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THE IMPACT OF MONETARY POLICY ON OUTPUT AND PRICE IN ETHIOPIA

BY

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This is to certify that the Project prepared by Mengesha Manedo entitled "The Impacts of Monetary Policy on Output and Price in Ethiopia" and submitted in Partial fulfillment of the requirements for the degree of master of arts in Applied Economic Modeling and Forecasting with concentration in Financial Policy Analysis and Planning complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

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Acronyms

ADF: Augmented Dickey Fuller

AIC: Akaike Information Criteria

CBE: Commercial Bank of Ethiopia

ECM: Error Correction Mechanism

HQ: Hannan Quinn information criteria

IRFs: Impulse Response Functions

LR: Likelihood Ratio

MoFEC: Ministry of Finance and Economic Cooperation

NBE: National Bank of Ethiopia

OLS: Ordinary Least Square

SC: Schwartz-Bayesian criteria

VAR: Vector Autoregression

VECM: Vector Error Correction Model

Abstract

This study examines the impacts of Monterey policy on output and price in Ethiopia by employing VECM Co-integration VAR model. There are different test were used in this studies before the analysis and domestic credit used as the proxy for monetary policy in Ethiopia and the main findings of the study are: gross domestic product, net foreign asset, Treasury bill yield rates and reserve money are all significantly and positively related to the domestic credit in the long run in Ethiopia. Consumer price index affects negatively and significantly to domestic credit in Ethiopia. The other two variables oil price and real effective exchange rates are not significant in the long run. None of the variables are significant in the short run and the speed of adjustment towards long run equilibrium takes many years to make a full adjustment for the shocks in the system.

Since money and capital markets are still at rudimentary stages with very few securities and given the lack of short-term money markets, interest rate policies are almost unused in the conduct of monetary policy in Ethiopia. It is, therefore, recommended that monetary authorities target monetary aggregate as a policy variable for effective monetary policy implementation. In addition, Monetary authorities should be put much effort to move towards more market based monetary and financial sector policies. In addition to the broad money and it also important to include other monetary aggregates that it may capture the monetary phenomenon of the country.

CHAPTER ONE

1.1 Background of The study

The two most important macroeconomic policies in the economics are monetary and fiscal policies, of which the monetary policy is one of the most important macroeconomic policy which the monetary authority use to control the supply of money, usually target the inflation rates or interest rates to stabilize the price and other macro variables. It is mostly used by the central banks to stabilizing the macro variables, from which the prices and output are the most important variables that influenced by monetary policy.

The monetary policy become effective since money, output and prices relations was established by the Pigouvian Cash Balance Equation 'M = k.P.Y' of quantity theory of money (QTM) in the classical era. This relation states that a direct and proportional influence of monetary growth on price inflation assuming full employment condition. Despite the fact that, the scholars raise different issues in taking the effectiveness of monetary policy versus fiscal policy to measure the macroeconomic policy. It is the most widely used as the policy tool to measure macro policies in nowadays.

The Ethiopian economy has been experiencing the different political regime hat result in economic reforms and structural changes. Before the 1991, the monetary authority dominated by the command government during these period private sectors were discouraged and there was largely nationalization of private sector by the government. National Bank of Ethiopia sets the interest rate structures in such a way that discourages the private sectors. The monetary policy during this period was highly influenced by the government.

After the replacement of 1974 command economy by the new market based market-oriented economic policy in 1991, the Monetary Authority has been implementing a wide array of economic reforms in the context of political economy. Monetary and Banking Proclamation of 1994 established the Monetary Authority as a judicial entity, separated from the governments and allowed private banks and insurance companies to operate in the industry. Monetary and Banking proclamation No 83/1994 and the Licensing and Supervision of Banking Business No. 84/1994 laid down the legal basis for investment in the banking sector Zerayehu (2014).

Though, there are some progress and growth in Ethiopian economic performance since the private sector has come to part in the economy, the financial sector are still low in Ethiopia, that there is low levels financial deepening, high interest rates spread (high difference between the lending and borrowing rates), low completions, dominancy of the government sector over the private sectors. The households and firms are interest inelastic which may result the monetary transmission channels through interest rate low not effective therefore, having these facts the purpose of this study is to examine the impacts of monetary policy on output and price in Ethiopia by employing coin grated VAR model by using the time series quarterly data from 1995 to 2015 to achieve the objective in this study.

1.2 Statement of problems

In every country stable and sound macroeconomics is the big issue that every economic society seeks to have. Hence there were different policy measures that have taken place to do this sound and stable economy. The monetary policy impact on the price, output and other macro economics variable is the most among the others. Hence the issue of monetary policy impacts on the macroeconomic variable is the wide researchable area since the early periods.

The money, output and prices relations was established by the Pigouvian Cash Balance Equation 'M = k.P.Y' of quantity theory of money (QTM) in the classical era. This relation states that a direct and proportional influence of monetary growth on price inflation assuming full employment condition. Since the classical period different research works pertaining to this relationship and many heated debates have revealed the sheer complexity in the association between money, output and prices. Some of the divergent views include Keynes Vis-a vis long run money neutrality proposition of the monetarist school; Philips curve philosophy of trade off between output growth and price stability, and its subsequent refutation in the long run by Phelps (1967) and Friedman (1968). However, besides agreement on basic issues such as the long-run neutrality of money, no clear consensus has been contradictory to explain how monetary policy decisions could be transmitted to prices and to the real sector (Lucas, 1972; Taylor, 1979; Ball, Mankiw, and Romer, 1988), as well as to describe the intensity and efficiency of this transmission Veronica M. et al (2003).

The historical evidence suggested for a high correlation between changes in the stock of money per unit of output and changes in prices in the same direction. Friedman noted that this correlation "tells nothing about direction of influence" (1958). However, the variety of monetary arrangements has substantial changes in the stock of money are both a necessary and sufficient condition for substantial changes in the general level of prices" (1958) see Stephen G.Hall et al (2012).

On the early works on the developing countries the researchers tried to see the impacts of monetary policy on the output and prices. The research conducted by the Chuku A. Chuku, 2009

on Nigeria observed that monetary policy innovations carried out on the quantity-based nominal anchor (M2) has modest effects on output and prices with a very fast speed of adjustment.

In both developed and developing countries like Ethiopia, the impact of monetary policy on the economy and in particular on output and prices has long been a key macroeconomic issue. It is also of fundamental importance from a policy perspective given how necessary it is for Monetary Authorities to have a proper understanding of the consequences of their actions to determine at each moment monetary stance is appropriate for reaching their final goal. Thus the Monetary Authority of Ethiopia (NBE) has set the final, intermediate, and operation targets to achieve its objective in the maintain price and exchange rate stability and support sustainable economic growth of Ethiopia and also the fast growth in Ethiopian economy since the last two decades were associated with growth in finance and money also paves the ways to growth in financial sectors and hence it is an interesting issue to see the impacts of monetary policy on output and price that may help the Monetary Authority of Ethiopia (NBE) to understand the effects.

The effectiveness of any monetary policy can be measured by the output that comes out of the policy measures taken by the monetary policy authority. In Ethiopia the main targets of the monetary policy is maintaining price stability and exchange rate stabilities in line with the high economic growth, low unemployment, however, for more than a decade Ethiopian experienced highest inflations in the history of the country and it is above the Africa's average inflations rate. In the year 2008 and the government of Ethiopia has paid much effort to tackle the problem, to reduce the high inflation rate. It is also observed that the country doing well in reducing the galloping inflation in to single digit (IMF, 2010). At the beginning of 2009 saw the imposition of unusually tight credit policies by the central bank, justified by the need to reduce inflation (Ethiopia Macroeconomic Handbook, 2010).

On the other hand, in developing countries like Ethiopia there are different factors affects the effectiveness of monetary policy on output and price. On the Ethiopian economic conditions were there is heavy dependency on the imported capital goods such as machineries, equipments and others goods as well, that it require high foreign currency and low development in financial sectors and less competiveness in the sector, interest inelastic natures the households and businesses, there is no secondary /capital/ market in financial sector and foreigners are prohibited in investing financial sector, with this facts the effective use of monetary policy to captures the output and other macroeconomic effects is difficult, therefore having this facts this study tries fill the gap that how is monetary policy effective in affecting output and price levels by employing the co integrated vector error correction models and examine the relationship between these variables.

1.3 Objective of the study

The main objective of this study is to examine the impacts of monetary policy on output and price in Ethiopia.

The specific objectives are: -

- to analyze relationships between output, price and monetary policy in Ethiopia
- to analyze relationships between output , price and effectiveness monetary policy in Ethiopia

1.4 Research questions

Does the monetary policy have effects on output and price?

1.5 Hypothesis

This study sets the following hypothesis.

The first hypothesis

Ho: - Monetary policy has no effect on output and price

H1:- Monetary policy has effect on output and price

The second hypothesis

Ho: - Change monetary policy does not cause change in the output and price.

H1:- Change in monetary policy cause change in output and price.

1.6 Significance of the study

The right choice of any effective macro economics policy may derive a country to better economic positions, while making the monetary policy by the central banks it important to understand the real effects the policy on some targeted variables. Therefore, this study will have the following significances as it focuses in the impact of monetary policy on output and price, it is important to understand the relations between monetary policy output and price. This paper may add some values to the existing literatures when it provides with some facts on these variables. It also serves as references for the further study of the research in the related areas in Ethiopia.

1.7 Organization of the Paper

On this paper there are five chapters, chapter one is about the introductions, background, statements of the problems and objective are presented, chapters two is about the theoretical and empirical literatures and the Ethiopian monetary policy framework, chapter three include the methodology and model specification data types and sources will be discussed, in chapter four include the empirical result will be discussed and finally in chapter five conclusion and policy implication will present.

CHAPTER 2

2. LITERATURE REVIEWS

On these parts of the both the theoretical and empirical literatures of the previous works on the related areas are reviewed and the frame Ethiopian monetary policy framework will be discussed.

2.1 The Theoretical Literature

The Monetary policy is all about the control of money supply by the monetary authority of a country mostly targeting on either inflation rates or interest rates to stabilize the macro economies such as price stability, exchange rates stabilities and low unemployment of the county. The actions of central banks or monetary authorities such as changing the interest rates, buying or selling of securities and the changes in the required reserve rates of commercial banks are the actions which the monetary policy consists.

Sims and Zha (2005) explained that the actual effects of monetary policy shocks on output and prices has raised the questions in the minds of central bankers and academicians from the time of the Classical quantity theorists in the 20th century to the monetarists in the 1950s and 60s and until present day economists. The two fundamental propositions about the effect of the quantity of money on the economy predate the emergence of monetary economics as a recognized discipline of study. The first is that increases in the quantity of money that is not associated with corresponding increases in real output will eventually lead to inflation, and the second is that a shortage of money can depress the volume of economic activity. A considerable literature has emerged, attempting to give credence or discordance to these propositions, using parsimoniously restricted multivariate time series models as Sims and Zha (2005) explained.

The impact of monetary policy on the economy and in particular on output and prices has long been a key issue in macroeconomic theory. It is also of fundamental importance from a policy perspective given how necessary it is for central bankers to have a proper understanding of the consequences of their actions so as to determine at each moment while monetary stance is appropriate for reaching their final goal. When we talk about the impact of monetary policy on the economy a distinction has to be drawn between the shorter term and the medium term: indeed, the effects of monetary actions on nominal and real variables can and generally will-differ considerably depending on the reference horizon.

In the book the New Neoclassical Synthesis and the Role of Monetary Policy by Marvin Good friend and Robert G. King 1997) suggests a set of the major conclusions about the role of monetary policy. First, New Neoclassical Synthesis models suggest that monetary policy actions can have an important effect on real economic activity, persisting over several years, due to gradual adjustment of individual prices and the general price level. Second, even in settings with costly price adjustment, the models suggest little long-run trade-off between inflation and real activity. Third, the models suggest significant gains from eliminating inflation, which stem from increased transactions efficiency and reduced relative price distortions. Fourth, the models imply that credibility plays an important role in understanding the effects of monetary policy. These four ideas are consistent with the public statements of central bankers from a wide range of countries. It is in this role that they can inform-rather than confirm-the priors of central bankers.

The credibility of monetary policy appears intuitively to require a simple and transparent rule. The new synthesis suggests that such a monetary policy involves stabilizing the average markup of price over marginal cost. In turn, this implies a monetary policy regime of inflation targets, which vary relatively little through time. Although price stability has been long suggested as a

primary objective for monetary policy, a number of major questions have arisen about its desirability in practice.

The concept of quantity theory money which began in 16th century was put the bit of literature available examining the interrelationships between money, output and prices. The Pigouvian Cash Balance Equation 'M = k.P.Y' of quantity theory of money (QTM) is the first formal framework to study the interactions amongst money, output and prices. This proposes a direct and proportional influence of monetary growth on price inflation assuming full employment condition. Since then, innumerable research works pertaining to this relationship and many heated debates have revealed the sheer complexity in the association between money, output and prices. Some of the divergent views include money non-neutrality proposition of Keynes vis-a-vis long run money neutrality proposition of the monetarist school; Philips curve philosophy of trade off between output growth and price stability, and its subsequent refutation in the long run by Phelps (1967) and Friedman (1968). In the context of developing countries there was a debate on emphasizing the role of monetary versus structural factors (Dutton (1971).

In the theory of monetary policy, does the monetary policy affect real output? If so, then what is the transmission channels by which these transmissions affects real output and price are the most influential monetary theories that raised by the macroeconomist. Hence, the following monetary transmission channels are among the commons.

The first one the interest rate channel which uses the standard Keynesian IS-LM frame work, which states the expansionary monetary policy, leads to the fall in the real interest rates, which decrease the cost of capital and increase the investment result in the increase in aggregate demand and output. The monetary Authority able to use the short term policy rates to influence

the long run real interest rates through price stickiness and the term structures, which affect the real economy.

The credit channels are passed through the asymmetry of information in the financial markets. As Bernanke and Gretler (1995) stated that the imperfections in the credit market may cause the monetary contractions, which leads to the increase in the external financial premium faced by the borrowers and to decrease in the loan supply. The credit channel is classified as bank lending channel, which is based on the assumptions of the monetary contractions, which decrease bank reserve and bank deposit, that lowers the quality of the bank loan available to lend and the other one is balance sheet channels which relates to the effect monetary policy can exert on the net worth of business and households. A monetary contractions decreases the net worth of a firm through it cash flow and the values of collateral finance premium associated with the more severe moral hazard problems and hence this leads to the reduce levels of lending ,investment and outputs.

The other one is exchange rate channel, where in the small open economy the extent to which the monetary policy can affect movement in the exchange rate is largely influenced by the theory of uncovered interest rate parity. This channel suggests that the expected future change in nominal exchange rates is related to the difference between the domestic and foreign interest rates. In this theory the uncovered interest rate enables the monetary policy Authority to influence the exchange rate, which in turn affects the relative price of the domestic and foreign goods that affects exports and output.

In the asset price channels Mishkin (1995) single out two main mechanisms through which the monetary policy shock are propagated by the changes in the equity prices. The first one is the

theory of Tobin's q which suggests that when equities are cheap relative to the replacement cost of capital, firms don't want to issues new equities to purchase investment goods, lead in to decline in investment and hence leads to decline in output. The second one is that equity prices may have substantial wealth effects on the consumptions because of permanent income hypothesis. That is the raise in the stock price increases the values of financial wealth, thus increase life time income of the households and the demand of consumptions and outputs.

The monetary policy can guide economic agents' expectations of the future inflations and the influences of price development. Thus the inflations expectations matters in the influences of the real interest rates and the price and money wage-setting behaviors which feed through in to the actual inflation in the subsequent periods. The expectations of the future changes in the policy rate can affect the medium and long term interest rates.

2.2 Empirical Literatures

The roles of monetary policies in macro economics are very high and hence the different macroeconomist tried to see these roles and the relations between the monetary policies and macro variables such output and prices. Therefore here I would like to put the empirical works of other researchers so as to get empirical supports for this paper.

The researchers have been conducting different researches to see the impact of monetary policy on output and prices. The following are some articles in this area of the research which used the Vector Auto Regressive models to analyze the relations. In the paper conducted by Chuku A. chuku,(2009) measuring the effects of monetary policy innovations in Nigeria: they carried out a controlled experiment using a structural vector auto regression (SVAR) model to trace the effects

of monetary policy shocks on output and prices in Nigeria. They made the assumption that the Central Bank cannot observe unexpected changes in output and prices within the same period. They conduct the experiment using three alternative policy instruments such as broad money (M2), Minimum Rediscount Rate (MRR) and the real effective exchange rate (REER) and found evidence that monetary policy innovations carried out on the quantity-based nominal anchor (M2) has modest effects on output and prices with a very fast speed of adjustment. While, innovations on the price-based nominal anchors (MRR and REER) have neutral and fleeting effects on output. The conclusion they have drawn was that the manipulation of the quantity of money (M2) in the economy is the most influential instrument for monetary policy implementation.

Bernanke and Blinder (1992) have used different version of VAR model to decompose the set of endogenous variables in the VAR model into sub-sets of policy and non-policy variables in US. The sub-set of non policy variables includes economic variables such as output, interest rate and price and the sub-set of policy variable includes federal funds rate to capture the overall stance of monetary policy. By imposing contemporaneous identification restrictions, they analyzed the impact of monetary shocks on real activity and price. Based on US monthly data covering the period 1961:7 to 1989:12, they find that the effects of shocks to funds rate on the output are essentially zero during first two to three quarters after the shock. The effect begins to rise at about 9-months ahead and reaches the peak after two years before returning back to zero.

Also in other research Ben S. Bernanke and Mar Gertler (1995) employed the VAR models to see the credit channels of monetary transmission mechanism by using the variables such as log of real GDP, log of GDP deflator, log of an index of commodity price and the federal fund rates to analyze monetary policy shocks to the response of output, price and federal fund rates and the

real GDP and GDP deflator used as the measure of the real activates and price and the commodity price index intended to control the oil price and other supply shock which affect output and inflations. On this work according to the estimated response pattern GDP declines after the four months after the tightening of the monetary policies bottoming out about the two years after the shocks. The price levels remains inherent for about a year and then declines after the drop in the GDP begins. Finally, after the rising sharply initially, the fund rate begins to fall after three to four months.

On the other hand the Vector Error correction model (VCM) which am going to use for this research was widely used method for the macro economics research analysis. The VEC methodology has become a workhorse of empirical research (see Cuthbertson, Hall and Taylor, 1991, and Greene, 2008, among others). As Stephen G.Hall et al (2012) stated on the methodology they employed on the analysis of the Milton Friedman's, the Demand for Money, and the European Central Banks (ECB) Monetary Policy Strategy. They used the VCM and TVCM to analyze the paper they conducted and the variables used were real money balances as broad money (M3) divided by the GDP deflator, real GDP is used as a proxy for real income. The opportunity cost of holding money is the long-term interest rate minus the own rate of return on M3.This is because of the long-run interest rate series for the euro area as a whole does not exist for the entire estimation period, which begins with 1980:Q1, used the rate on 10-year German sovereign bonds for the long-term rate and demonstrated that the many direct connections between the contributions of Milton Friedman and the monetary policy strategy of the European Central Banks. The VCM approach aims to identify a set of variables which, together, form a stable long-run relationship. If such a relationship is found to exist, the variables are said to co integrate.

In the Developing countries like South Africa, Chile, Indonesia and others, the use of VECM model has become the most important empirical method for the analysis of the monetary policy effect on macroeconomic variables and the monetary policy transmission mechanism as well. In South Africa Waal and Eyden, 2012 develop a structural co integrated vector autoregressive (VAR) model with weakly exogenous foreign variables, suitable for a small open economy like South Africa. The type of model is known as an augmented vector error correction model (VECM), referred to by VECX* and compile the foreign variables with trade-weighted three-year moving average data for 32 countries, to account for the significant change in trade shares over time.

On this specific study area of Ethiopia, Zerayehu S. (2014) has used Vector Autoregressive Error Correction (VECM) cointegration VAR models to Analyze the monetary policy and macro economic shocks in Ethiopia, estimation and analysis of monetary policy reaction function. On the article he used the variable such as domestic credit as the most indicators of monetary policy performance, net foreign assets, Consumer price index, Real Gross Domestic Product (RGDP), Real effective exchange rate (REER) and Fiscal gap (FG) and he founded that both net foreign asset and GDP are statistically significant and positively influence domestic credit in the long run dynamics model. It is only consumer price index that has a positive impact in the short run dynamics. All other explanatory variables negatively influence domestic credit in the short-run dynamics model. The effect of monetization of fiscal deficit on monetary policy depends on the endogeneity and exogeneity of fiscal deficits in the long run dynamics model and the speed of adjustment or feedback effect towards long run equilibrium takes many years to make a full adjustment when there is a shock to the system.

2.3 The Ethiopian Monetary Policy Framework

3.2.1 Monetary Policy Objective

The principal objective of the monetary policy of the National Bank of Ethiopia is to maintain price and exchange rate stability and support sustainable economic growth of Ethiopia. Price stability is a proxy for macroeconomic stability which is vital in private sector economic decision on investment, consumption, international trade and saving. Finally, macroeconomic stability fosters employment and economic growth. Maintaining exchange rate stability on the other hand is considered as the principal policy objective of NBE so as to be competitive in the international trade and to use exchange rate intervention as policy tools for monetary policy to affect both foreign reserve position and domestic money supply National Bank of Ethiopia Monetary Policy Frame work (2009).

More specifically, the objectives of Ethiopia's monetary policy are to:

- Foster monetary, credit and financial conditions conducive to orderly, balanced and sustained economic growth and development.
- Preserve the purchasing power of the national currency – ensuring that the level of money supply is generally consistent with developments in the macro- economy and intervening in the foreign exchange rate market for the purpose of stabilizing the rate when conditions necessitate.
- Encourage the mobilization of domestic and foreign savings and their efficient allocation for productive economic activities through the implementation of a prudent market driven interest rate policy.
- Facilitate the emergence of financial and capital markets that are capable of responding to the needs of the economy through appropriate policy measures.

- These measures would ensure the gradual introduction of trading instruments on a short-term basis.

3.2.2 Monetary Policy Strategy/Targeting Framework

Monetary policy strategy of a central bank depends on a number of factors that are unique and contextual to the country. Given the policy objective, any good strategy depends on the macroeconomic and the institutional structure of the economy. An important factor in this context is the degree of openness of the economy. The more open the economy is, the more the external sector plays a dominant role in monetary management.

Within a country's monetary management framework, there are basically three targets: the ultimate or final target, the intermediate target and the operating target is considered as the principal policy objective of NBE so as to be competitive in the international trade and to use exchange rate intervention as policy tools for monetary policy to affect both foreign reserve position and domestic money supply.

The final targets of monetary policy in Ethiopia are to maintain price and exchange rate stability and support sustainable economic growth. In achieving these objectives, the NBE sets money supply as an intermediate target. It should be noted that intermediate targets are not directly controlled by the central bank NBE's Monetary Policy Frame Work (2009). NBE takes the broader definition of money or M2 as money supply. The current target is to ensure that the money supply growth is in line with nominal GDP growth rate.

The operational target is an economic variable that the central bank wants to influence, largely on a day-to-day basis, through its monetary policy instruments. They can be used to link instruments of monetary policy to intermediate targets set by the central bank and represent the first impulse in the transmission process of monetary policy. The growth of base money/reserve money is being used as operational target of the National Bank of Ethiopia. Reserve money (Base money) is defined as the sum of currency in circulation and deposits of commercial banks at NBE. The practice of targeting reserve money is based on the assumption that there will be a stable money demand function in the economy. If the money demand happens to be unstable over the medium to long term, then the NBE will shift its targeting in to another workable framework such as interest rate targeting or multiple indicator approach.

3.2.3 Monetary Policy Instruments

The introduction of a wide range of monetary instruments by central banks engenders competition, efficiency and transparency and broadens financial intermediation in the banking system. It also promotes liquidity management of commercial banks and gradually leads to the development of well functioning money and financial markets which could serve as catalysts for economic growth and development. So far, the use of such instruments has been extremely limited in Ethiopia due to the underdevelopment of the money market and the virtual non-existence of a financial market. Thus, it is envisaged to use a mix of diversified monetary policy instruments so as to effectively carry out the monetary management function of the NBE.

Open Market Operation (Sale and purchase of bonds or securities issued by governments) has generally been used by countries as one of the main instruments for the development of money

markets. Trading in these instruments liquefies the financial system in particular and the national economy in general and increases financial intermediation among market participants. In light of this, the NBE will use open market operations (sale and purchase of government securities) as one of its monetary policy instruments NBE's monetary policy Frame work (2009).

2.4 The Conceptual Framework

From both the theories and empirics we can infer that the monetary policy is the most important macroeconomic area where different scholars had paid attentions working on it. Based on these theoretical and empirical facts mentioned in the above, for this study I tried to see the impacts of monetary policy on output and price in Ethiopia by using quarterly data on eight variables, such domestic credit, real gross domestic product, consumer price index, reserve money, real effective exchange rate, oil price and treasury bills yield rate to analyze.

CHAPTER 3

3. DATA METHODS AND MODEL SPECIFICATIONS

3.1 Data source and Types

On this study the secondary quarterly data will use to analyze the study. The types of data on which this paper will use for this study are secondary time series quarterly data on which are relevant for this study. The quarterly data use for this study from 1995 QI-2015 QIV, which totally 80 observations. The sources of all data are National Bank of Ethiopia (NBE) and Ministry of Finance and Economic Cooperation (MoFEC).

3.2 Model Specifications

3.2.1. The Vector Error Correction (VECM) Model

The money output relations views of proposed by the traditional Keynesians places emphasis on the change in monetary aggregate affecting output (y) through interest rate channel. The mechanism can be traced by using the following systematic mechanism (Mishkin, 1996).

They put the relationship of money as: - **M/P= f(y r) ---------- 3.1**

Were M is money supply, P is domestic price r is interest rate and y is growth rate of output.

Also both the Taylor paper (1995) and the study by Obstfeld and Rogoff (1995) emphasize the importance of the exchange rate channel of monetary policy and The relationship between the nominal exchange rate and the real sector can be seen through Mundell-Fleming model which describes the market for goods and services by incorporating net exports. In particular, the goods market is represented with the following equation:

Y = C + I(r*) + G + NX (E (p/p*) ----------3.2

This equation states that aggregate income Y is the sum of consumption C, investment I, government purchases G, and net exports NX. Investment depends negatively on the interest rate, which equals the world interest rate r*. Net exports depend negatively on the exchange rate E. when the nominal exchange rate appreciates, foreign goods become cheaper compared to domestic goods, and this causes exports to fall and imports to rise.

On the other hands, VECM methodology has become popularly used by the different researchers for their works on the monetary policies and money demand functions in the empirical research (Cuthbertson,Hall, and Taylor, 1991, and Greene, 2008). The VECM approach aims to identify a set of variables which, together, form a stable long-run relationship. If such a relationship is found to exist, the variables are said to co integrate. In the Hendry's 1998 VECM model he estimated a unique and stable long-run co integrating vector between quarterly data for nominal M1, real output, the consumer price index, and a short-term interest rate. This vector can be also considered to be a long-run money-demand function.

In addition to the above, Johansen-Juselius (1990) methodology was used to estimate the long-run co integrating vector from a VECM of the form, D*Xt* = G(*L*)D*Xt* + *DZt* + ab¢[*Xt* – 1] where *Xt* is a vector of endogenous variables (money, output, prices, and interest rates), is a matrix of parameters for a fourth-order lag process, Z_t is a vector of stationary exogenous variables including seasonal dummies, and D is the matrix of parameters associated with the exogenous variables. The parameters measure the speed at which the variables in the system adjust to restore a long-run equilibrium, and the vectors are estimates of the long-run co integrating relationships between the variables in the model and found that the system have a unique stable

long-run co-integrating relationship between money, inflation, output, and interest rates. However, the estimated short-run parameters of Hendry's original, the estimated coefficients on the lagged endogenous variables were unstable as stated by Adam and Hendry, and hence they added exogenous variables such as output gaps, exchange rates, 90-day commercial paper rate, the inflation rate and others to improve the estimates (see Charleen Adam and Scott Hendry).

Therefore, to see the impacts of monetary policy on output and price in Ethiopia, this study employed VECM cointgrateion analysis using the quarterly data from the year 1995 to 2015. On the categories of the information on quarterly data series on this study, this paper apply vector error correction model (VECM) to see the long run and short run relations between the variables on this study. The Vector Error Correction Model, which involves testing co integration in the variables long run relationships.

In the Ethiopian monetary policy frame work, the final targets of monetary policy are to maintain price and exchange rate stability and support sustainable economic growth. Hence to achieve the National Bank of Ethiopia (NBE) has both the intermediate and operational targets see National Bank of Ethiopia Monetary policy Frame work (2009). The broad money (M2) or money supply considered as intermediate targets, which is that intermediate targets are not directly controlled by the central bank. Therefore, as it is suggested by other researcher instead of the broad money M2 as monetary policy proxy variable the most determinant of broad money (m2) domestic credit (DC) and net foreign asset (NFA) are preferable, but the net foreign asset is not under the fully control of Ethiopian Monetary authority instead domestic credit will use on this research see Zerayehu (2014). On the other hand the reserve money (mo) is the operational target of NBE that it is an economic variable that the central bank wants to influence, largely on a day-to-day basis, through its monetary policy instruments. They can be used to link instruments of monetary

policy to intermediate targets set by the central bank and represent the first impulse in the transmission process of monetary policy. The Treasury bill rate (Tbr) is another variable which is use as policy instrument in the open market operations as the monetary policy instrument, the net foreign asset (NFA), the consumer price index (CPI) and real GDP are used as for the real sectors and real effective exchange rate (REER) for the trade with the rest of world effect on the monetary policy and finally, the oil price (Op) used as foreign variable that affect monetary policy in Ethiopia, the inclusion of foreign variables, which is relevant for a small open economy such as Ethiopia, is possible in a VECM to analysis the impact of a global shock on the transmission of monetary policy in Ethiopia. Therefore having all the above theoretical and empirical works, this model has the following specifications including eight variables including the domestic credit and it is stated as:

$$\mathbf{DC_t=\alpha_{0+}\ \alpha_1\ GDP_t) +\alpha_2\ (CPI_t) +\alpha 3\ (Mo_t) +\alpha 4\ (NFA_t)+\alpha 5\ Tbr_t+\ \alpha 6(REER_t)+\ \alpha 7(Op_t)\text{-------}3.3}$$

Where, DCt stands for Domestic credit, GDPt designates Real GDP, CPI_t denotes Consumer price index, Mo_t stand for reserve money, NFA_t stands for net foreign assets, Tbr_t stands for treasury bill yield rates, REER stands for Real effective exchange rate and Op_t denotes for oil price, where as α_0 stands for constant term and $\alpha_{1-}\ \alpha_7$ are the coefficients of the respective variables. Having these variables the study employed VECM model to see the long run and short run relation. The economic views (E-views) package will use to estimate parameters. Finally, the following tests will be chosen to conduct on the variable are the unit root test, the Johansen test of cointgrateion, test for the weak and strong exogenity, model stability tests and Ordinary least square estimations(OLS) techniques will use to estimate the parameters and the others test as well. The details of these tests will be display on the section four this paper.

3.2.2. Unit root test

A stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed. If a time series is not stationary in the sense just defined, it is called a non stationary time series. In other words, a non stationary time series will have a time varying mean or a time varying variance or both (Gujarati, 2004).

In general, if a (non stationary) time series has to be differenced d times to make it stationary, that time series is said to be integrated of order d. A time series Yt integrated of order d is denoted as Yt ~I (d). If a time series Yt is stationary to begin with (i.e. it does not require any differencing), it is said to be integrated of order zero, denoted by Yt ~I (0). Most economic time series are generally I (1); that is, they generally become stationary after taking their first differences (Gujarati, 2004).

Testing the stationarity of variables is relevant for the reason that it incorporates important behavior for these variables and making analysis with non stationary variables may result in spurious correlation. A stationary time series is superior or more important than a non stationary in economic analysis as it makes easier the study of the behavior of variables in the long run (Gujarati, 2004). Stationary test will be done on all time series properties of data employing the unit root test by Augmented Dickey- Fuller (ADF). If it is assumed that the error term, ut, is uncorrelated, the DF test may be used. But in case the ut is correlated, Dickey and Fuller have developed a test known as the Augmented Dickey Fuller (ADF) test. The ADF test is used in this

study as most tests of the DF type have low power. That is, they tend to accept the null of unit root more frequently than is warranted.

The general form of the ADF equation where only an intercept is included is as follows:

$$\Delta Y_t = \mathbf{A_0} + pYt\text{-}1 + \sum_{i=2}^{p} ß \Delta Y_{t-i+1} + \acute{\varepsilon}_t \quad \text{----------} \quad 3.4$$

For the case where the auto regression includes the intercept and a trend, the equation is of the following form:

$$\Delta Yt = A0 + A1t + pYt\text{-}1 + \sum pi=2\ ß\Delta Y\ t\text{-}i+1+\acute{\varepsilon}t \quad \text{----------} \quad 3.5$$

Where, is any variable in the model to be tested for stationary, A1 is coefficient of a trend, ἐt is an error term, ΔYt is the first difference operator and A0 is a constant. The null hypothesis of ADF is p =0 against alternative hypothesis that p <0. A rejection of this hypothesis means that the time series is stationary or it does not contains a unit root while not rejecting means that the time series is non-stationary (Enders, 1996).

We have to be care full also in determining p of the lagged variables because too few lags will leave autocorrelation in the errors and distort the test and too many lags will reduce the power of the test. Economists suggest the use of information criteria such as Akaike information criteria, Schwarz bayesian criteria and recursive t-statistics procedure to determine the optimal lag length. The detail tests will be shown in the chapter four in econometrics analysis.

3.2.3. Cointgrateion test

For economic variables after the unit root test, there must be cointegartions test before we precede to the VECM models. If two variables are not co integrated or proved to have no long run relationship, the testing procedure will stop there and one will not go for the construction of an error correction model. But if they are co integrated or proved to have a long run relationship one needs to go for an error correction mechanism. The error correction mechanism (ECM) is a mechanism used to correct any short run deviation of the variables from their long run equilibrium. If two variables Y and X are co integrated, then the long term or equilibrium relationship that exists between the two can be expressed as ECM (Gujarati 2004). This means one shall go for the construction of an error correction model if and only if the variables are co integrated.

CHAPTER FOUR

4. RESULTS AND DISCUSSIONS

4.1. Empirical Results

4.1.1. Unit Root Test

While testing the unit root we first change the series in to the log form to avoid the trends in the data, except the treasury bills yield rate others data are transformed to the log form on the e-views package. Therefore the log form of the data is as follows:

$LnDCt = \alpha_{0+} \alpha_1 (Ln\ GDP_t) + \alpha_2 (LnCPI_t) + \alpha 3\ (LnMo_t) + \alpha 4\ (LnNFA_t) + \alpha 5\ (Tbr_t) + \alpha 6\ (LnREER_t) + \alpha 7\ (LnOp_t)$ ---------- 4.1

4.1.2. Unit root test at level

Table4.1. unit root test at level

Augmented dickey fuller statistics (ADF) at level			
Variables	With levels	With intercept and trend	None
DC	-0.7137	-2.2182	2.8799
GDP	0.4403	-1.9698	2.2724
CPI	1.8854	-1.4340	4.3592
M0	-0.6287	-2.2483	0.7929
NFA	-1.0566	-2.0111	1.6848
REER	-1.5518	-2.2993	0.0362
OP	-1.2696	-2.8314	0.5782
TBR	-2.2525	-3.5654	-1.1998

Source; estimations result from the data

Here as we can see from the output tables 1 at the levels the variables are not stationary. That is we

fail reject the null hypothesis which declare that the data series has unit root. The table above the t statistics is less than the critical value in absolute term at 1 percent, 5 percent and 10 percent respectively hence we fail to reject the null hypothesis and the data has unit root at the level. Mostly the economic variables are not stationary at the levels and, hence we need to see them at the first difference before we go to the other test.

4.1.3. Unit root Test at the first difference

After the first difference all the non stationary data becomes stationary, see table two below. The table below the t statistics is greater than the critical value in absolute term at 1 percent, 5 percent and 10 percent respectively hence we reject the null hypothesis and the data is stationary at the first difference. This can lead as to use the co integration test that is required in the VECM model since the variables are stationary at the first difference.

Table 4.2. : Unit root Test at the first difference

Augmented dickey fuller statistics (ADF) at first difference			
Variables	**With levels**	**With intercept and trend**	**None**
D(DC)	-9.0987	-9.0480	-8.2786
D(GDP)	-14.0499	-9.5030	-13.5324
D(CPI)	-7.8864	-8.5173	-6.8133
D(M0)	-9.7903	-9.8371	-9.7482
D(NFA)	-8.7195	-8.6843	-8.4420
D(REER)	-7.9008	-8.1113	-7.9484
D(OP)	-8.3171	-8.387983	-8.3868
D(TBR)	-9.3899	-9.4140	-9.4448

Source: Estimated results from the data sources.

4.1.4. Lag Length Determination

Identification of lags is the first and foremost task while performing co-integration analysis or fitting co-integrating VECM. In this context, Akaike information criteria (AIC) and Schwarz information criteria (SBIC) were found to be more robust. Accordingly, the number of lags identifying the order of co-integration is one in the model. Following lags specification for the order of co-integration, it is necessary to determine the number of co-integrating equations in the system so as to correctly specify the VECM model fitting a given set of data. This can be done by using the Johansen multiple trace test procedure and a method based on minimizing either of the two different information criteria.

Table 4.3. : Lag order selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: DC CPI GDP M0 NFA OP REER TBR
Exogenous variables: C

Sample: 1995Q1 2015Q4
Included observations: 83

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-4685.039	NA	1.79e+39	113.0853	113.3184	113.1789
1	-4035.931	1157.446*	1.36e+33*	98.98629*	101.0846*	99.82926*

* indicates lag order selected by the criterion

The maximum lag selected by the lag selection criteria is one as we can see from the above table 3 above. Therefore we can use this one lag length for the Johansen test of co integrations and vector error correction model.

4.1.4. Cointgrateion Test

After conducting the optimal lag length determinations the important steps follow on this study is the investigating of the existence of any long-run relationship between the variables by checking whether the variables are co integrated; that is, if there exists a linear combination of them that is stationary. Hence in this empirical model the investigation consists of I (1) variables that are modeled in separate dynamic; employed the Johansen co-integration analysis to test for the presence of long run co-integration in the impacts of monetary policy on price and output. According to Stock and Watson (1988), the co-integrating rank (r) refers to the number of common trends, or co-integrating relationships in some or a combination of all of the series in the system. Therefore the Johansen test of co integration is applied to test the co integration tests in this part. The results of cointgrateion analysis following Johansen and Juselius (1990) stated below on the table.

Table: 4.4. Cointgrateion Test

Hyphotezed no of equations	**Trace statistics**	**Eigen Value**	**P-vale**
p= 0	188.9716	0.599308	[0.0001]**
p≤ 1	113.9776	0.319145	[0.6882]
p≤ 2	82.45629	0.292016	[0.5393]
p≤ 3	54.13894	0.259835	[0.4075]
p≤ 4	29.46660	0.172683	[0.7040]
p≤ 5	13.92209	0.108345	[0.7986]
p≤ 6	4.518652	0.052497	[0.8124]
p≤ 7	0.096830	0.001180	[0.7557]

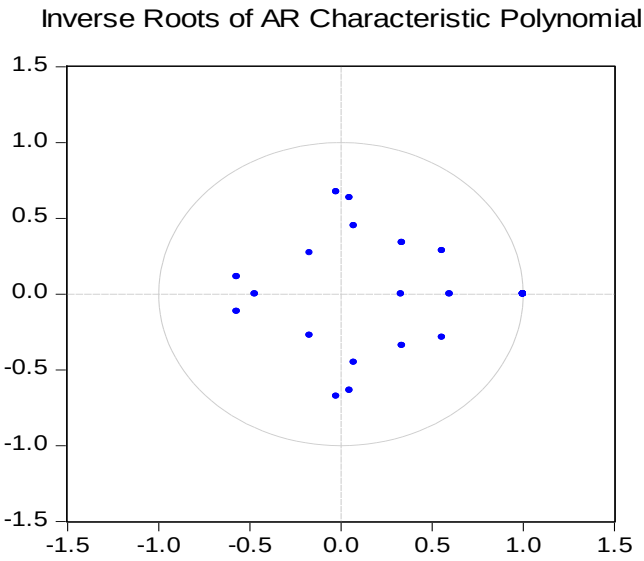
** Indicates statistically significant at 5% level of significance.

The trace statistics in the table 4 above shows that there is one co-integrating equations at 5 percent levels of significance. The trace statistics adjusted for degrees of freedom confirms that the null

hypothesis of at most one co integrating vector is not rejected at 5% significance level. On the basis of this trace statistics it‘s possible to see that there is only one co integrating vector since the trace statistic associated with the null hypothesis of is not rejected at 5 percent levels of significance. On the other hand, the maximum eigenvalue test also explains that there is one cointigartinig equation at 5 percent level. Hence the test indicates that there are long run relationships.

4.1.5. Model Stability Test

The model stability test use to show that how strong is the model in explaining the monetary policy impact on the price and output. Stable model has high power in correctly predicting and checking the monetary policy impacts on output and price, thus it is the objective of this research. Therefore the inverse root of the autoregressive polynomial shows that the model is stable since all the plots lies inside the circles. Therefore, this model can use for the predictions and analysis of the monetary policy impacts on the output and price since it is stable model.



Source:-Estimation result from the model

Fig. 4.1 Inverse Root of AR characteristics Polynomial

4.2. Vector Error Correction Model (VECM)

Table: 4.5. Long run equilibrium Vector Error Correction Estimates

Long run equilibrium Vector Error Correction Estimates			
Variables	**Coefficient**	**Std. Error**	**t-Statistic**
Constant	**26.67617**	-	-
CPI(-1)	**-4.426099**	**-0.9317**	**[-4.75064]****
GDP(-1)	**1.380065**	**-0.4973**	**[2.77503]****
M0(-1)	**0.982573**	**-0.2952**	**[3.32864]****
NFA(-1)	**0.664419**	**-0.2997**	**[2.21688]****
OP(-1)	**-0.088717**	**-0.2927**	**[-0.30309]**
REER(-1)	**0.122025**	**-1.1583**	**[0.10535]**
TBR(-1)	**1.055262**	**-0.1082**	**[9.75446]****

Note; ** indicates the variable is significant at 5 percent levels of significance

We can see the t-statistics in the table 5 above which implies that t value greater than 1.96 at 5 percent, which indicates that the variable is significant at 5 percent levels of significance. Therefore, in here above table 5 we can see that, all variables are significant except oil price and real effective exchange rate. As indicated in the chapter three above in the model specification parts the domestic credit used as the proxy for the Ethiopian monetary policy. In the long run consumer price index affects the domestic credits negatively as the coefficient in indicates. The domestic credit and gross domestic product has positive relationships in the long run, as indicated in the table above. This also leads to the rejections of the null hypothesis that we set as there is no

relations between price, output and monetary policy. The reserve money which used as the operational target in Ethiopian monetary policy has affect domestic credit positively and significantly.

The net foreign asset (NFA) which the most determinant of money supply in Ethiopian monetary policy has both significant and positive relationships with the domestic credit in Ethiopia.

The international oil price (Op), which is external shock to Ethiopia economy, has the negative relationship with the domestic credit and it is not significant. The real effective exchange is not significantly affecting the domestic credit in Ethiopia; this is also supported by the other research see Zerayehu (2014). It also due to the exchange rate channel of monetary policy is weak in Ethiopia. The Treasury bill rate is one of the instruments in the open market operation in Ethiopian monetary policy and that it affect domestic credit positively and significantly as shown in the above table. Therefore the long run VECM model as form of equations as follows:-

LRDC=26.67+1.380LGDP-4.260LCPI+0.982LM0+0.664LNFA-

0.088LOP+0.122LREER+1.055LTBR------ (4.2)

With t=[2.77503] [-4.75064]** [3.32864]** [2.21688]** [-0.30309] [0.10535] [9.75446]** respectively.**

4.3. Short run Estimates of Coefficients

Table4.6. short run equilibrium Estimates

Dependant variable: Domestic Credit (DC)
Method of Estimations: Least Square

short run coefficients				
Variables	Coefficient	Std. Error	t-Statistic	Prob.
constant	0.062376	0.024118	2.586309	0.0117
DCPI(-1)	-0.502135	0.713184	-0.704075	0.4837
DGDP(-1)	0.037164	0.126129	0.294653	0.7691
DM0(-1)	-0.001062	0.098844	-0.010749	0.9915
DNFA(-1)	-0.008563	0.125093	-0.068452	0.9456
DOP(-1)	-0.001748	0.115204	-0.015171	0.9879
DREER(-1)	0.532829	0.615677	0.865435	0.3897
DTBR(-1)	0.005048	0.032249	0.156542	0.8760

Source: estimate result from the model output

The short-run dynamic includes simultaneous current effects, short-run adjustment effects to lagged changes to the variable and previous equilibrium errors in the system. Identification of the short-run structural equations often requires that the residuals are uncorrelated, or at least not significantly correlated since residual covariance matrix plays an important role in the identification of the short-run structure. When the residuals of a short-run structural model are approximately uncorrelated, it might be possible to label them as estimated shocks (Reade, 2006). In the table above none of the variables are significant in the short run at five percent of levels of significance.

The existence of stationary and co integration in the long run equation permits to develop the error correction model as indicated in the above. The results of parsimonious vector error correction model for LDC reported in table 5 by employing the Hendry‘s general to specific model. The lagged error correction term (ECT-1) included in the model to capture the long run dynamics

between the co-integrating series is correctly signed (–0.008) and statistically significant. The coefficient of ECT, which measures the speed of adjustment at which Domestic credit (DC) would adjust to changes in gross domestic product (GDP), consumer price index (CPI), reserve money, real effective exchange rate oil price and treasury bills yield rate before converging to their equilibrium level, has the correct sign, implying that the series is non explosive and that long-run equilibrium is attainable. The estimated coefficient of ECT (-0.008) for RGDP, indicates speed of adjustment to reach the equilibrium following a shock. In other words, about 125% of disequilibrium of the current year‘s shock converges and is eliminated within a year and the economy returns to long-run equilibrium within 5.25 years.

4.4. Granger Causality Test

Table 4.7: Pairwise Granger Causality

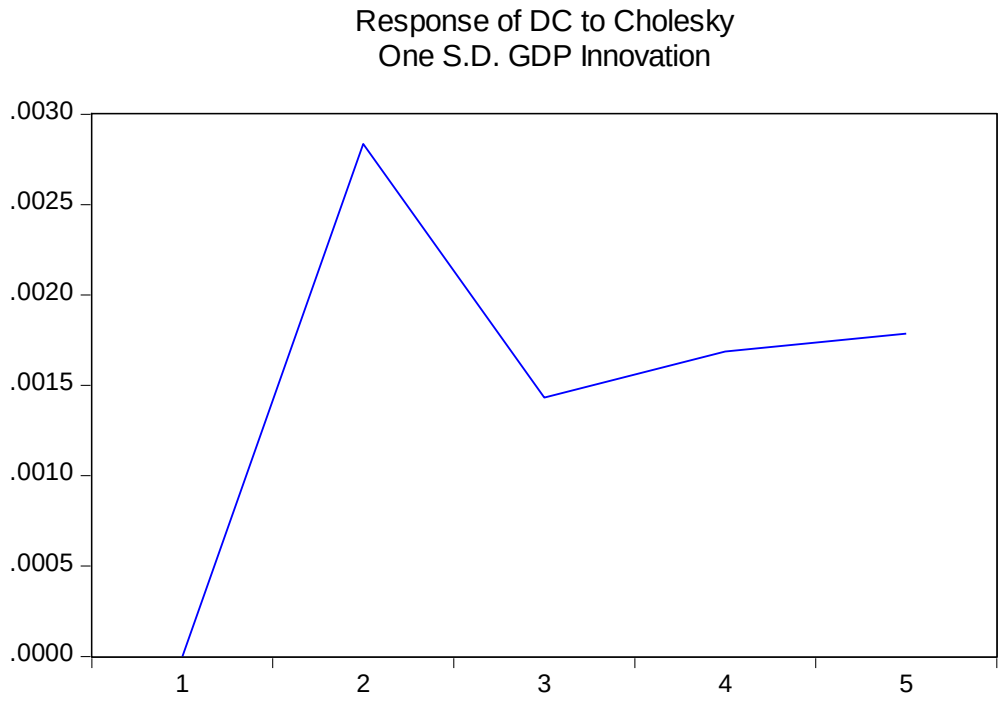
Pairwise Granger Causality Tests			
Null Hypothesis:	F-Statistic	Prob.	Decisions
GDP does not Granger Cause DC	1.63965	0.2041	Accept
DC does not Granger Cause GDP	5.60140	0.0204	Reject
NFA does not Granger Cause DC	1.73346	0.1917	Accept
DC does not Granger Cause NFA	5.05787	0.0273	Reject
REER does not Granger Cause DC	0.00012	0.9913	Accept
DC does not Granger Cause REER	3.23589	0.0758	Accept
TBR does not Granger Cause DC	0.00032	0.9858	Accept
DC does not Granger Cause TBR	10.6404	0.0016	Reject

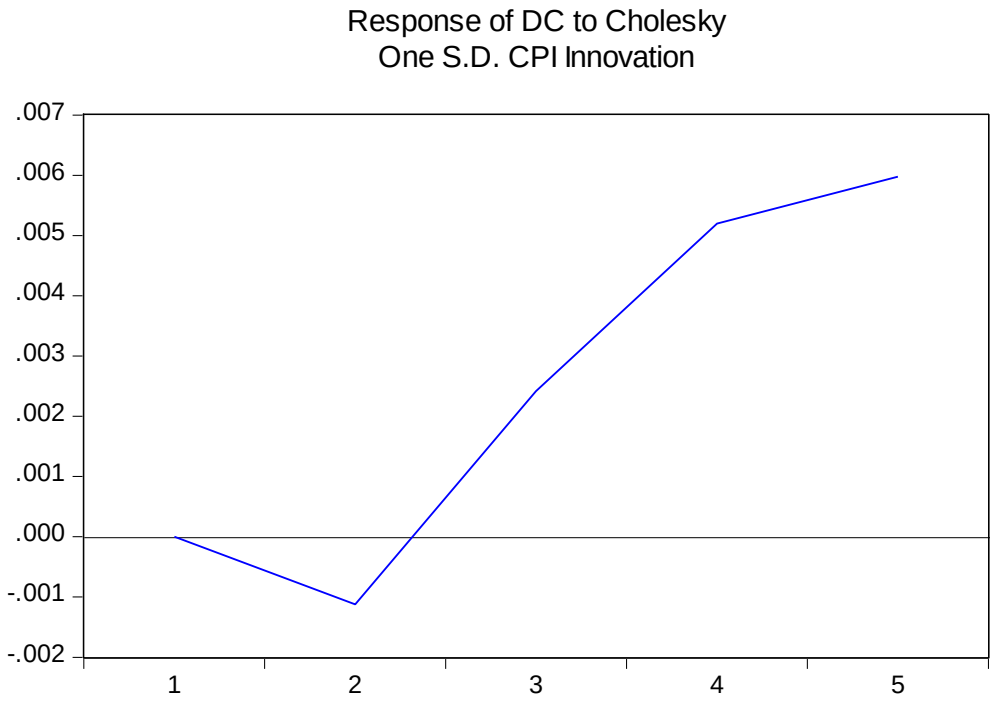
Here in the table 7 the Granger causality test shows that the domestic credit does Granger cause Gross domestic product. The net foreign asset (NFA) doesn't granger cause the domestic credit, but domestic credit does granger cause net foreign asset. The real effect exchange rate does not granger cause the domestic credit and the domestic credit also does not cause real effective exchange rates. Finally, the Treasury bill rate does not granger cause the domestic credit, but domestic credit does granger cause Treasury bill rate.

4.5. Impulse Response Analysis

In this section the impulse response analysis shows how the change in the monetary policies or shocks affects the variable that the study is interested in. The impulse response function shows the increment to each variable due to one standard error shock of the other variable taking account all interactions between the variables. The impulse responses are eventually expected to converge to a level that is consistent with the estimated long run co-integrating relationship. Impulse response function, reported for a horizon of five years enables us to trace out the response of output and price to a shock in policy variables. It allows us to see the monetary policy impacts on the output and price. The shock is represented by one standard deviation of the error term in the underlying structural model for the variable. Since all variables are measured in logs, the impulse response functions trace out a growth rate relative to the base period when the shock occurred (Jayaraman, 2010). The following graphs Results of Impulse Response Function Analysis (Response of LDC)

Figure 4.2. Results of Impulse Response Function Analysis (Response of LDC)




Response of DC to Cholesky
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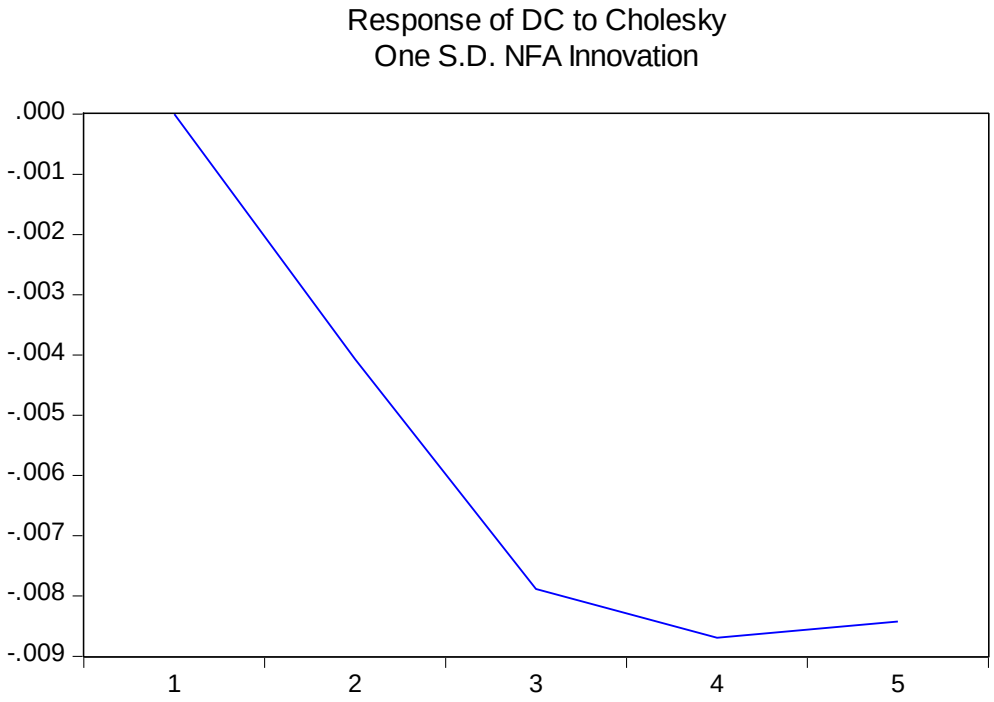
Response of DC to Cholesky
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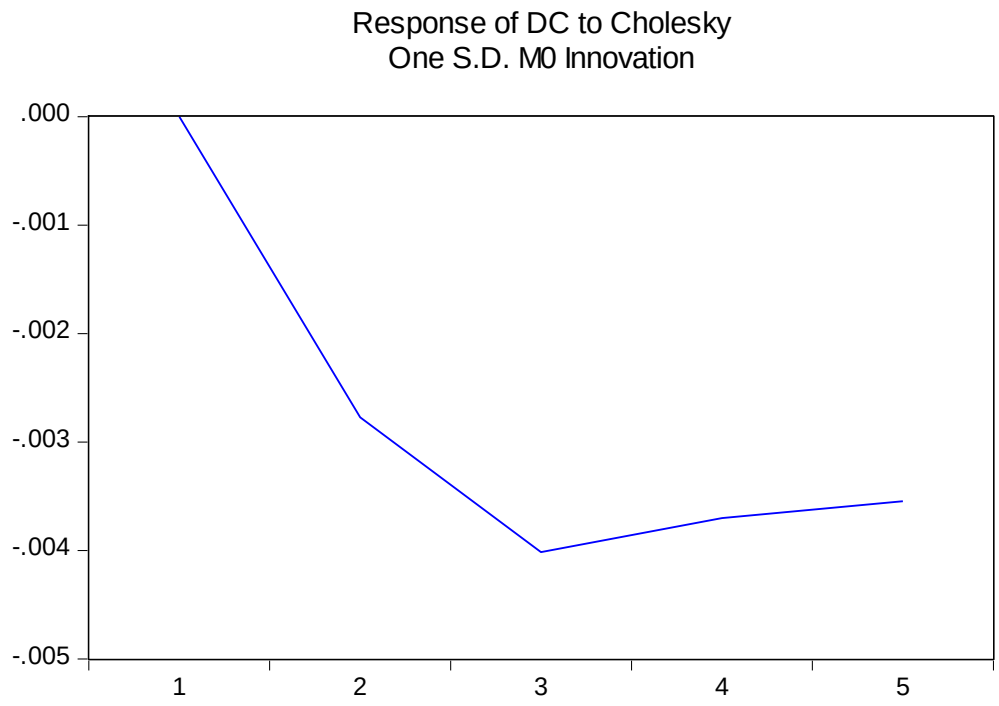
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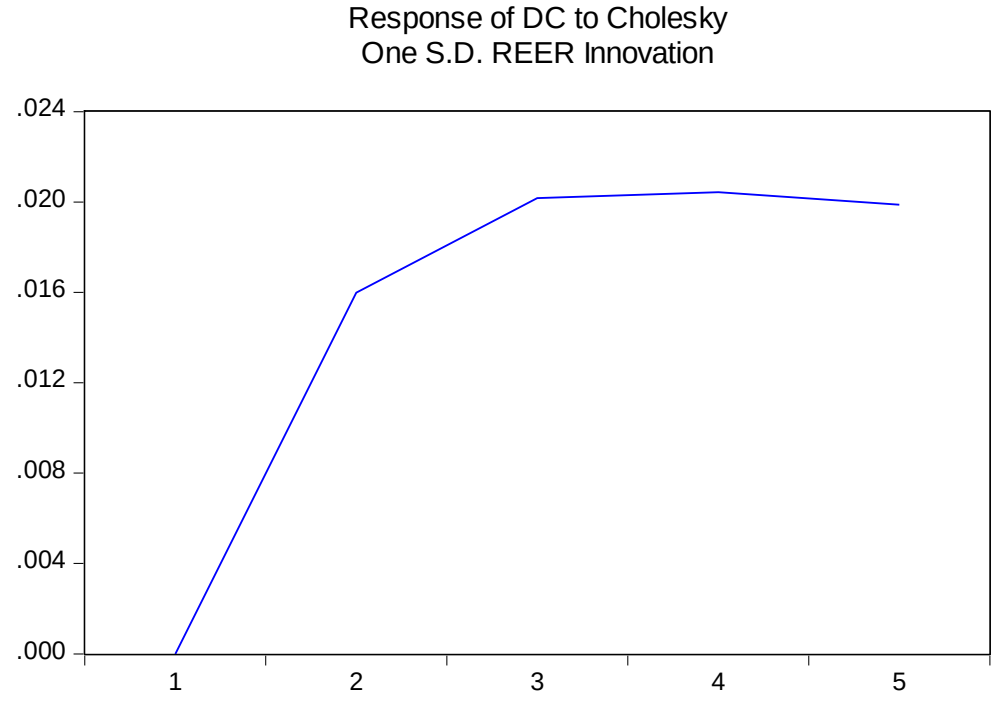
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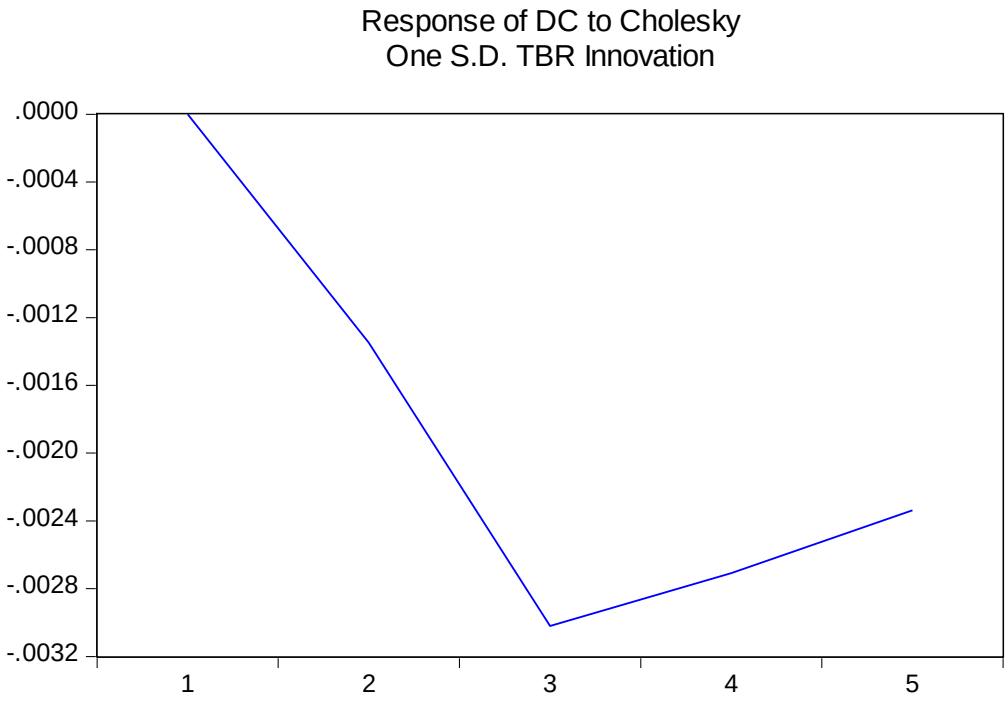
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CHAPTER FIVE

5. CONCLUSSIONS AND POLICY IMPLICATIONS

5.1 CONCLUSSIONS

This project is an attempt to investigate impact of monetary policy on output and price in Ethiopia, by using the quarterly data series from year 1995quarter 1 to 2015quarter four. The study employed vector error correction methods (VECM) to analyze the study on this project, with the main objective of analyzing the relationship between monetary policy output and price. The results of the co-integration test based on Johansen's procedure for domestic credit indicate the existence of the co-integration between variables. Therefore, the variables have a long-run equilibrium relationship between them. Following the same procedure, the Johansen co-integration test also confirmed by error correction term one co-integrating equation. Thus the result vector error correction results revealed that there is long run relationship between monetary policy, output and price. The monetary policy affect long run output positively and significantly and this is also supported by other researcher output and theory of money. The consumer price index has negatively related and significant with domestic credit. The real effective exchange is not significantly affecting the domestic credit in Ethiopia; this is also supported by the other research see Zerayehu (2014). Moreover, the reserve money which used as the operational target in Ethiopian monetary policy has affect domestic credit positively and significantly and the treasury bill rate has also significant and positively affect the domestic credit. On the other hand, there is low long run adjustment coefficient or speed of adjustment which it take long time to adjust the

equilibrium and it suggested by other researcher this indicates the inadequacy of the financial market and weak financial development, which in turn implies that the indirect monetary policy instruments might not be effective as expected Zerayehu (2014).

5.2 POLICY IMPLICATIONS

The main target of the Ethiopian monetary policy is that long run price and exchange rate stability in line with the economic growth. Hence, the underrating of the long run relationship between output and price on this study which established relation between monetary policy shocks and prices in the long run, are proved to be existing and constitutes a satisfactory framework for the discussion of anti-inflationary policies in the Ethiopia.

Since money and capital markets are still at rudimentary stages with very few securities and given the lack of short-term money markets, interest rate policies are almost unused in the conduct of monetary policy in Ethiopia. It is, therefore, recommended that monetary authorities target monetary aggregate as a policy variable for effective monetary policy implementation. In addition, Monetary authorities should be put much effort to move towards more market based monetary and financial sector policies. In addition to the broad money and it also important to include other monetary aggregates that it may capture the monetary phenomenon of the country.

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Appendix

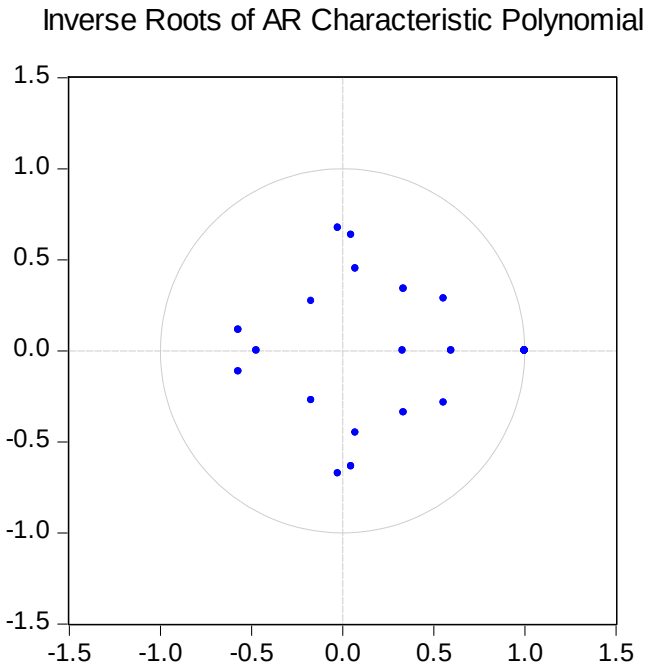
1. Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.997995	Prob. F(24,56)	0.4839
Obs*R-squared	24.26587	Prob. Chi-Square(24)	0.4465
Scaled explained SS	360.4348	Prob. Chi-Square(24)	0.0000

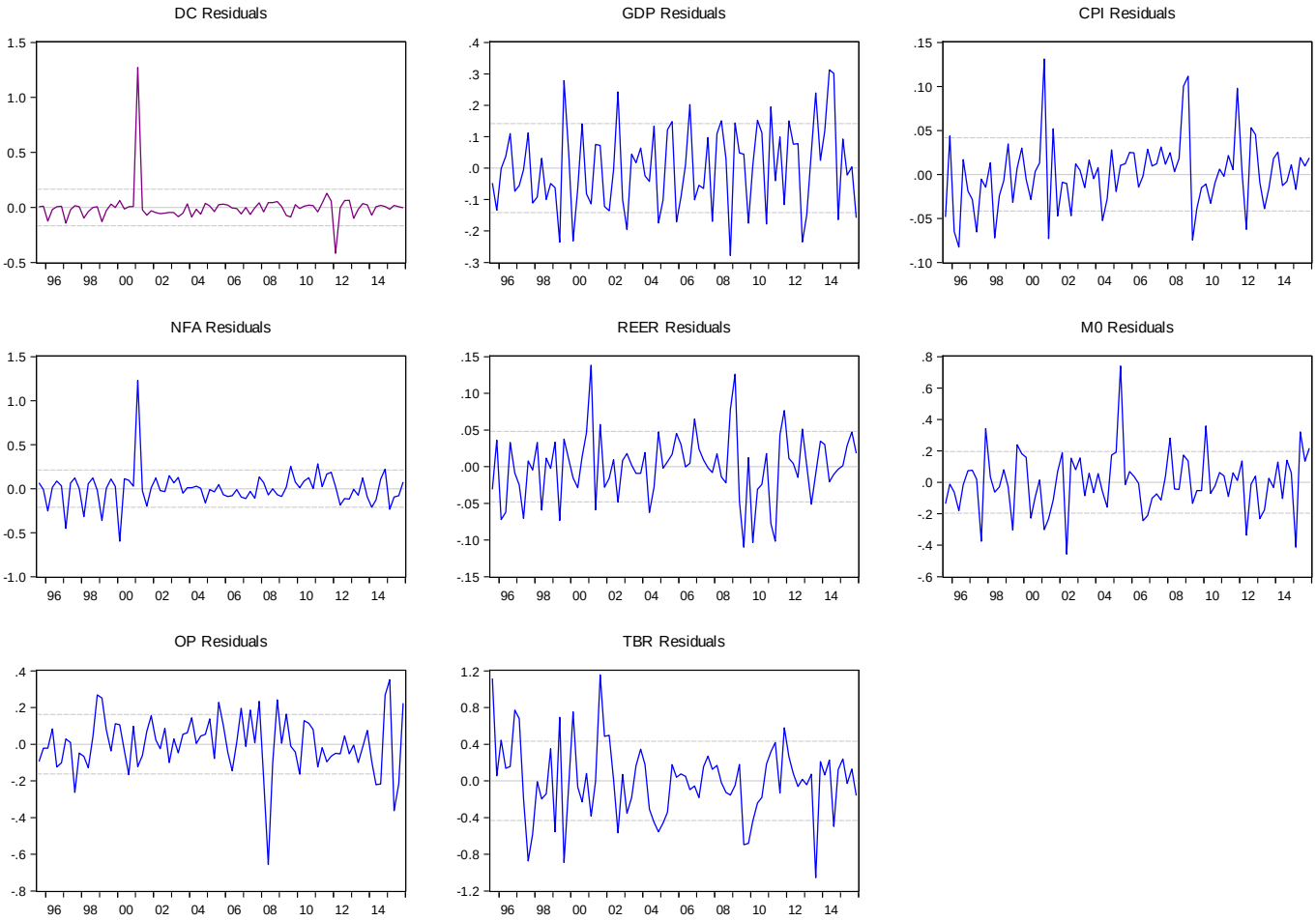
2. Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.322008	Prob. F(1,62)	0.2546
Obs*R-squared	1.691081	Prob. Chi-Square(1)	0.1935

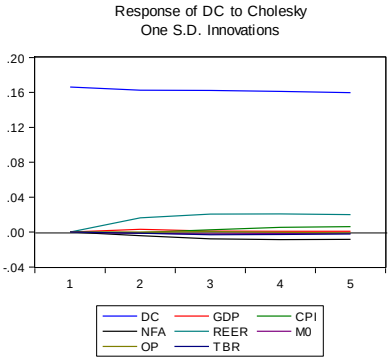
3. Model Stability test

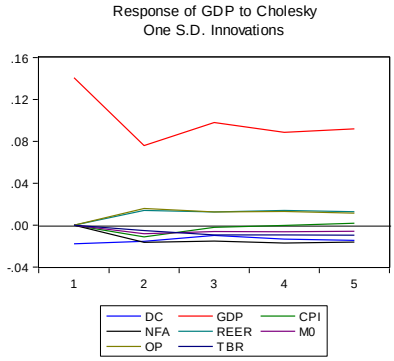


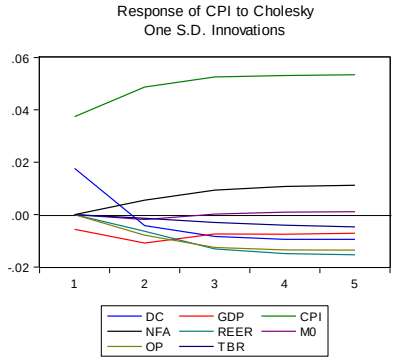
4. Residual normality test

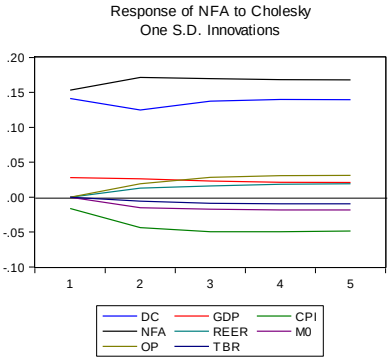


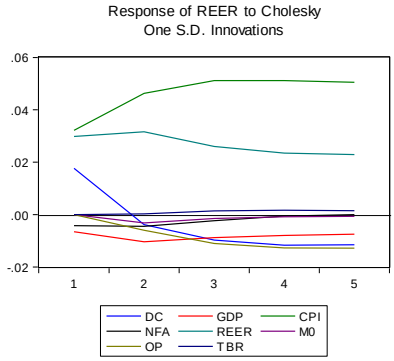
5. Impulse response

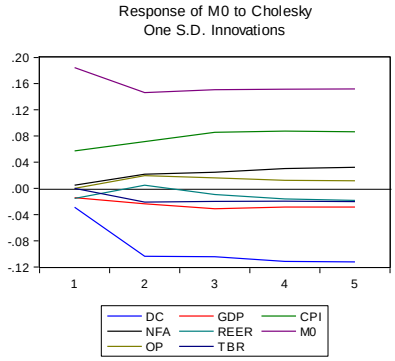


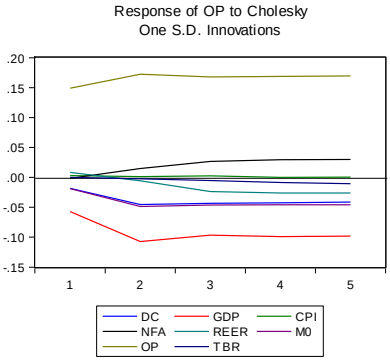


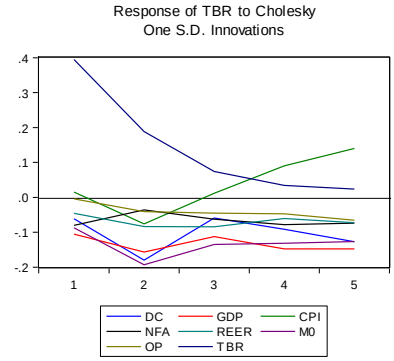












Declaration

I, the undersigned, declare that this Project is my original work and has not been presented for a Master's degree in any other University, and that all sources of material used for this thesis have been duly acknowledged.

Declared By:

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Signature: _____

Date: _____

Confirmed by (Advisor)

Name: Zerayehu Sime (PhD)

Signature: _____

Date: _____

Place and date of Submission: _____