni- directional run from financial development to economic growth which is supported by the theory of supply leading hypothesis that illustrate the creation of financial institutions and markets increase the supply of financial services and thus leads to real economic growth.

But other studies like (Roman, 2012), found that a contradictory finding over the pattern of relationship between financial development and economic growth which concluded as the causation run from economic growth to financial development. The study is consistent with the theory of demand following hypothesis that states as the economy grow, demand is created in the process. Thus, it is economic growth that creates demand for financial development Levine (2005) cited in Caporale et al (2009).

In addition Ankilo and Tajudeen (2010) found different causation for different countries, uni directional relations running from financial development to economic growth in some African countries, while causality runs from economic growth to financial development in other countries. The study also concluded bidirectional causality between financial development and economic growth in Chad, South Africa, Kenya, Sierra Leone and Swaziland.

However it contradicts with Jung, (1986) that concluded that less developed countries have a supply – leading causality pattern and developed countries have demand following hypothesis pattern of causality. Even though empirical studies on the pattern of relationship between financial depth and economic growth in Ethiopia are few, the studies under taken in Ethiopia also

contradict each other. The study by Roman (2012) and Dejene, (2016) are different in their conclusion. Roman's study illustrate that in Ethiopia financial development indicators have a positive and significant relationship with economic growth in the long-run. However, in the short-run the link is weak; the increase in financial development in the long-run has a considerable effect causing an increase in economic growth.

In contrary to the Roman's finding, Dejene (2006) concluded in opposite direction that implies financial development is an essential economic growth driver in Ethiopian economy in the short run. But the financial sector development did not reach the minimal level needed to support long run economic growth.

Therefore, the contradiction among studies is unsettled and this is the main research gap in which result a problem for decision making for policy makers. And to solve this problem this study is enhanced using data of large sample and incorporating both financial depth indicators broad Money and credit to private sector as the growth of domestic product(GDP) .

1.3. OBJECTIVES OF THE STUDY

1.3.1 General Objective

The general objective of this study is to examine the relationship between financial depth and economic growth in Ethiopia.

1.3.2 Specific objectives

- To analyze weather the growth of financial depth causes economic growth
- To analyze the short and long run relationship between financial depth and economic growth.

1.4. HYPOTHESIS OF THE STUDY

The study critically investigates the following research hypothesis regarding the relationship between financial depth and economic growth in Ethiopia.

- The growth of financial depth expected to affect economic growth positively.
- By contrast Economic growth and financial depth expected to have bidirectional relationship.

1.5. SIGNIFICANCE OF THE STUDY

The findings of this study will help government and the monetary authorities to see the effectiveness of monetary policy in the management of the Ethiopian economy in terms of money demand and supply which have a positive economic growth. This research work further serves as a guide and provides insight for future research on the topic and related field for academia's and policy makers who are interested on the topic.

1.6. LIMITATIONS OF THE STUDY

The availability of data may affect estimation technique due of lack of comprehensive data for previous years. But attempt is made to solve this problem using different source of data estimation technique.

1.7. SCOPE OF THE STUDY

The study is limited in scope with regard to the issue of examining the relation between bank credit and growth as well as impact assessment. The study covers the period between the years 1970-2016 G.C. The selection of the period only depends on the availability of data.

1.8. ORGANIZATION OF THE THESIS

This paper is organized into five chapters, following the introduction in chapter one, chapter two present literature review. Chapter three discusses Reaserch methodology employed. Chapter four presents' empirical results, interpretation and discussion of the results and finally chapter five provides conclusion and policy implications based on the findings.

THAPTER TWO : LITRATURE

2.1. THEORETICAL LITERATURE

A finance is an arrangement of monetary institutions and markets trade in a variety of financial instruments which are occupied in currency diffusion activities and the provision of loans and credit facilities. Financial institutions and markets dwell in a key place in the economy as intermediaries in channelling savings and other funds to borrowers and investors. In doing this, one of their main roles is to settle the different requirements of savers and borrowers, thereby facilitating a higher level of saving and investment in the economy than would otherwise be the case (Levine, 2000) cited in Roman(2012).

Levine (1997) breaks the functions of financial instutions in to five (1) produce information about possible investments and allocate capital (2) monitor investments and exert corporate governance after providing finance (3) facilitate the trading, diversification and management of risk (4) mobilize savings (5) facilitate the exchange of goods and services.

2.1.2 INDICATORS OF FINANCIAL DEVELOPMENT

The development of the financial sector can be measured using different kinds of indicators. The most commonly used financial development indicators include:

1. Liquid Liabilities to GDP: major indicators to measure the size, relative to the economy, of financial intermediaries. It consists of currency plus demand and interest bearing liabilities of banks and other financial intermediaries divided by GDP. It is the broadest available indicator of financial intermediation (Beck & Demirguc-kunt, 2009).
2. Private Credit to GDP: credit issued to the private sector by banks and other financial intermediaries divided by GDP. It measures the activities of financial intermediaries by channelling savings to investors. Countries with higher levels of private credit to GDP have been shown to grow faster (Demirguc-kunt and Levine 2008).
3. Commercial-Central bank: the ratio of commercial bank assets to the sum of commercial bank and central bank assets.

2.1.2. THEORIES OF FINANCIAL DEVELOPMENT

There are many theoretical literatures about the relationship between financial development and economic growth. The debate on whether the causal relationship runs from financial

development to economic growth on the one hand and economic growth to financial development on the other hand is far from settled.

Demand following hypothesis which states that as the economy grow demand is created in the process. It is economic growth that creates demand for financial development. Increasing demand for financial services might lead to an expansion in the financial sector as the economy grows Patrick, (1966). This hypothesis is shared both by Robinson J, 1952 and Lucas, (1988). Thus, according to the Demand following hypothesis economic growth is a causal factor for financial development.

According to supply-leading and demand-following hypothesis by Patrick (1966), the supply-leading hypothesis argues a causal relationship from financial development to economic growth, which means the creation of financial institutions and markets increase the supply of financial services and thus leads to real economic growth. The same line of argument is followed by King and Levine, (1993) Greenwood and Jovanic, (1990), Demirguc-Kunt and Levine, (2008)

2.1.3. Theories of Economic growth

The classical economists of the 18th and 19th centuries have developed different theories regarding how and which factor of production will generate economic growth. The classical economists believe that saving in the economy is a key factor, which is used for capital formation. Growth in domestic product is an important determent of welfare and wellbeing of the people in each country. Therefore, understanding and determining the primary factors which affect the economic growth is a very interesting aspect of scholarly studies.

Modern growth theory identifies two specific channels through which the financial sector might affect long-term growth: first through its impact on capital accumulation (including human as well as physical capital) and second through the rate of technological progress Lucas,(1988), Romer, (1991) and Helpman et al,(1991). These financial sector effects, nevertheless, occur from the intermediation role of the financial institutions, which enable the financial sector to mobilize savings for investment, facilitate and promote inflows of foreign capital such as foreign direct investment (FDI) portfolio investments and bonds, and remittances. According to the classical economists' capital flow from low return to capital location to high return to capital locations. The flow of the capital needs financial institutions as a channel. Thus, the financial institutions

optimize the allocation of capital between contending issues by ensuring that capital goes to its most productive use.

Economic growth models in modern theories have been premised on the same assumption about investment and saving as sources of economic growth. There are three economic growth models including the neoclassical model which is proposed by Domar (1946) and Harrod (1939), endogenous growth model introduced by Solow (1956), and financial repression hypothesis modeled by McKinnon,(1973) and Shaw, (1973)

2.1.3. HARROD- DOMAR MODEL

The Harrod-Domar Model states the rate of economic growth in an economy as dependent on the level of saving and the capital output ratio.

The productivity of capital investment (this is known as the capital-output ratio)

$$g = \frac{S}{\theta} - \delta$$

Where g = gross rate of growth domestic product

S = saving

θ = capital output ratio

δ = depreciation of capital

If there is a high level of saving in a country, it provides funds for firms to borrow and invest. Investment can increase the capital stock of an economy and generate economic growth through the increase in production of goods and services. The capital output ratio measures the productivity of the investment that takes place. If capital output ratio decreases the economy will be more productive, so higher amounts of output is generated from fewer inputs. This again, leads to higher economic growth. The model is mainly used in development economics. It suggests that if developing countries want to achieve economic growth, governments need to encourage saving, and support technological advancements to decrease the economy's capital output ratio. The Harrod-Domar model provides a framework for economic development and has been an important influence to government policy formulation.

2.1.5. SOLOW – MODEL

According to Solow model, exogenous technological improvement and capital accumulation drive economic growth. Based on his analysis of the American data from 1909 to 1949, he observed that 87.5% of growth of that period was attributable to technological change, and 12.5% to the increased use of capital. The result of the Solow growth model was that many came to believe financial markets had only minor influence on the rate of investment in physical capital, and the changes in investment were viewed as having only minor effects on economic growth.

2.1.6. FINANCIAL REPRESSION HYPOTHESIS

According to McKinnon, (1973) and Shaw, (1973) Financial repression hypothesis states that a measure by governments channel funds to them as a form of debt reduction. Financial repression includes Explicit or indirect capping of interest rates, such as on government debt and deposit rates ,Government ownership or control of domestic banks and financial institutions with barriers that limit other institutions from entering the market, High requirements, Creation or maintenance of a captive domestic market for government debt, directing credit to certain industries.

Financial repression also takes the form of forcing banks to allocate credit to industries that are perceived to be strategically important for industrial policy, ensures stable provision of capital rather than leaving it to decisions of disinterested banks or to efficient securities markets. Government directives and guidance sometimes include detailed orders and instructions on managerial issues of financial institutions to ensure that their behavior and business is in line with industrial policy or other government policies.

According to Beim and Charles, (2001), the key reason for the government to implement financially repressive policies is to control fiscal resources. By having a direct control over the financial system, the government can funnel funds to itself without going through legislative procedures and more cheaply than it could when it resorts to market financing.

McKinnon, (1973) and Shaw, (1973) were the first to illuminate the notion of financial repression. While theoretically an economy with an efficient financial system can achieve

growth and development through efficient capital allocation, McKinnon and Shaw argue that historically, many countries, including developed ones but especially developing ones, have restricted competition in the financial sector with government interventions and regulations. According to their argument, a repressed financial sector discourages both saving and investment because the rates of return are lower than what could be obtained in a competitive market. In such a system, financial intermediaries do not function at their full capacity and fail to channel saving into investment efficiently, thereby impeding the development of the overall economic system. In general, the Mckinnon-Shaw model shows that financial repression reduces both the quality and quantity of investment in the economy.

The early hypotheses of McKinnon and Shaw assumed that liberalization, which would be associated with higher real interest rates. The underlying assumption is that saving is responsive to interest rates. The higher saving rates would finance a higher level of investment, leading to higher economic growth. Therefore, according to this view, we should expect to see higher saving rates (as well as higher levels of investment and growth) following financial liberalization.

Sala and Roubini, (1992) Developed a model that shows financial repression reduces the productivity of capital and lowers savings, which hampers growth. The model also examined the effects of policies of repression of the financial system in the form of taxes, restrictions and various sorts of regulations on the rate of economic growth. They asked the question why an optimizing government represses the financial sector in spite of the fact that it reduces economic growth.

2.2. EMPIRICAL LITERATURE

Several empirical Studies have shown that there is a strong relationship between financial development and economic growth.

Chang and Seteven (2005) Analyzed financial development and economic growth in Taiwan using vector auto regressive model and found that financial development and Growth Domestic product are co integrated, the Granger causality tests based on vector error-correction models (VECM) suggest unidirectional causality running from financial development to economic growth. Chang and Seteven (2005) result supports the supply-leading hypothesis for Taiwan.

In addition to chang and Seteven (2005), Odo et al (2016) had investigated the causality and impact of financial development on economic growth in Nigeria and South Africa by employing co integration, VECM and granger causality test. The result of granger causality indicates a unidirectional causality running from financial development to economic growth in Nigeria but a bidirectional causality from financial development to economic growth in South Africa validating the Supply leading hypothesis of financial development by Patrick (1996), which states that the direction of causality between financial development and economic growth changes over the course of development. That is, at the early stage of development "the supply – leading" is evident but as real growth occurs in the economy, it will spark demand for financial services. This study therefore concludes that supply – leading phenomena is evident in both Nigeria and South Africa economies.

Similar to Chang et al. (2005) findings, Jung (1986) analyzed the relationship between financial development and economic growth at international level and found that less developed countries (LDCs) have a supply-leading causality pattern more frequently than a demand-following pattern. In this sense, what Patrick emphasized about the usefulness and the importance of financial development in LDCs is borne out empirically. Thus, LDCs are characterized by the causal direction running from financial to economic development, and DCs by the reverse causal direction, regardless of which causality concept is employed.

In contrast to the Jung (1986), Ankilo et al (2010) investigated the long run causal relationship between financial development and economic growth for ten sub – Saharan countries, but the granger causality test result different causation for different countries even if the countries are almost at the same level of Development. Granger causality test within the VECM framework shows unidirectional relations running from financial development to economic growth in Central African Republic, Congo Republic, Gabon, and Nigeria while causality runs from economic growth to financial development in Zambia. However, within the same framework, the results show bidirectional causality between financial development and economic growth in Chad, South Africa, Kenya, Sierra Leone and Swaziland.

Whereas Roman, (2012) analyzed using the VAR and VECM approach to determine the long-run and short-run relationship between financial development and economic growth in Ethiopia.

Furthermore, the granger causality test is employed to determine the direction of causality. Using the financial development indicator PRIV, Roman (2012) found uni-directional causality from economic growth to financial development; this implies that past economic growth rate is an important determinant for the development of the financial system. As the economy grows the demand for financial resources will increase and this in turn will boost the development of financial sector. This finding is consistent with Patrick's (1966) Demand-following hypothesis which postulates a causal relationship from economic growth to financial development.

Rodgers et al. (2014) studied the relationship between financial development and economic growth in Africa using data from 50 countries for the period 1980-2008.The study applied panel regression and causality testing using credit to the private sectors to total GDP and the ratio of broad money (M2) to total GDP as proxies of financial development. In contrast the Roman (2012) findings, the regression concluded a positive relationship between financial development and economic growth. Moreover, the causality test by Rodgers and others (2014) shows a bi-directional relationship between financial development and economic growth in Africa. It is also inconsistent with the demand following hypothesis that state the relationship between economic growth and financial development is a uni-directional from financial development to economic growth.

As seen above the empirical findings so far are mixed on the causal direction of financial and Economic growth. Thus, most empirical studies are contradicting in their conclusion over the direction of casual relationship of the relationship between financial development and economic growth. The question of whether financial development is cause for economic growth or economic growth is cause for financial development? Or is the casual relationship between economic growth and financial development is bi- directional? Or no causal relationship between the two variables is far from settled. Therefore, this study will analyze the impact and relationship between financial depth and economic growth, and will determine kind of casual relationship the two variables have in Ethiopia.

CTHAPTER THREE: REASERCH METHEDOLOGY

3.1. METHOD OF ANALYSIS

The study will apply the Johansen Co-integration test to investigate the long run determinants of real economic growth in Ethiopia. If co integration between under variables exist the study will apply Vector Error correction Model (VECM), if not Vector Auto Regressive (VAR) approach will applied to identify the relationship between financial depth and economic growth. The use of VAR model help the study account for spurious correlation, and endogeneity bias as it is designed for non-stationary time series and requires no endo-exogeneous division of variables when compared to simultaneous equations. Other tests like causality through Granger causality also applied Gujarati (2004).

In the simultaneous or structural equation models some variables are treated as endogenous and some of as exogenous or predetermined (exogenous plus lagged endogenous). Estimation such models, it has to be make sure that the equations in the system are identified (either exactly or over). This identification is often achieved by assuming that some of the predetermined variables are present only in some equations. Therefore, if there is true simultaneity among a set of variables, they should all be treated on an equal footing; there should not be any a priori distinction between endogenous and exogenous variables. It is in this spirit that VAR model developed Gujarati,(2004).

Before estimating the VAR, we have to decide the maximum lag lengths, K to generate the white noise of error terms. This can be done based on the Akaike information criteria (AIC) or Schwarz (SIC). Since time-series variables have been widely noted to be non-stationary, the results that are obtained from the level VAR are spurious and misleading (Mukhopadhyay and Pradhan, 2010) cited in (Roman, 2006). Moreover, utilizing properly differenced variables in the VAR may lead to model mis-specification if the level variables share the long run relationship or are co integrated. In this case the VAR should be written in a VECM (Vector Error Correction Model). The error correction mechanism (ECM) first used by Sargan and later popularized by Engle and Granger corrects for disequilibrium. An important theorem, known as the Granger representation theorem, states that if two variables Y and X are co integrated, then the relationship between the two can be expressed as ECM Gujarati (2004).

3.2. MODEL SPECIFICATION

The model employed is based on considerations of incorporation of essential variables explained in the literature section of the paper and keep it straight and effective in explaining the impact of financial depth on economic growth. Under these considerations, the following variables are used to develop Real economic growth model: broad money Relative to GDP, domestic credit to the private sector Relative to GDP, population growth rate and degree of openness (i.e. export less import) Relative to GDP. Accordingly, the study will measure economic growth as the real gross domestic product growth rate. Financial development measured by broad money (M2) relative to (GDP) and Credit to private sector (PRIV) relative to GDP. Degree of openness is measured (Trade) by import less export(X-M) and population growth measured by population growth rate (POPG). Government expenditure excluded from the model because the study made its base on neo classical growth model of 1956 known as Solow growth model. The model assumes output is produced with the help of two factors of production, capital and labor Solow (1956). Since the data of capital formation is not adequately found in developing countries then it proxied by private investment which is credit to private sector.

Definition of Variables in the model and the possible relationship with real gross domestic product growth rate.

Variables	Definition	Expected Relationship with RGDPG
RGDPG	Real Gross Domestic Product Growth Rate	-
PRIV	Credit to Private Sector	Expected to be positively related
POPG	Population growth Rate	Exoected effect of the variable is mixed
M2	Broad Money	Hypothesised to relate positively
Trade	Export less import	Expected to relate positively

3.2.1. ECONOMETRICS MODEL

Therefore the model will be specified as

$$RGDPG_t = F\ (M2t, PRIVt, POPGt, Tradet,)$$

$$RGDPGt = \beta_1 + \beta_2 PRIVt + \beta_3 M2t + \beta_3 Tradet + \beta_4 POPGt + \mu$$

In order to avoid the problem of hetroscedacity problem we will take log on both sides of the model as following.

$$LRGDPGt = \beta_1 + \beta_2 LPRIVt + \beta_3 LM2t + \beta_3 LTradet + \beta_4 PoPGt + \mu$$

Where

LRGDPGt = the log of Real GDP growth rate at time (t)

LPRIVt = the log credit to private sector relative to GDP at time (t)

LM2t = the log of broad Money relative to GDP at time (t)

LPOPGt= the log of population growth rate at time (t)

LTradet = the log trade (export less import) at time (t)

μ= error term

3.3. ECONOMETRICS PROCEDURES

3.3.1. UNIT ROOT TEST

According to Greene (2002)there are two models which have been frequently used to characterize non-stationary:

(1) Random walk without drift (i.e., no constant or intercept term)

Suppose ut is a white noise error term with mean 0 and variance σ^2.

$$Y_t = Y_{t-1} + u_t \text{...} (1)$$

In this model the value of Y at time t is equal to its value at time (t-1) plus a random shock; thus it is an AR (1) we can write

$$Y1 = Y0 + u1$$

$$Y2 = Y1 + u2 = Y0 + u1 + u2$$

$$Y3 = Y2 + u3 = Y0 + u1 + u2 + u3$$

In general, if the process started at some time 0 with a value of Y_0, we have

$$Yt = Y0 + \Sigma ut$$

Therefore

$$E(Yt) = E(Y0 + \Sigma ut) = Y0$$

In like fashion, it can be shown that

$$\text{var}\,(Yt) = t\sigma^2$$

As the preceding expression shows, the mean of Y is equal to its initial, or starting, value, which is constant, but as t increases, its variance increases indefinitely, thus violating a condition of stationary. In short, the RWM without drift is a non stationary stochastic process. In practice Y_0 is often set at zero, in which case E (Yt) = 0 It is easy to show that, while Yt is non stationary, its first difference is stationary. In other words, the first differences of a random walk time series are stationary .

(2) Random walk with drift (i.e., a constant term is present).

$$Yt = \delta + Yt{-}1 + ut$$

Where δ is known as the drift parameter, the name drift comes from the fact that if we write the preceding equation as it shows that Yt drifts upward or downward, depending on δ *being* positive or negative.

$$E(Yt) = Y0 + t \cdot \delta$$

$$\text{var}\,(Yt) = t\sigma 2$$

Then $Yt = \rho Yt{-}1 + ut - 1 \leq \rho \leq 1$

If ρ = 1, becomes a RWM (without drift). If ρ is in fact 1, we face what is known as the unit root problem, that is, a situation of non-stationary; we already know that in this case the variance of Yt is not stationary. The name unit root is due to the fact that ρ = 1.11 Thus the terms non stationary, random walk, and unit root can be treated as synonymous. If, however, $|\rho| \leq 1$, that is if the absolute value of ρ is less than one, then it can be shown that the time series Yt is stationary in the sense we have defined it. RWM with drift the mean as well as the variance increases over time, again violating the conditions of (weak) stationary. In short, RWM, with or without drift, is a non-stationary stochastic process. Therefore In order to test for the existence of a unit root in time series, we use the popular tests: Dickey-Fuller (ADF) test. Dickey and Fuller (1976) tested (Gujarati 2004).

3.3.2. CO INTEGRATION ANALYSIS

A natural first step in the analysis of co integration is to establish that it is indeed a characteristic of the data. Two broad approaches for testing for co integration have been developed. The Engle and Granger (1987) method is based on assessing whether single-equation estimates of the equilibrium errors appear to be stationary. The second approach, due to Johansen (1988, 1991) and Stock and Watson (1988), is based on the VAR approach Greene, (2002).

There are two ways of testing the existence of co integration, the Engel-Granger or EG approach and the Johansen approach.

A. The Engel-Granger Approach

Although regression analysis deals with the dependence of one variable on other variables, it does not necessarily imply causation. In other words, the existence of a relationship between variables does not prove causality or the direction of influence. But in regressions involving time series data, the situation may be some what different because, if event A happens before event B, then it is possible that A is causing B. However, it is not possible that B is causing A. In other words, events in the past can cause events to happen today. This is roughly the idea behind the so-called Granger causality test Gujarati (2004).

B. The Johansen Approach

The reason for the application of Johansen approach is Engle-Granger co integration test cannot be used to test the number of co integration relationships that the Johansen test can do.

3.4 NATURE AND SOURCE OF DATA

This study does the empirical analysis by employing data sets for the period 1970-2016 for all the variables specified in the model. This period is chosen based on the availability of data. Data for real gross domestic product growth rate (GDPG), broad money (M2), Credit to the Private Sector (Priv), and degree of openness (Trade) obtained from the National Bank of Ethiopia and population growth rate (POPG) obtained from World Bank Database.

CHPTER FOUR : EMPIRICLA AND DISCUSSION

This chapter analysis the causation between financial depth and economic growth using annual data of fourty six years from 1970 – 2016 in Ethiopia, before econometric Analaysis the study will apply describtive analysis

4.1 DESCRIPTIVE RESULT

As Table 4.1 shows kurtosis and skewness of variable are normaly distributed since the value for kurutosis approximate to three for the lowest and six for the hight value and the skewness is between negative one and positive on wich is normal.

Table 4.1 decriptive statitcs

Statistics	GDPG	Trade	M2	POPG	PRIV
kurtosis	2.1	3.2	2.2	4.4	2.42
skewnesss	-0.60	0.98	-0.21	-0.62	0.39

Source own copmputation using stata 12

Figure 4.1 shows the trand of broad money credit to private sector and real domestic growth all variables are trendinging together with time . therefore it is expected that the co integration between variables will happen.

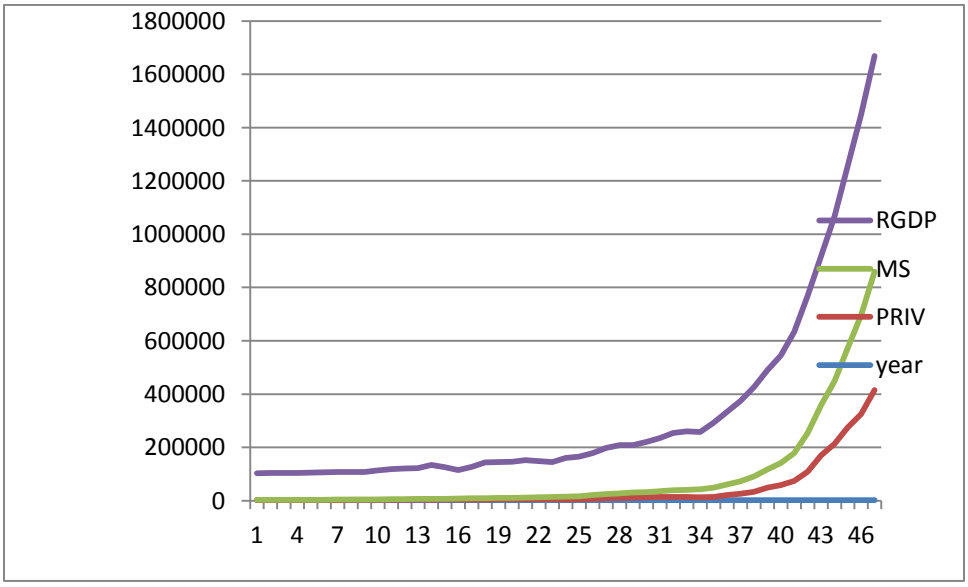


Figure 4.1 trend in broad money and private credit in relation to GDP

Source own calculation using micro soft exel

4.2. ECONOMETRICS RESULT

Before estimation it is necessity to employed the unit root test, to know the time series data's are stationary or not. After identifying the optimal lag length, the presence of the co-integrating vectors is tested by means of the Johansen system. additional the granger causality test is engaged to discover the direction of causality between financial depth and economic growth. .

4.2.1. UNIT ROOT TEST RESULT

This test is made using the Augmented Dickey-Fuller (ADF) unit root tests. When the ADF test statistics is larger than the critical value in absolute terms, the null hypothesis of unit root is rejected, and if the ADF test statistics is less than the critical value in absolute terms, we fail to reject the null hypothesis, Therefore unit root tests conducted discovered that all variables have unit root in their level hence they are not stationary. As a result, the variables have to be differenced to accomplish stationary. From the test results on the first difference given in Tables 1.b, the null hypothesis has been rejected because of the fact that all variables become stationary at their first difference. As the Unit root tests revealed that all variables used in this study are stationary at their first difference

Table 4.2a Augmented Dickey-Fuller test for unit root at level

variables	Test statistics	Critical value at 5%	P -value
LGDPG	-1.904	-2.952	0.33
lnM2	0.186	-2.952	0.97
Lnpriv	0.765	-2.944	0.99
LnPOPG	-1.824	-2.952	0.36
LnTrade	-2.006	-2.950	0.28

Source : own computation using Stata 12

The Table 4.2a shows that all variables at level have a unit root since the absolute value of the test statistics is greater than the critical value at five percent therefore we fail to reject the null hypothesis that is the variables are unit root.

Table 4.2b Augmented Dickey-Fuller test for unit root at difference

variables	Test statistics	Critical value at 5%	P -value
LGDPG	-4.933	-2.952	0.000
lnM2	-10.595	-2.944	0.000
Lnpriv	-35.931	-2.944	0.000
LnPOPg	-5.260	-2.950	0.0000
LnTrade	**-4.161**	**-2.955**	**0.000**

Source : own computation using Stata 12

As the Table 4.2b above shows the absolute values of the test statistics for all variables in the first different are greater than its critical value at 5% level of significance. The result indicates that the variables are stationary at first difference. So the null hypothesis that suggests each variable has unit root can be rejected by the ADF test.

4.2.2. CO INTEGRATION TEST RESULT

To evaluate the long run relationship between variables we use the co integration technique, be short of co-integration between variables suggests being of no long-run association between them. consequently, the Johansen co-integration method is practical. prior to estimate have to decide on the maximum Lag length but, including too many lagged terms will consume degrees of freedom, not to mention introducing the possibility of multi co linearity. Including too few lags will lead to specification errors. One way of deciding this question is to use a criterion like the Akaike or Schwarz Gujarati (2004).

Table 4.3 VAR lag order selection criteria

lag	LL	LR	DF	P	FPE	AIC	HQIC	SBIC
0	-104.63				.00011	5.099	5.17	5.30
1	69.97	349.22	25	0.00	$1.1e^{-07}$	-1.85	-1.40	-0.63*
2	97.57	55.19	25	0.00	1.0^{e-07}*	-1.98	-1.14	0.27
3	123.13	51	25	0.00	$1.1e^{-07}$	-2.00	-0.79	1.2
4	152	58.4*	25	0.00	$1.2e^{-07}$	-2.2*	-61	2.09

Source : own computation using Stata 12

As seen on Table 4.3 LR and AIC are choose four lag length, FPE chooses two lag length HQIC and SBIC are choose one lag length , therefore the study will apply four lag lengths during estimation to avoid multi co linearity problem.

Table 4.4 Johansen co integration test

Maximum rank	Parms	LL	Eigenvalue	Trace statistic	Critical value
0	80	100.73	-	103.23	68.52
1	89	129.82	0.74	45.05*	47.21
2	96	140.81	0.40	23.07	29.68
3	101	148.33	0.29	8.03	15.41
4	104	152.09	0.16	0.51	3.76
5	105	152.35	0.011	-	-

Source : own computation using Stata 12

It can be seen from the table 4.4 that the Johansen tests for co integration rank test (Trace) shows one co integrating vectors at the 5% critical value in the system. Thus based on trace statistics result we can conclude that there exists meaningful long run relationship between the variables under consideration

4.2.3 GRANGER CAUSALITY TEST RESULT

The study applied granger causality test between real growth domestic product growth rate (RGDPG) and financial depth indicators PRIV (Private credit relative to GDP) and M2 (Broad money relative to GDP). As the estimated granger causality test is reported in table (4.5). Shows, we do reject the null hypothesis that LnRGDPG does not granger cause to LM2 and we accept the null hypothesis that says LnM2 is not granger cause to LnRGDPG. Therefore the direction of causation between LnRGDPG and LnM2 is uni directional running from economic growth to financial depth . in this case the study is in line with demand following hypothesis that stats as the economy growth it creates demand which makes the economy to growth. this justified as because broad money grow relative to economic growth since the growth of money more than economic growth rate it will lead inflation.therefore the monetory authority will restrict the growth of money to the level of demand for money.

And the test shows the granger causation between LnRGDPG and LnPRIV is bi directional becuase we do reject the two null hypothesis, LnRGDPG is not granger cause to LnPRIV and LnPRIV do not granger cause to LnRGDPG. Therefore the causation between credit to private sector and real economic gross rate is bi directional running from economic growth to financial depth and from financial depth and to economic growth. the result is in line with the findings of Haile and Kassahun (2011) who employed data of Ethiopia from 1972-2010 to find the causal relationship between financial development and economic growth. In addition it is consistent with Sime (2016) who employed data from 1973 to 2008 and analyzed Causality between financial development and Economic Growth in Ethiopia. Greenwood & Jovanovic, 1990 also found a bi directional relationship financial development and economic growth. this is beause as the financial depth deepen the supply for finance will icrease that increase the economy and in turn as the economy increases the demand for finance will increase.

Table 4.5; - Granger causality Wald tests

Equation	Excluded	Chi2	df	Prob>chi2
GDPG	M2	35.71	4	0.00
GDPG	PRV	42.60	4	0.00
M2	GDPG	2.16	4	0.7
PRIV	GDPG	14	4	0.007

Source : own ccalculation using stata 12

4.2.4 DIAGNOSTIC TESTS

Diagnostics test is undertaken to become aware of model misspecification and as a direct for model perfection. These tests are serial correlation, model stability and normality tests. The serial correlation test done using the Lagrange multiplier (LM) test. The null-hypothesis of the LM test that the residuals are not serially correlated is accepted at 5% level of significance (see appendix C).

The Jarque-Bera normality test is used to see whether the regression errors are normally distributed. The null-hypotheis that the residuals are normal is rejected in this particular study. However, econometric theory states that the existence of non-normality does not affect and distort the

estimator's BLUE and consistency property (Enders 1995). The non-normality of vector in our model doesn't affect the coefficients and t-values (see appendix D)

4.2.5 LONG- RUN AND SHORT – SHORT MODELS

The study identified one co integrated equation through Johansen trace statistics and the objectives of the study is to examine the long and short run impact of financial depth on economic growth Hence, we estimated the vector error correction model, the result in table (4.5) below is based on the estimation of the Vector error correction model with four lag selected by the optimum lag length selection criteria.

Table 4.6 Estimates of β Johansen normalization to LRGDPG

Variables	Coefficient	Z value	P value
lnGDPG	1		
lnM2	-3.760128	-6.31	0.000
lnPRIV	-3.03903	5.66	0.000
lntrade	.5763241	1.15	0.249
lnPOPG	5.382693	5.48	0.000
cons |	-4.872834		

Source own calculation using stata 12

The Johansen normalization equation can be written as:-

LnGDPG = 3.76LnM2 + 3.03LnPRIV – 0.58LnTrade- 5.4LnPOPG + 4.88

From the above equation it can be observed that LnM2 and LnPRIV have a positive and significant impact on LnRGDPG in the long run .a percentage increase in LnM2 and LnPriv will increase LnRGDPG by 3.76 % and 3.03% repectively in the long run with coeffient of significant at 1 % . this is due to monitazation and credit to private sectors will take maximum time to affect the economy showing the low development of credit channeling in the short run. However, and LnPOPG (population growth rate) have a negative and statistically significant relationship with LnRGDPG in the long-run a parentage increase in LnPOPG will reduce RGDPG in 5.4 % this might be due to the rapide increase in popaation will be burden for means

production in which increase slower than the population needs.While LnTrade (import less export % RGDP) has a negative and in significant relationship with long Run RGDPG the unexpected sign for Trade is due to the is country experiencing a persistent trade deficit wich reduce LnRGDPG growth rate (see Appendix E)

Table 4. 7 Vector Error Correction Models

GDPG		coef	std	z	p
cel		-1.56	0.30	-5.07	0.000
M2	LD	0.788	2.95	0.27	0.79
	L2D	3.41	2.88	1.18	0.23
	L3D	2.53	3.07	0.82	0.41
PRIV	LD	6.61	1.83	3.61	0.00
	L2D	4.51	1.84	2.44	0.01
	L3D	-.069	0.34	-0.2	0.84
Trade	LD	1.82	1.01	1.8	0.07
	L1D	-0.04	1.03	-0.05	0.96
	L2D	-1.65	1.08	-1.53	0.12
POPG	L1D	4.3	1.45	2.97	0.00
	L2D	0.72	1.37	0.53	0.59
	L3D	-1.03	1.08	-0.95	0.34

Source own calculation using stata 12

As Table 4.7 indicates the sign of co integration equation (c e1) is negative and significant at 1% that indicates financial depth (LnM2 and LnPRIV) will influence lnRGDPG in the long run. Ce1 is called the speed of adjustment which means the disequilibrium will adjust towards long run equilibrium at the speed of ce1 (1.56) ; Broad money (M2) and private credit (PRIV) have long run impact on real growth domestic product growth rate (RGDPG).

In the short run Credit to the private sector (LnPRIV) is significantly affcte LnRGDPG through period lagged values. LnTrade and LnPOPG affect LnRGDPG through one period

lagged value , while broad money (lnM2) doesn't have a strong direct positive effect in the short run. this shows

- ✓ the under development of the financial sector to affect the eonomy in the short run.
- ✓ lack adequate policy and effiecint supervision of financial institution

4.2.6 IMPULSE RESPONSE

Impulse response function is used to trace the effect of a one shock to one of the innovations on current and future values of the endogenous variables. We can identify the positive or negative impact of the variables and determine how long it would take for that effect to work. It is a method of assessing the interaction among the variables in the VECM. Figure 4.2 below illustrates the response of LnRGDG due to a shock of (generalized impulse) each explanatory variable. In the first graph, response of lnRGDPG to lnRGDPG implies growth rate of real gross domestic product in the future will depend on the current growth rate of gross domestic product growth rate. Any shock will affect LnRGDPG immediately but it will increase after three periods and this effect remains the same in the economy for a long time period and will not die out even in the 10th quarter though it shows a fluctuation. Therefore current LnRGDPG rate will affect future LnRGDPG significantly.

Sourec: own Computation using stata 12

Figure 4.2 Impulse Response Graph

Any positive shock in broad money (LM2) makes an immediate increase in lnRGDPG and this effect gradually down but does not die out over the time period and may reflect a cyclical effect. Immediate effect of LnPRIV shock is quite low and however after time period it begins to increase its affect will not dying out in the 10th period of time.

Table 4.8 Impulse Response of LRGDP

step	LnRGDPG	LnM2	LnPRIV	lntrade	lnPOPG
0	1	0	0.	0	
1	-.319174	6.68504	0.058497	.920173	-4.1303
2	.080878	6.95153	0.560085	-1.21843	-3.42477
3	.374883	3.46026	0.7360021	-1.49271	-.249865
4	.340102	3.26923	0.149898	-.119216	2.09006
5	.054597	5.29333	0.23394	-2.06546	-2.68175
6	.229134	4.53048	0.317172	-1.05759	-2.37534
7	.371073	3.34821	0.120988	.479857	-.245348
8	.07202	-.025814	-049985	-.708178	-.619868
9	.177814	2.45082	-0.7722	-1.50126	-1.81137
10	.253306	4.85816	0.160174	-.515127	-1.81842

Source : owne calculation using stata12

Table 4.8 presents the results of the IRF. In response to shock of LnRGDPG, LnRGDPG itself decrease by -0.32 in the first year and continues to grow in the third period, in the long-run reaching 0.25 in 10th period. A one disturbance originating from LnM2 produces a 6.7 increase in RGDPG in the first year. Its effect continues to decline with a positive impact as the forecast horizon is extended, then rise again and reaches 4.8 at the 10th year which shows the long run which shows LnM2 has a permanent impact on GDPG. In other words, financial development has a long- run impact on economic growth which is consistent with the above findings. The impact of LnPRIV is positive in the long run it runs from 0.05 to 0.16. the result is consistent

with the findings of the study and those of LnPOPG and lnTrade affect RGDPG negative in the long run. This might be due to the increase in population more than the increase in production will affect RGDPG negatively lnRGDPG and the persistence trade deficit will reduce GDOPG growth (see Appendix F).

4.2.7 SUMMERRY OF FINDINGS

the study found a bi-directional causality running from economic growth to financial depth and from financial depth to economic growth for credit to private sector and uni directional causality for Broad money running from Economic growth to financial depth. Besides the granger causality the study found that financial depth have positive and significant impact on Economic growth in the long run.but the impact of financial depth in the short run is insignificant only credit to private sector has effect on the economy in the short run through two lagged period. Popalation growth rate has significant and negative impact on the gross Domestic product growth rate but Trade has negative and insignificant impact on gross Domestic product growth rate this might be due to persistence Trade deficit of the country

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The study examines the nexus between financial depth and economic growth in Ethiopia over the 1970-2016 periods. By Using Vector Error Correction Model (VECM) to determine the long-run and short-run relationship between financial development and economic growth Furthermore, the granger causality test is employed to find the direction of causality. The empirical result shows a bi-directional causality from economic growth to financial depth and from financial depth to economic growth for credit to private sector and uni directional causation running from Economic growth to financial depth. Besides the granger causality test attempt was made to determine the impact of financial depth on Economic growth of Ethiopian economy with a reference to short run and long run effect which was determined using co-integration approach. The result of the findings indicates that the two financial depth indicators (LnM2 and PRIV) have positive impact on gross domestic product growth rate in the long run; Broad Money had insignificant impact on gross domestic product growth rate in the short run but it had a positive and significant impact in the long run. And credit to private sector had positive impact in the in the long run but it affect the economy in the short run only through period lagged value. The Impulse response result is also in line with the above findings that financial depth has a long-run impact on economic growth.

5.2 RECOMMENDATION

Reference to the findings and conclusion reached at the end of the study; the following are recommended:

- ✓ Adequate policies and efficient supervision of all financial institution should be provided and sustained.
- ✓ in order to stimulates economic growth Central bank of Ethiopia (CBE) should regulate credit to private sector by reduce interest rate for productive sector of the economy such as investment on capital goods.
- ✓ Since financial depth have a significant effect on economic growth of Ethiopia in the long run, policy makers should focus on long-run policies interest rate and macroeconomic stability
- ✓ Generally the finding of the study claims the government to create conducive environment for the development of finance to sustain its contribution to economic growth.

Reference

Alemayehu Geda (2006) The Structure and Performance of Ethiopia's Financial Sector in the Pre- and Post Reform Period with a Special Focus on Banking. researchgate.

Akinlo, Anthony Enisan and Tajudeen Egbetude, (2010) Financial Development and Economic Growth: The Experiance of 10 Sub-Saharan African Countries Revised. The Review of Finance and Banking,

Arfanuzzaman,MD (2014) The Long-Run Dynamic Relationship between Broad Money Supply and the GDP of Bangladesh: A VECM Approach Independent Researcher and Graduate Student, Dhaka School of Economics

Beck, T., A. Demirgüç-Kunt, and V. Maksimovic (2005). Financial and Legal Constraints to Firm Growth: Does Size Matter? Journal of Finance.

Beim D. and Charles W.C (2001) Emerging Financial Markets... New York: MCGraw Hill.

Caporale, Guglielmo Maria , Christophe Rault , Robert Sova and Anamaria (2009) Financial Development and Economic Growth:Evidence from Ten New EU. Economics and Finance Working Paper Series, Volume 09-37. Helpman E and Grossman G.M, (1991). Innovation and Growth in the Global Economy, cambridge. MA,MIT press.

Chang, Tsangyao Caudill and Steven B (2006) Financial Development and Economic Growth Applied Economics.

Dejene Mamo Bekana (2016) Does Financial Sector Development Drive Economic Growth in a Post- Communist Economy? Evidence from Ethiopia. Economic Insights – Trends and Challenges, Volume V(LXVIII)

Demirguc-Kunt, Asli and Levine R (2008) Finance, Financial Sector Policies and Long run Growth. The World Bank Commission on Growth and Development Working Paper, p. 11

Enders, W. (1995). Applied Econometric Time Series. Iowa State University, John Wiley and Sons, Inc.

Graff, Michael (2016) Financial Development and Economic Growth – A New Empirical Analysis. JEL Classification: G20, N20, 016

Greenwood, J and B Jovanic, (1990) Financial Development Growth And the Distribution of Income.

Journal of Political Economy, Volume 98, pp. 1076-1107.

Gujarati, D. N. (2004) Gujarati: Basic Econometrics, Fourth Edition. Fourth Edition ed. s.l.:The

McGraw−Hill Companies,.

Haile Kibret Fantaye and Kassahun Aberra (2011). Linkage between Financial market Development and Economic Growth in Ethiopia. Paper Presented at the 9th International Conference of EEA/EEPRI.

Jung, W. S. (1986) Financial Development and Economic Growth: International Evidence. the university of chicago press journals, Volume 34, pp. 333-346

Kahan, Mohasin and Senhadji, Abdelhak S. (2000). Financial Development and Economic Growth : over view. international monetory fund working paper.

King, Robert. and Levine, Ross. (1993) Finance and Growth; schumpeter Might Be Right. Quarterly Journal of Economics, Volume 108, pp. 717-738.

Levine R. (2005), "Finance and Growth: Theory and Evidence," Handbook of Economic

Growth, in: Aghion P. and S. Durlauf (ed.), vol 1, 865-934.

Levine R. (1997), "Financial Development and Economic Growth: Journal of Economic

LiteratureVol. XXXV (June 1997), pp. 688–726

Lucas, R., (1988) On Mechanics of Economic Development. Journal of Monetary Economics, Volume 22, pp. 3- 42.

Mckinnon, R., (1973) money and capital in Economics Development. Washington DC: Brookings

Institution..

Mukhopadhyay, B and Pradhan,R. (2010). An Investigation of the Finance-Growth Nexus: Study of Asian Developing Countries Using Multivariate VAR Model. International Research Journal of Finance and Economics, Issue 58

Murty Sreerama, Wondaferahu Mullugeta Demissie and Sailaja (2012) The Long-Run Impact of Bank Credit on Economic Growth in Ethiopia: Evidence from the Johansen's Multivariate Cointegration approach. European Journal of Business and Management, 4(14).

NBE, National Bank of Ethiopia Quarterly Bulletin (20016) National Bank of Ethiopia Quarterly Bulletin, Fourth Quarter 2015/16.

Odo Stephen idenyi Bigben C.Ogbonna Promise E. Agbi Charity I. Anoke (2016) Investigating the Causal Relationship between Financial Development and Economic Growth in Nigeria and South Africa.. Journal of Economics and Finance (IOSR- JEF), 7(2).

Roman Tesfaye (2012) The Link Between Financial Development and Economic Grpwth in Ethiopia

Robinson, J. (1952) The Generalization of the General Theory in; the Rate of Interest and other Essays. London: Macmillan.

Romer, p., (1986) Increasing Returns and Long term Growth. journal of political Economy, Volume 94, pp. 1002- 1037.

Rodgers A. Musamali, Esman M. Nyamongo and Eliud D. Moyi , (2014) The Relationship between Financial Development and Economic Growth in Africa. Research in Applied Economics, 6(2)

Sala and Roubini (1992) financaial repression and Economic growth. Journal of Development Economics, 39(5-30).

Shaw, E., (1973) Financial Deepening in Economic Development. New York: Oxford Univesity Press.

Sime, Workenh Eshatuu (2016) Causality between Financial Development and Economic Growth: Empirical Evidence from Ethiopia: (Johansen and VECMApproaches) Ethiopian Civil service University ,School of Policy Studies

Solow, Robert M, (1956) a Contribution to the Theory of Economic Growth. The Quarterly Journal of Economics, Vol. 70, No. 1. , pp. 65-94.

Patrick, H., (1966). Financial Development and Economic Growth in Underdeveloped Countries. Economic Development and Cultural change, Volume 14, pp. 174-189.

List of Appendices

Appendix A; Lag Exclusion Wald Tests

Equation: All

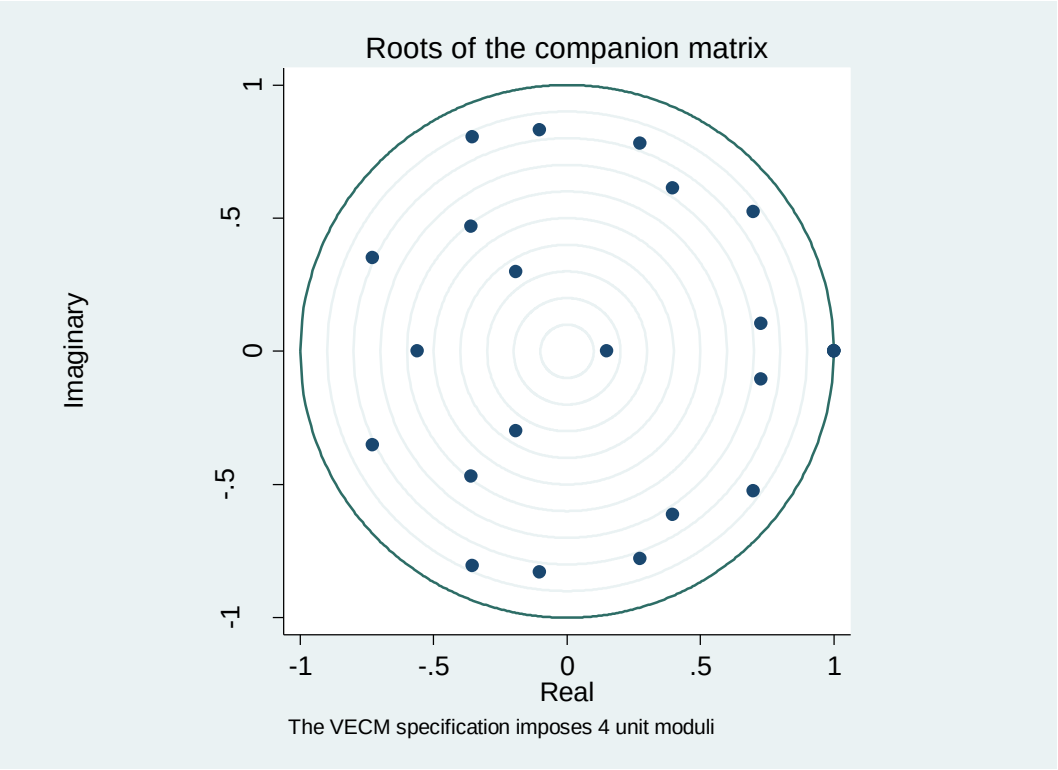
lag	chi2	df	Prob > chi2
1	434.3639	36	0.000
2	152.0939	36	0.000
3	123.5316	36	0.000
4	138.9501	36	0.000

Appendix B: VECM Stability Test

Eigenvalue stability condition

Eigenvalue	Modulus
1	1
1	1
1	1
1	1
-.3550071 + .8056018*i*	.880355
-.3550071 - .8056018*i*	.880355
.6978548 + .5245762*i*	.87303
.6978548 - .5245762*i*	.87303
-.1025047 + .8298251*i*	.836132
-.1025047 - .8298251*i*	.836132
.2731924 + .7796454*i*	.826124
.2731924 - .7796454*i*	.826124
-.7280695 + .3518887*i*	.808648
-.7280695 - .3518887*i*	.808648
.7277682 + .1044957*i*	.735232
.7277682 - .1044957*i*	.735232
.3953741 + .6129392*i*	.729394
.3953741 - .6129392*i*	.729394
-.359449 + .4686161*i*	.590597
-.359449 - .4686161*i*	.590597
-.5611668	.561167
-.1912726 + .2977968*i*	.353932
-.1912726 - .2977968*i*	.353932
.1484174	.148417

The VECM specification imposes 4 unit moduli.



Appendix C: VEC Residual Serial Correlation LM Tests

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	46.7340	36	0.10854
2	38.6784	36	0.34962
3	34.1421	36	0.55718
4	31.0010	36	0.70514

H0: no autocorrelation at lag order

Appendix D: VEC Residual Normality Tests

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_lnGDPG	1.483	2	0.47647
D_lnM2	0.008	2	0.99609
D_lnPRIV	0.068	2	0.96647
D_lntrade	6.922	2	0.03140
D_lnPOPG	13.290	2	0.00130
ALL	21.771	10	0.01632

Appendivx E

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
lnGDPG	1	.	.	.	.	.
lnM2	-4.10375	.7098137	-5.78	0.000	-5.494959	-2.712541
lnPOPG	6.296779	1.098936	5.73	0.000	4.142904	8.450654
lnPRIV	-3396903	.6654415	5.10	0.000	2.092661	4.701144
lntrade	.6643118	.5240542	1.27	0.205	-.3628155	1.691439
_cons	-5.384079	.	.	.	.	.

Appendix F:

Impulse response Table

Results from order1

step	(1) irf	(2) irf	(3) irf	(4) irf	(5) irf	(6) irf	(7) irf
0	1	0	0	0	0	0	1
1	-.319174	.009464	.039368	-.072122	-.020962	6.68504	1.13153
2	.080878	.023546	.016238	-.070985	-.048959	6.95153	1.15749
3	.374883	.010523	-.004074	-.033095	-.009317	3.46026	1.22037
4	.340102	.018991	-.0071	-.047529	-.027952	3.26923	1.2259
5	.054597	.025757	.028119	-.054463	-.017227	5.29333	1.28448
6	.229134	.020246	.016292	-.052148	-.032998	4.53048	1.23523
7	.371073	.018158	.008737	-.032337	-.015729	3.34821	1.22056
8	.07202	.021584	.024069	-.045712	-.029662	-.025814	1.28235
9	.177814	.024418	.026767	-.049964	-.033959	2.45082	1.33074
10	.253306	.020064	.019991	-.043256	-.024243	4.85816	1.31237

step	(8) irf	(9) irf	(10) irf	(11) irf	(12) irf	(13) irf	(14) irf
0	0	0	0	0	0	1	0
1	-.081857	-.776533	.058497	1.85196	-.070727	1.48508	.51126
2	-.56942	-1.09684	.560035	1.00392	-.129539	1.72891	.4368
3	-.459524	-.053181	.736021	-4.45085	-.045939	2.08168	-.016703
4	-.152978	.289647	.149898	-3.19239	.004283	1.94143	-.045073
5	.45363	.326339	.233494	-.252675	-.022547	1.61033	-.021581
6	.754821	.2157	.317172	-1.66684	.046511	1.57691	-.182967
7	.629736	.038316	.120985	.52902	.092495	1.62693	-.212475
8	.587575	-.036735	-.049985	-.536027	.053009	1.53001	-.060302
9	.44901	.006833	-.07722	533887	.040235	1.56422	.033124
10	.379947	.031926	.160174	-1.9739	.064147	1.71644	-.020964

step	(15) irf	(16) irf	(17) irf	(18) irf	(19) irf	(20) irf	(21) irf
0	0	0	0	0	1	0	0
1	-.229878	.920173	-.040747	.148479	.919872	-.023669	-4.1303
2	-.359821	-1.21843	.001423	.566183	.625592	-.075706	-3.42477
3	-.69619	-1.49271	-.02066	.471108	.693315	-.109039	-.249865
4	-.808028	-.119216	-.057779	.223234	.712387	-.130879	2.09006
5	-.669565	-2.06546	-.000499	.280337	.613943	-.148784	-2.68175
6	-.624731	-1.05759	.025559	.276192	.607911	-.141189	-2.37534
7	-.637495	.479857	-.018853	.186969	.66129	-.02703	-.245348
8	-.59054	-.708178	-.012445	.20232	.651174	-.041295	-.619868
9	-.535714	-1.50126	.007497	.272826	.655092	-.101643	-1.81137
10	-.611471	-.515127	-.010359	.260347	.696851	-.099608	-1.81842

step	(22) irf	(23) irf	(24) irf	(25) irf
0	0	0	0	1
1	-.017351	-.241027	-.291252	.080143
2	.13031	-.491724	-.096825	.21922
3	.074722	-.472934	-.006829	.487648
4	.048555	-.521335	-.021938	.62771
5	.057769	-.344398	-.065713	.567862
6	.067406	-.363846	-.022043	.352462
7	.028972	-.377624	.147599	.493766
8	.033426	-.340699	.054569	.484779
9	.05873	-.274241	-.062338	.464225
10	.045678	-.343871	-.051371	.421749

(1) irfname = order1, impulse = lnGDPG, and response = lnGDPG

(2) irfname = order1, impulse = lnGDPG, and response = lnM2

(3) irfname = order1, impulse = lnGDPG, and response = lnPRIV

(4) irfname = order1, impulse = lnGDPG, and response = lntrade

(5) irfname = order1, impulse = lnGDPG, and response = lnPOPG

(6) irfname = order1, impulse = lnM2, and response = lnGDPG

(7) irfname = order1, impulse = lnM2, and response = lnM2

(8) irfname = order1, impulse = lnM2, and response = lnPRIV

(9) irfname = order1, impulse = lnM2, and response = lntrade

(10) irfname = order1, impulse = lnPRIV, and response = lnGDPG

(11) irfname = order1, impulse = lnPRIV, and response = lnM2

(12) irfname = order1, impulse = lnPRIV, and response = lnPRIV

(13) irfname = order1, impulse = lnPRIV, and response = lntrade

(14) irfname = order1, impulse = lnPRIV, and response = lnPOPG

(15) irfname = order1, impulse = lntrade, and response = lnGDPG

(17) irfname = order1, impulse = lntrade, and response = lnM2

(18) irfname = order1, impulse = lntrade, and response = lnPRIV

(19) irfname = order1, impulse = lntrade, and response = lntrade

(20) irfname = order1, impulse = lntrade, and response = lnPOPG

(21) irfname = order1, impulse = lnPOPG, and response = lnGDPG

(22) irfname = order1, impulse = lnPOPG, and response = lnM2

(23) irfname = order1, impulse = lnPOPG, and response = lnPRIV

(24) irfname = order1, impulse = lnPOPG, and response = lntrade

(25) irfname = order1, impulse = lnPOPG, and response = lnPOPG

Appendix G

Descriptive statistics

stats	lnGDPG	lntrade	lnM2	lnPOPG	lnPRIV
kurtosis	2.101572	3.20377	2.232366	4.40697	2.424606
skewness	-.6066757	.9801157	-.2159422	-.6207907	.3932216

Appendix H

Lag Length selection criteria

Selection-order criteria
Sample: 1974 - 2016 Number of obs = 43

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-104.633				.000113	5.09919	5.17471	5.30398
1	69.9758	349.22	25	0.000	1.1e-07	-1.85934	-1.40622*	-.630597*
2	97.5748	55.198	25	0.000	1.0e-07*	-1.98022	-1.1495	.272474
3	123.13	51.11	25	0.002	1.1e-07	-2.00603	-.7977	1.27062
4	152.357	58.454*	25	0.000	1.2e-07	-2.20264*	-.61671	2.09796

Endogenous: lnGDPG lnM2 lnPRIV lntrade lnPOPG
Exogenous: _cons

Appendix I Johansen Co Integration Test

Johansen tests for cointegration
Trend: constant Number of obs = 43
Sample: 1974 - 2016 Lags = 4

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	80	100.73788	.	103.2378	68.52
1	89	129.82924	0.74156	45.0550*	47.21
2	96	140.81989	0.40022	23.0737	29.68
3	101	148.33812	0.29509	8.0373	15.41
4	104	152.09807	0.16044	0.5174	3.76
5	105	152.35676	0.01196		

Appendix J Granger Causality Wald Test

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
lnGDPG	lnM2	35.718	4	0.000
lnGDPG	lnPRIV	42.601	4	0.000
lnGDPG	lnPOPG	17.762	4	0.001
lnGDPG	lntrade	19.406	4	0.001
lnGDPG	ALL	115.59	16	0.000
lnM2	lnGDPG	2.163	4	0.706
lnM2	lnPRIV	8.0843	4	0.089
lnM2	lnPOPG	4.0607	4	0.398
lnM2	lntrade	2.964	4	0.564
lnM2	ALL	31.275	16	0.012
lnPRIV	lnGDPG	14.009	4	0.007
lnPRIV	lnM2	10.288	4	0.036
lnPRIV	lnPOPG	9.2877	4	0.054
lnPRIV	lntrade	19.447	4	0.001
lnPRIV	ALL	97.703	16	0.000
lnPOPG	lnGDPG	4.3213	4	0.364
lnPOPG	lnM2	12.053	4	0.017
lnPOPG	lnPRIV	8.1792	4	0.085
lnPOPG	lntrade	5.1731	4	0.270
lnPOPG	ALL	53.643	16	0.000
lntrade	lnGDPG	11.631	4	0.020
lntrade	lnM2	18.041	4	0.001
lntrade	lnPRIV	10.16	4	0.038
lntrade	lnPOPG	2.4754	4	0.649
lntrade	ALL	33.027	16	0.007

Appendix K Vector Erro Correction

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_lnGDPG						
_ce1						
L1.	-1.568053	.3093657	-5.07	0.000	-2.174398	-.9617073
lnGDPG						
LD.	.2488788	.2271037	1.10	0.273	-.1962363	.6939938
L2D.	.0714937	.1979176	0.36	0.718	-.3164176	.459405
L3D.	-.0609662	.132502	-0.46	0.645	-.3206654	.1987329
lnM2						
LD.	.7889611	2.957947	0.27	0.790	-5.008508	6.58643
L2D.	3.417603	2.888094	1.18	0.237	-2.242958	9.078164
L3D.	2.531248	3.077532	0.82	0.411	-3.500605	8.5631
lnPRIV						
LD.	6.617324	1.834484	3.61	0.000	3.021801	10.21285
L2D.	4.514934	1.848523	2.44	0.015	.8918954	8.137972
L3D.	-.069366	.3440059	-0.20	0.840	-.7436052	.6048732
lntrade						
LD.	1.823879	1.015355	1.80	0.072	-.1661792	3.813938
L2D.	-.0476405	1.035942	-0.05	0.963	-2.078049	1.982768
L3D.	-1.656369	1.084676	-1.53	0.127	-3.782296	.4695578
lnPOPG						
LD.	4.310045	1.453189	2.97	0.003	1.461846	7.158244
L2D.	.728377	1.373825	0.53	0.596	-1.964271	3.421025
L3D.	-1.032329	1.084088	-0.95	0.341	-3.157102	1.092445
_cons	.0000632	.4843184	0.00	1.000	-.9491835	.9493099