

HOW CENTRAL BANK RESPONDS TO

MACROECONOMIC SHOCKS?

**SPECIFICATION, ESTIMATION AND ANALYSIS OF
MONETARY POLICY REACTION FUNCTION:
THE CASE OF ETHIOPIA (1991-2005)**

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BY

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JULY, 2006

ADDIS ABABA

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DECLARATION

I, the undersigned, declare that this is my original work & has not been presented for a degree in any other university and that all sources of materials used for the thesis have been duly acknowledge.

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ACRONYMS

CPI	Consumer Price Index
DC	Domestic Credit.
DCP	Domestic credit to private sectors
REER	Real effective exchange Rate
GDP	Gross Domestic Product.
Fg	Fiscal deficit or gap
NDCG	Net domestic Credit to Government
NBE	National Bank of Ethiopia, Interchangeable with Central Bank
MOFaED	Ministry of Finance and Economic development
FIML	Full Information Maximum Likelihood estimation
VECM	Vector Error Correction Method
IMF	International Monetary Fund
WB	World Bank
IFS	International Finance Statistics
EPDRF	The Federal Democratic Republic of Ethiopia
TGE	Transitional Government Ethiopia
BOP	Balance Of Payment
CSA	Central Statistics Authority
CEB	Commercial Bank of Ethiopia
SAS	Structural Adjustment support
SAP	Structural Adjustment Program
ESAF	Enhanced Structural Adjustment Facility
AERC	African Economic Research Consortium
NPL	Non Performing of Loan
ERP	Economic Reform Program.
ECM	Error Correction Model
VAR	Vector Autoregressive
CBB	Construction and Business Bank

How Central Bank Responds to Macroeconomic Shocks?
Specification, Estimation and Analyses of Monetary Policy Reaction Function:
The Case of Ethiopia (1991-2005)

By Zerayehu Sime

ABSTRACT

This paper presents a model of monetary policy in Ethiopia after financial liberalization policy adopted. It is designed to identify both the goals and pattern of policy with the two major aims: firstly to know the way how National Bank of Ethiopia systematically responds to macroeconomic shocks and secondly to evaluate the performance monetary policy against its initial objective including assessment of gap analyses in monetary policy frame work.

Hence, the model demonstrates that the National Bank of Ethiopia chooses the domestic credit as the most appropriate indicator of monetary policy with the determinants of net foreign assets, consumer price index, fiscal gap, real effective exchange rate and Gross Domestic Products to formulate the reaction function. On top of this the empirical results explain that domestic credit has strong long run & positive relation with net foreign assets & to real Gross Domestic Product. But it has short run relation with consumer price index, real effective exchange rate and real Gross Domestic Product at different lag structure. The NBE followed a combination of both accommodating and stabilization monetary policy. The Coefficients of equilibrating error terms, ECM suggest that the speed of adjustment/ feed back effect towards the long run equilibrium takes many years for full adjustment when there is a shock in the system, indicating the longer lags structure and undeveloped financial sectors resulted in obstacles for the effectiveness of monetary policy.

Regarding to the evaluation of monetary policy objectives up on short run dynamics model, Both low inflation rate and reduction of monetization of fiscal deficit can be maintained in the review period while achieving the international reserve target is not fully under the control of NBE. Basically, the attempts of NBE to maintain the growth rate of money supply at the rate of nominal GDP growth has been satisfactorily met in the review period The sterilization coefficient revealed incomplete sterilization activities while the offset coefficient tell us a highest degree of monetary control with low degree of capital mobility.

Therefore in general due to the non-existence of a well-developed secondary market, the lack of latitude to engage in discretionary activities, and partial monetization of the economy make the monetary policy implementation ineffective.

Chapter one: - Introduction

1.1 Background of the study

Countries have gratefully concerned about the macroeconomic stability and the growth of GDP to achieve a better living standard of their people. Hence, they pay attention to the existence of sound macroeconomic policies laid a fertile ground to attract domestic and foreign investment along with the development of business confidence. The attempts are also made to consider different aspects policy implication of macro activities and to synchronize the net effects of all efforts particularly fiscal and monetary policy into a particular direction addressing the critical problem of real sector. Being each macroeconomic policies interact, supplement, and complement each other, there should be then set out principles that policymakers can use when designing policy packages, before implementing it practically. It means that policy is likely to have a positive or negative effect on the various target variables. In effect it might have stimulating or damping effect on economy.

So as the interactions between real and monetary sectors can determine countries growth rate of GDP, One of most and foremost researchable area in macroeconomics is monetary policy. It is the nucleus part of macro policy and can attract many researchers to steer the government into a particular direction and considers international macroeconomic co ordinations. Hence, a monetary sector is too much sensitive to macroeconomic shocks like domestic and foreign shocks or policy and non-policy shocks. Depending on the independence of central bank, policy makers widely engaged in determining the pattern of monetary policy, and in setting the effectiveness of policy objective, policy target and policy instruments. These conditions are depending on the political and the economic condition pursued by the countries.

In the case of Ethiopia, the Derg regime came in to power in 1973/74 actions to centrally planned economy was nationalizing the emerging private banks and Insurance companies. Here *monetary policy was designed to the target of central plan*. The private sectors were marginalized from getting bank loan and the bulk of investment decisions were made within the public sectors. In the ten-year plan, it envisages that close to 73% of the commutative credit expansion would be allocated to state, cooperative etc and the remaining 27% was expected to be extended to the central state in the form of direct advances-bill and bond purchase. Economic sectors lost their own autonomy and the development of financial markets and institutions was curtailed. These policy actions together with recurrent drought and intensified civil war were held responsible for the sluggish economic

performance and macro economic instability, increasing BOP deficits and inflationary pressure. Extension of credit intake by central government had to do a lot with the behavior of money supply during Derge regime. Though the scarcity of foreign assets from poor foreign sectors policy had seriously hampered their impact on monetary expansion and constraint the endeavor to expand the public sectors. Since borrowing had also been effected for non- development purpose, the resulting external indebtedness had not been sustainable. The exchange rate was fixed, thus, at a very low level to prevent growth in the domestic cost of foreign currency due to weak foreign assets, parallel markets had a number of restriction. Despite the prevalence of negative real interest rate for the most period, deposits kept on growing because of lower demand for money in the private sectors (MOFaED: 1999).

Government also imposed artificially lower nominal interest rates on the deposits of profitable public enterprises and non-bank financial institutions like pension funds and insurances. This enabled government to avail sufficient financial resources to the socialized sector at preferential interest rates. The problem was however, with the inefficiency and poor productivity performance that had been prevalent in the socialized sector, leading to inefficient utilization of funds channeled to them. This was evident with a number of public enterprises, which were incurring operational losses and yet supported by budget subsidy. Later on, this development had resulted in to a large sum of non-performing loans incurred mainly by Agricultural and Industrial Development Bank. Hence, the Derg policy of expanding the public and socialized sector at the expense of the private sector proved to be a failure and unsustainable because of inadequate monetary policies, among others, which impaired development of the financial sector.

Apart from increasing pressure on domestic financial resources, government's endeavor to expand the public sector was constrained by the availability of foreign exchange (as is the case for any developing countries), necessitating external borrowing and assistance. Since borrowing had also been effected for non-development (defense) purposes, the resulting external indebtedness had not been sustainable. The exchange rate was, thus, fixed at a very low level to prevent growth in the domestic cost of foreign currencies. This has, however, penalized the export sector, which has not developed from the beginning. To restrain effective demand for foreign exchange, government has introduced a number of restrictions on the imports of some commodities (especially consumer goods), foreign exchange rationing through licensing, introduction of high and protective tariff rates and the like.

Following these economic crises, The EPDRF government came in to power in 1990/91 with the adoption of market-oriented economy up on the adjustment programs of IMF and the World Bank structural adjustments. Policy measures were taken to improve the external imbalance, liberalize trade and financial sectors, to remove fiscal and real sectors constraints. As an important of stabilization, monetary policies of the reform period has been aimed at maintaining the growth in nominal GDP so that inflation could be contained and external balance maintained at a sustainable level. In doing so government sought to ensure adequate growth of credit to meet the requirements of the non- government productive sector. Moreover six private banks, twenty-five micro finance institutions, and nine insurance companies are emerged.

Government has progressively introduced indirect monetary policy instruments including adjusting interest rate, open market operations for government securities, setting the minimum deposit and maximum lending rate, removing discriminatory interest rate among sectors. On the other hand, *monetary policy is shifting to the objective of reducing monetization of budget deficits in order to lower inflation.* As put the policy Framework paper of Oct.1992:

“ The objective of monetary policy will be to ensure domestic liquidity expansion that allows for reasonable credit growth to meet the proper needs of the productive sectors particularly the private sectors, while reducing domestic inflation and that pressure on the BOP. Attainment of this objective will require a significant cut back in credit to the central government”(TGE, 1992).

Even though open market operation is not in its standard way, steps are taken to lay ground by developing Treasury bill market. Auctioning of government securities to the public and financial institutions was started in January 1994/95 and currently there are three categories of treasury bills with maturity periods of 28,91,and 182 days on the market. Both private and public enterprises participate in this auctioning. Apart from being a non-inflationary financing instrument to the government, T- bills help avoid crowding out effects of government borrowing from the banking system and help prepare the ground for capital markets.

Ethiopia's monetary policy has continued to focus on maintaining price stability and achieving international reserve targets during year 2003/04. Accordingly, broad money supply increased by 15.2%, which was lower than the 21.2% growth in nominal GDP. This has the 21.2% reflected not only in the slowdown in headline but also in M2/GDP ratio declining from 52.7% in 2002/03 to 50.1% in 2003/04. The monetary policy instruments used by the National Bank of Ethiopia include

reserve requirements, sale of T-Bills, setting minimum deposit rate, and rediscount window facility and moral suasion. The bank is considering enhancing the effectiveness of the instruments and /or introducing new one (NBE: 2003/04).

In doing so, the central bank responds to both *policy and non-policy shocks* or *foreign and domestic shocks* to have macroeconomic stability, and attempts to meet its own monetary policy objectives. Macroeconomic shocks refer to the economic disturbances that create instability and make a deviation from the point of reference like the trends and the target values. Such shocks are stemmed from domestic and/ or foreign disturbances and they might be policy and/ or non-policy shocks. Unlike developed countries that conduct explicit way of responding to these shocks, in developing countries, like Ethiopia can implicitly respond in some fashionable patterns up on the determinants of monetary policy. In addition, policy reaction function describe how monetary authorities adjust their operating targets (and instruments) to new information such as an increase in expected or lagged inflation, high economic growth, depreciating exchange rate, excessive money growth. Naturally, important elements in estimating reaction functions are instrument variable, Backward-looking or forward looking, non-linearity and regime shifts. It also refers to changes on a mostly monthly and quarterly frequency, and provides a link between short-horizon operating procedures and longer-horizon strategy objectives (D.J.C. Smart: 2004).

1.2 Statement of the Problems

The central essence of the study is going to identify the problems associated with the response of National Bank through monetary policy when there are shocks in the system. After the falling down of socialist regime and direct monetary policy instrument, monetary authority attempts to conduct basic financial liberalization program step by step including establishments of indirect or market-based policy instruments, inter -banks money markets, a treasury bills auction market as a stepping stone for open market operation in an undeveloped financial market and then to move out to a full fledged open market operation step by step, lifting up the ceiling and floor the interest rates through time, the entrance of private banks and all those commercial banks are allowed to set credit interest rate and the floor of deposit interest rate. Beside that the exchange rate are dramatically depreciating to alleviate the current account deficit and etc. In general breaking down financial repression policy of the Derge regime assumed to be a fertile ground for National Bank creating conducive and sensitive monetary sectors under the control of policy makers. Many expected there would be a considerable change over the financial sectors following the adoption of financial liberalization.

However the reformation of financial sectors launched might not bring considerable advancement in controlling monetary instruments and then monetary policy is not as effective as expected. For instance monetary authority has limited financial instruments with less controllability over them and there is weak relation between instruments and targets. Though National Bank drawn a credit facility since March 2001, there are no commercial banks have requested credit from the bank. Like this, inter-bank money market opened in 1998 could not exercised as expected and become ineffective. Surprisingly one of the best instruments namely open market operation (security market) are not established and then National Bank loses its controlling power of imposition over commercial banks' credit and interest rate. Hence all these and others sum total impacts make a stress on how National Bank controls on money supply & demand, and responds to macro economic shocks in order to maintain its objectives. Therefore the study can critically investigate the problems associated with monetary policy and its response to macro-economic shocks including:

- What are the problems involved in monetary policy instruments and the reaction towards macro shocks when the Bank attempts to meet its long run and short run policy objectives?
- What are the determinants of monetary policy after financial liberalization program introduced? To what extent the effectiveness of the policy depend on lag structure and the structure of the economy?
- Why some of macroeconomic variables are insensitive to monetary policy? What are the factors which insulate the monetary authority action? In other words why monetary policy sometimes unable to govern Macro variable shocks?

Given these problems and the absence of broad and active financial markets as well as lack of latitude to engage in discretionary activity, how does central bank respond? Is there a systematic pattern/ fashion in responding to Macro shocks? What policy dominates either stabilizing or accommodating or a mixture of two? How can the econometric outcome of estimating such a function be rationalized: economically or/and institutionally?

1.3 objectives the study

The explicit guidelines that National Bank ascribe to when taking policy decision would appear to be intractable for obvious reasons. Moreover Empirical evidence tells us more about the interaction among variables. Hence the major objective of the study is to know the way in which National Bank

of Ethiopia reacts to macro economic shocks and to evaluate its performance against its policy objectives with the following specific objectives:

- To know the performance of monetary policy and the actions taken by NBE to tackle the problems.
- To specify and analyze a monetary policy reaction function of Ethiopia and the interactions or feedback responses for policy determinants, and to identify variables that are relatively sensitive to monetary policy.
- To suggest policy implications after critical examination of the objectives of the monetary policy whether the National Bank meet its initially designed objectives since financial liberalization adopted.

1.4 Data and Methodology

The study investigates the response of National bank to macroeconomic shocks including for both domestic and foreign shocks. And evaluates the monetary policy objectives employing quarterly data over the period 1991-2005. The data all are obtained from National bank of Ethiopia, Ministry of Finance and Economic Development, and International Finance Statistics of the IMF. Accordingly analyzing how central bank manages those policy instruments in order to meet its own policy objectives seeks to know the interaction between monetary policy and macroeconomic shocks. To make things simple and taking the prevailing condition, here in the model, no need of restriction on the variable as exogenous and endogenous. Thus, the study blends Johanson (1988) procedure for vector autoregressive model specification with co integration and error correction techniques to estimate long- and short run coefficients. A VAR system of equation may be specified as

$$Z_t = A_0 \Delta_t + A_1 Z_{t-1} + A_2 Z_{t-2} + A_3 Z_{t-3} + \dots + A_n Z_{t-n} + \epsilon_t$$

Where Z_t is an $n \times 1$ vector that containing n variables in the system namely domestic credit, net foreign assets, consumer price index, Gross domestic products, real effective exchange rate, and fiscal deficits. Where Δ_t is a vector holding deterministic terms like trend, intercept, Dummies and so forth. ϵ_t is an n dimensional vectors of multivariate random errors with zero mean and covariance matrix Σ , that is innovation term. After some mathematical manipulation we obtain the error correction representation.

Up on determining the rank of the long run matrix Π (Matrix α and β), the essence of conducting co integration analysis is to: -

- Test for presence of long run stationary relationship between variables (i .e. equivalent to testing the hypothesis that what exist is a mere spurious correlation between variables due to co-movements of variables).
- Estimate long run parameters β_s (Co integrated vectors)
- Estimate long run coefficients of adjustments α_s (Loading coefficients)
- Employ long run information to estimate VECM_s that describe short-term dynamics.

1.5 Scope of the study

The scope of the study is confined to the role of NBE in responding to macro shocks, and evaluates its objectives by using specification estimation and analysis of policy reaction function. It includes the policy design, assignments, and instruments-targets relations. The study covers for the period since the falling down of Derg regime, 1991.

1.6 Significance of the study

Till now there are many research topics that have been done on monetary policy and its effectiveness. However specifying and estimating the policy reaction function in case of Ethiopia is scanty. This study may place its own contributions to evaluate the policy objective and it could be a building block for future studies. It also shed light on screening out the determinants of policy, and ensure whether there systematic pattern of response or not,

1.7 Organization of the paper

This paper consists of five chapters with different sections and sub-sections. Chapter one presents the introduction for the main part of the paper, and chapter Two also states that theoretical and empirical literature review of money and monetary policy in line with how central bank responds to macroeconomic shocks. Chapter three focuses on macroeconomic overview and examination of monetary policy objectives including the development of monetary and other related issues, and the monetary policy framework. Chapter four presents methodology and model specification with time series characteristic: unit root and Co-Integration analysis. It also produces the interpretation of VAR model econometric outcomes and then finally the last chapter as usual gives conclusion and recommendation with policy implication.

Chapter Two: Review of Related Literature

2.1 Theoretical Literature on Money and Monetary policy

2.1.1 Theory of Money and monetary policy

It is obvious that the very nature of monetary policy is to control money supply, which is linked with the changes in economic variables (Mishken: 1998). Hence analysing the behaviors of money supply is the fertile ground and a precondition for effective monetary policy. Accordingly, as universally accepted, money can be used as a medium of exchange, a unit of account, a store of value and a means of payment. However there is unsettled debates among economist how money affects the economy. In general, each school of thought like classical, Keynesian and monetarist presented different version to the effect of money over the real sectors due to the underlined assumptions

- **The Classical Monetary theory**

The classical economists argue that monetary forces do not change real variables such as output and employment. Accordingly, money acts only as a medium of exchange and it facilities transactions, i.e. neglects money as a store of value. Unlike Hume whose theory was based on long run equilibrium and restricted metal concept of monetary system, the one, Henry Thornton proposed that a *short-term theory* and took *expansion of credit* into account. As Hume, the expansion of money has real effects in the short-term particularly in a metal-based currency economy but Thornton expressed the long-term effect unknown.

He believed that in an expanding economy, the credit system can stimulate the economy depend on the demand pattern of the economy, He also advocated monetarist to pursue a credit management system through the use of monetary instruments of interest rate to control any excessive credit expansion, which can lead to boom and then to slump. He found an indirect link between money supply and prices through the rate of interest in that the rate of interest affects money supply, which in turn affects the price level. This linkage between prices, money and interest rate was the basis for Keynes's later works on the general theory of employment, interest and money (Mankiw, N.Gregory: 2003)

Irving Fischer developed the 'exchange or transaction equation' of earliest quantity theory of money. His theory based on that money was simply a medium of exchange such was held only to

facilitate exchanges. For the aggregate economy, at equilibrium, $PT=MV$ where T is demand for money (trade volume) and also is determined independently of the other variables in the identity, P is average price of commodity and factor, M is average quantity of money and is determined independently of any of the three other variables, V is average velocity of money and MV is supply of money is assumed to be passive and dependent where V is stable. This consideration permits the identity to be transformed in to a version of the 'quantity theory of money'. The demand for money (it depends on real factors of production) is taken as stable and outside the influence of monetary factors. Money supply (MV) and trade volume (T) determines the level of P and there is proportional relation ship between general price and money supply (Branson, William H: 1989).

Marshall and Pigou gave another version of the quantity theory of money to be called Cambridge equation. According to cash balance approach, individuals desire to hold money because it provides certain services such that security, purchasing power, buying on favorable term, opportunity arise, convenient asset to have and the like. For the aggregate economy, at equilibrium, $M=KYP$ where M is average money supply in a period, Y is real income, P is average general price, K is a fraction of cash balance out of real income and KY is demand for real cash balances. Here K is assumed to be constant in a fully employed economy and real income change only a very slowly. When M increase p will continue to rise until the demand for money equates the supply of money (Mankiw, N.Gregory: 2003).

Therefore in the short run money is not neutral to the economy, but in the long run equilibrium because of prices rise with the same proportion to equate actual and desired real money balances, money is neutral. Even though the classical dichotomy has been subjected to many debates, classicalist divided the economy in to the real and the monetary sectors. In the real sector, which is associated with the short-run monetary theory, real wages, output and employment are influenced and money is not neutral to the economy. While in the monetary sectors, which is associated with long run theory, the interest rate plays no role and money is neutral to real variables but affects nominal variables.

- **Keynesian Monetary theory**

According to this thought, the changes in money supply may be transmitted to real output and employment through interest rate and investment. Money is demanded for three motives: transactions, precautionary and speculative motives. Unlike classical, the Keynesian argument

incorporates both the medium of exchange and store of value as basic functions of money. Keynesian's view of the economy can be presented in a very simplified form. Suppose that for some reason each household and firms in the economy decides that it would like to hold a little more cash. Keynes argued this happens when businessmen lose confidence and start to think of potential investments as risky, leading them to hesitate and accumulate cash instead: An individual can increase cash holding by spending less. So what happens when everyone tries to accumulate cash simultaneously? The answer is that income falls along with spending.

For Keynes, the first and most thing to do is to make it possible for the people to satisfy their demand for more cash without cutting their spending, preventing the downward spiral of shrinking spending and shrinking income. The way to do is simple to print money and somewhat get in to circulation. So the usual and basic Keynesian answer to recessions is a monetary expansion. But he worried that even sometimes not be enough if a recession become a true depression.

Once the economy is deeply depressed during the depression year, 1930s, households and especially firms may be unwilling to increase spending no matter how much cash they have; they may simply add any monetary expansion to their hoarding. Such a situation, in which monetary policy has become ineffective, has come to be known as a 'liquidity trap'. In such a case, the government has to do what the private sector will not: spend. When monetary expansion is ineffective, fiscal expansion must take its place. Such a fiscal expansion can break the vicious circle of low spending and incomes and getting the economy moving again. Therefore there were re-establish stability by drawing into use idle resources, capital and labour. However after some time unemployment, which was expected to move inversely with prices increase, began to move in a similar direction. The cheap- money policy of Keynesians could not mop up unemployment, rather created monetary instability caused by inflation (Keynes: 1936).

To the detail, in Keynes theory, an increase or a decrease in money supply is attributed to the open market purchase or sale of government instrument by the central bank depending on the prices of security. The speculative motive is a key element of his liquidity theory and distinguishes Keynes from the classical school of thought. In classical, there is no distinction between motives, and takes money as neutral to the economy in the long run (Branson, William H: 1989, Mankiw, N.Gregory: 1997).

Keynes considered investment in financial assets as an alternative investment if money rose, and are replaced for money because money has nil return. The return of financial assets is the sum of the capital gain and the interest yield of the assets. So the owner make a decision based on this return

the whether to buy or to hold speculative (idle balance). If at higher interest rate the wealth owner hold less idle balances is changed to bonds up on the anticipation of the rate of interest and the capital gain. Contrasting this with the quantity theorist, a rise in money supply does not result in a direct proportionate increase in prices since part of it is held as idle balances because of different motives principle. For Keynes the general price level is determined by labour costs. But in classical, money supply determines the level of prices, wage, and employments. For Keynes those variables are determined through the rate of interest. Keynesians also differ from the classical monetary school in their view of transaction mechanism in the monetary sectors (Branson, William H: 1989).

The classical school does not state a thing about the source of extra money in an economy, while Keynes identified sources such as open market operation, increased exports and deficit expenditure. Unlike classicists who believed in wage cuts to diminish unemployment, Keynes recommended an increase in prices, which he believed that it would shrink the real wage rate and increase the demand for labour (Branson, William H: 1989).

- **Monetarists Monetary theory**

Monetarists' school argues in favor of the classical theory with slight deviations. They agree that money may affect real variables in the short run but only nominal variables or magnitudes changes in the long run. Friedman has studied the demand for money and suggested not only income and interest rate, total wealth also affects the desire to hold real money balances. Monetarism, as advocates of free market, started challenging Keynes's theory in the 1970s. Milton Friedman, the founder of monetarism, attacked Keynes idea of smoothing business cycle on the ground that such active policy is not only unnecessary but actually harmful, worsening the very economic instability that is supposed to correct, and should be replaced by simple, mechanical monetary rules. This is the doctrine that came to be known as monetarism (Friedman: 1970).

Friedman began with a factual claim; most recessions, including the huge slump that initiated the Great Depression, did not follow Keynes's script. I.e. they did not arise because the private sector was trying to increase its holding of *a fixed amount of money*. Rather, they occurred because of a fall in the quantity of money in circulation (Branson, William H: 1989 & Mankiw, N.Gregory: 2003).

The policy rule under Monetarism is that if economic slumps begin when people spontaneously decide to increase their money holdings, then the monetary authority must monitor the economy and pump money in when it finds a slump is imminent. If such slumps are always created by a fall in the

in the quantity of money, then the monetary authority need not monitor the economy; it need only make sure that the quantity of money doesn't slump. In other words, a straightforward rule-"keep the money supply steady"- is good enough, so that there is no need for a "discretionary" policy of the form, 'pump money in when your economic advisers think a recession is imminent.'

Money supply, which has been given a limited direct role in an economy, received a prominence position; their theoretical formulation is based on the old quantity, Cambridge cash balance, and the Keynesian liquidity preference theories. Similar to old quantity theorists, the monetarists believe that money plays a significant role in an economy and influence the periodic movement economic activity and particularly income and price levels. While the old quantity theorist, an increase in money supply result in a *direct* level determines the purchasing power or real money balance commodity holds. If prices rise, a commodity's demand for real balances increase, since more money is required now to purchase commodities.

The monetarist model is fundamentally a model for the demand of money and not a money supply model. Unlike Keynesian model, their model does not deal with changes in output, employment, money income or the price level. They consider money as assets (wealth) With implicit yields such as convenience and safety and treated it like production factors or commodities. The demand for money depends on total wealth, the prices and yields of money assets in terms of other alternative assets, tastes and preferences. They regarded money as any other commodity in which tastes and preferences play a significant role in the decision to buy or not to buy. For this reason, their model follows the general macroeconomic demand for goods equation where the quantity of a commodity is depending on its prices, prices of other commodities and on test and preferences (Friedman: 1968).

In general monetarism postulates that variation in money supply brings disturbances to prices and hence influence resource allocation. Growth in prices occurs only as an expansion in money supply, which implies that rigid monetary policy result in a stable environment for the performance of an economy. Friedman assigns three roles for monetary policy. Namely to restrain money itself from being a central cause of economic disorder, to present a stable background for the working of the economy and, to counterbalance majors instabilities from other sources. The monetarist alleged monetary policy to provide a universal remedy to all business-cycle evils, and monetary policy was primarily to be directed to encouraging the banking system in to satisfying the monetary demands of the business commodity.

So far we have seen the role of money in macroeconomic system depends on of the thoughts of different schools. Given that money can matter the economy, How could transmitted its effects? It can transmit through the intermediate macro variables namely portfolio balance, wealth, Credit, expectation, and exchange rate (Harris, Branson, Thomas Havrileskey: 1967).

According to Keynesian argument, if monetary authority undertakes open market operation to increase money supply will lead to increase bond price and interest rate. Even if there is no direct relation between money and with real assets, money can affects it through bond markets where the demand and price of the bond interaction directly affect the given money supply and then the real assets of the household (Harris, 1985 and Branson, 1989).

According to Tobin approach, money stands at one end of continuous spectrum of assets with real assets at the other. An increase money supply will result in portfolio adjustment and higher expenditure in real capital asset. For instance an increase in money supply leads to excess reserves by commercial banks, and they adjust their portfolio by either more loan or by engaging in secondary government market. He strongly considers, not only bond, many financial assets in equity market with a ripple effects that transmitted monetary impact in to real assets. i.e. the effect of a change in money supply is seen as a ripple passing along the range of financial assets but diminishing in magnitude and unpredictability as it proceed further away from their initial distribution. The ripple effect will eventual reach the demand for equity pushing up their prices and pressing their yield until this demand for real physical asset that will result in high investment spending and their output and employment (Branson, 1989).

On the other hand, monetarist does not endorse the indirect relation, and the ripple effect as recommended by the aforementioned schools. Rather they believed that money could easily and directly affect the real sectors through the portfolios balance approach. Besides that money is like any other assets and the term interest rate refers not only to the rate of return of the final assets but also to the rate return that the flow of services from any real assets represents the cost of assets. However the rate of return are implicit and unobservable. Thus the monetarist “money” is a substitute for not only financial assets but for all assets that comprise wealth portfolio (Friedman: 1970).

On top these intermediate variables, textbook expositions of the monetary transmission mechanism typically assume a financial structure in which banks coexist with well-developed and liquid markets for securities in the form bonds and equities. However the development of financial markets and

macroeconomic policy in Sub-Saharan Africa characterized by weak security markets and bank dominated structure.

As central banks bear an increasing share of responsibility for short-term macroeconomic management, effects on the monetary transmission mechanism and on conduct of monetary policy are particularly important. The transmission mechanism is strongly influenced by the state of domestic financial development, and financial structure may also constrain the ways in which monetary policy is conducted (AERC: 2003).

Under financial repression, the monetary authority can make use of a wide array of policy instruments, but the influence of these instruments on aggregate demand and real sectors is likely to be extremely complex and to be influenced by a variety of factors that can be expected to vary across time and place. While in liberalized 'bank-only' environment, monetary policy instruments consist of reserve requirements and central bank lending to commercial banks. Transmission is through the 'credit channel' (the cost or availability of bank credit) and the 'asset channel' (the market price of durable goods, which exerts wealth effects on aggregate demand). The relative importance of the availability versus the cost of credits, as well as the strength of the asset channel, is likely to vary with financial development.

In a 'bank-com-securities' world, the process of financial development will influence the relative roles of channels of transmission associated with the 'traditional' view of monetary transmission (interest rate effect that influence aggregate demand through real long-term interest rates, assets value and real exchange rates) and those associated with the 'lending view' (the credit channel and balance sheet channel). By increasing the scope for bank borrowers to access other sources of finance, as well as banks themselves to sustain lending in the face of reduction of reserves, financial development is initially likely to strengthen the former and weaken the latter.

As financial development proceeds in a bank-cum-securities setting, however, the growth of 'near-monies' will tend to weaken the traditional channels of transmission operating through the effects of open market operations on markets interest rate, essentially by increasing the interest elasticity of the demand for money. This does not mean that central Bank will lose control over interest rates, but that larger changes in reserve may be required to achieve a given interest rate effects. With respect to the conduct of monetary policy, the increased role of the asset channel associated with financial development, coupled with the role of expectations in determining assets value is likely to increase the uncertainty associated monetary policy effects, not least because of the possible effects that

monetary policy may have in creating or collapsing asset-price bubbles. The implication is the financial development increases the premium on predictability in the conduct of monetary policy (AERC: 2003).

2.1.2 Monetary policy framework and operating procedures

In the face of real world's complexities, policymakers need guiding principles to aid them in their work. It is important to examine the theory of economic policy against multiple objectives of the countries. This government objective is not only confined to economic sphere but it bring us to the concept of multiple and hierarchical objectives.

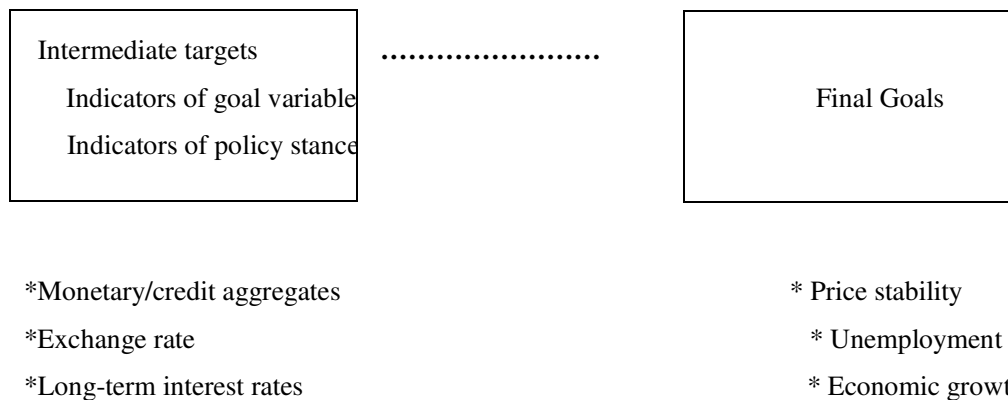
Tin Bergen (1955-1967) developed a mathematical model of policy formulation that conclude a government must use at least as many policy instruments as the numbers of its target variables. It serves as a warning against trying to use just one or a few policy measures to achieve a multiplicity of objectives.

The pursuit of multiple objectives bring with the potential for conflicts among them. This brings in the idea of tradeoffs, when progress towards one objective can be achieved only at the cost of a retreat from another objective. Trades off are pervasive and further complicate the policy problem. In principle, central bank can resolve choices between conflicting objectives according to their place in the hierarchy, or according to the weight that government places up on each of them. There is also danger while each policy decision may be carefully considered, this individual consideration may divert attention from the overall design and coherence of policies when taken together.

Taking all complexity in to account, the monetary authority draw monetary policy framework and operating procedures in the context of countries' existing condition to have achieving certain goals or objectives. Macroeconomic goals may have included items such as highest possible long-term economic growth or lowest unemployment, moderate inflation rate (*price stability*), balancing foreign trade (*stability in foreign exchange market*), *interest rates stability*, *stability in financial markets*. In recent years, however, responding to new insights from macroeconomic theory, mandates have increasingly focused on price stability. In some cases this goes as far as setting explicit numerical targets for inflation to be attained over specific time horizons: inflation targeting (Mishkin, 1998).

In more general terms, the pursuit of final goals of monetary policy rests on a series of choices regarding the information set used as a basis for short-term and longer-term policy adjustments, including the weights and specific roles attached to various economic variables. This subsumes such as the choice of exchange rate regime, intermediate target variables, forecasting, and indices of the thrust of monetary policy or overall conditions in the monetary sphere. The variables playing a role at the strategic level are generally not under the close control of the authorities and the corresponding policy decisions usually pertain to longer horizons. Hence, monetary policy strategy specify both intermediate targets

Monetary policy strategy



Regarding to monetary policy tactics, operating procedures relate to what might be called the tactical level of policy implementation. They cover the choice of instruments and of operating targets. Monetary policy instruments are official interest rates (discount window), market operation (repo tenders), reserve requirements, and direct control (ceilings on bank credit growth and deposits). Operating targets are variables which, being more proximate to the policy instruments in the causal chain, can be influenced quite closely by the authorities. They include money market interest rates

(Overnight or call rate), and bank reserves (commercial banks' deposits with the central banks plus vault cash). Monetary - policy indicator is needed to measure correctly the intensity of policy actions, so that by looking at it we can know how much of a change in the target variable already chosen (money supply as argued above) is due to policy actions. This should help evaluate, guide, and readjust policy actions quickly.

Currently, all central banks implement monetary policy through market-oriented instrument or direct instrument geared to influencing operating targets and do so largely by determining the conditions that equilibrate supply and demand in the market for bank reserves to influence economic activities. In conclusion, in view of the complexity of instruments-targets interrelationships and the interconnectedness of different policies, we have urged the adoption of “a system approach”, with policies viewed as a consistent, mutually supporting package (Tinbergen: 1967).

This urges us to the determinant and behaviors of policy reaction function that states how central bank adjust their operating targets (and instrument) to information, such as an increase in expected or lagged inflation rates, high economic growth, depreciating exchange rate, excessive money growth and provides a link between short-horizon operating procedure and long-horizon strategy objectives.

2.1.3 Determinants of Monetary policy & their co-ordination

The monetary policy of central banks in developing countries has been the subject of numerous studies, which seek to identify the determinants of these policies. The policies of central banks of developing nations, however, have not received the same degree of scrutiny. This difference has been due, in part, to a belief that monetary agencies in the developing economies do not have the latitude to engage in discretionary activities.

As central bank attempts to control money supply and bring macroeconomic stability, the policy makers have to critically consider all the determinants of their policy decision. Broadly speaking, factors that affect the magnitude and the direction monetary authority action are the monetary implication of government deficits, the interactions with the external sectors, and the targets of the authority and its specified objectives (Joyce Joseph: 1991).

2.1.5.1 Monetization of budget deficit and inflation

In the absence of broad and active financial markets in developing countries, the primary obligation of the monetary authorities is to finance the government budget. Under these circumstances, monetary growth depends primarily up on fiscal policy .The government can pay deficit in three ways. *It can borrow from the public* through issue bonds to the public, *it can print money*, i.e. borrow from the central bank or *it can run down foreign-exchange reserve*.

A government that has borrowed a lot in the past has already accumulated a heavy debt, and it will have difficulties borrowing further, either domestically or from abroad, because of doubts about its capacity to service its debts. Typically, such a government has also exhausted its stock of foreign exchange reserves after prolonged period of large budget deficits. For these reasons, a government with chronically large budget deficits is likely to find itself eventually compelled to pay for those deficits by printing money. The growth rate of money supply is largely dominated by the growth rate of credit from central bank.

Assuming that fixed exchange rate, quantity theory of money and that velocity of money is an increasing function of the interest rate and perfect capital mobility, under international arbitrage, Any attempt by the government to borrow from the central bank simply leads to an increase of money that, in turn, causes a loss of reserves and a subsequent reversal of the money supply increase. The government will indirectly be financing the deficit out of international reserves losses (Sylvanus Ikhde: 2004).

What does all this tell us about inflation? As long as foreign reserves continue to be available, the country can avoid inflation. The exchange rate remains fixed at its pegged level, and the external price level is given. If the fiscal deficits persist, however, the government eventually runs out of reserves. At that point, when domestic residents attempt to exchange their home money for foreign currency, the government cannot continue to intervene in the market. The central bank has no option but to allow the exchange rate to depreciate. The collapse of a pegged exchange rate system, when the central bank run out of reserves, is called BOP crisis.

To the subsequent, assuming fiscal deficits under floating exchange rates, the government cannot borrow and it no longer has foreign exchange reserves and the only way to finance the deficit is through money creation, seigniorage (Sylvanus Ikhde: 2004).

In general under floating exchange rates, the deficits result in inflation. Each deficit leads to a given rate of inflation. One way to describe the fiscal deficits is being financed through an inflation tax on real money balances. The tax rate is the inflation rate while the tax base is the level of real money balances. The real goods and services that the government purchases with the money that it prints each period is the measure of the tax revenue collected by the government as result of the inflationary policy.

2.1.5.2 Monetary Effect of Balance of payments

According to Monetary view, surpluses (deficits) in the money account measure the rate at which money balances are being accumulated (reduced) money balances are adjusted to their desired levels. There fore a balance of payment is the one mechanism by doing actual money balances are adjusted to their desired levels. The monetary approach to the balance of payment prescribe a solution to an external imbalance lies in the reduction in domestic absorption, more specifically the government budget deficit (Thomas Havrilesky and John T. Boorman: 1980).

The monetary view of the BOP maintains that the transactions recorded in the balance of payments are essentially a reflection of monetary phenomena. As such, it places emphasis on the direct influence of an excess demand for and supply of money on the BOP. The crucial concept is that which captures all transactions reflection the adjustment of actual money balances to the desired levels. i.e. the only transactions considered below the line are those, which have an influence on domestic and foreign monetary bases and thus on domestic and foreign money supplies.

The MBOP is a theory of an automatic adjustment process. According to this theory, any BOP disequilibria or exchange rate movement reflects a disparity between actual and desired money balances and will automatically correct itself. While the adjustment process is different under different exchange rate regimes, the implication is that the process is automatic and that its effects cannot be neutralized in the long run. Any BOP imbalance or exchange rate change is a phase in the automatic adjustment process and attempts to counter these processes merely increase the forces which give rise to the adjustment ultimately required for a return to equilibrium (Thomas Havrilesky and John T. Boorman: 1980).

It is concerned primarily with the long run. The approach recognizes that short run analysis is often complicated by the fact that postulated adjustment behavior is incomplete in the short run. For example the adjustment of actual money balances to their desired levels does not occur instantaneously, but rather requires the passage of time. However, the government cannot follow such policies in the long run. This seems reasonable because, in the long run success in neutralizing the effects of international reserves flows implies that the government of some countries (surplus) is willing to trade investment and consumption goods for foreign currency balances. The accumulation of these balances by surplus country governments represents a nonmarket induced transfer of wealth

away from domestic to foreign consumers. For whatever reason, it is unrealistic to suppose that government would pursue such policies in the long run (Warren and Khatkhate: 1976).

An implication of this theory is that, under a system of fixed exchange rates, domestic monetary policy does not control a country's money supply. Excessive monetary expansion (contraction), via expansion (contraction), of some controllable component of the monetary base, will result in an outflow (inflow) of international reserves (an uncontrollable component of the monetary base) and a tendency for the money supply to return to its former level. The resulting BOP deficit (surplus) is only a reflection of these uncontrollable international reserve outflows (inflow). Through this process, the inflationary or deflationary impact of domestic monetary of the world via intercountry flows of international reserves. At the same time, however, the domestic economy is subject to the influence of inflationary or deflationary monetary actions taken in other countries. Under a system of freely floating exchange rates, the domestic monetary authority retain dominant control over the money supply, while the interaction of domestic and foreign monetary policies determines the exchanges rather than the BOP. In this case, a county neither imports nor exports international reserves. As a result, the domestic economy is subjected to the full consequences of inflationary or deflationary domestic monetary policies and is insulated from the effects of monetary actions taken in other countries.

2.1.5.3 Monetary Base and Authority targets

The major determinants of broad money supply namely the *net foreign assets* and *net domestic credit* and the components of Broad money narrow money and quasi-money are important macroeconomic variables that reflect the combined effects of fiscal, monetary and exchange rate policy. The level of fiscal deficit and its mode of financing, credit policies, interest rate management, and the flexibility of the foreign exchange regime directly affect the level of aggregate demand and their overall impact is being felt through monetary aggregates. Along with supply side responses, such policies ultimately influence the rate of inflation and the overall macroeconomic environment. There fore, annual change in monetary aggregates, rather than their absolute magnitudes, is crucial indicators of overall macroeconomic stability and considered for monetary policy analysis (MOFaED: 1998/99).

Considering all these components, monetary authority also responds to macroeconomic shocks depending on Authority target: targeting monetary aggregates or targeting inflation in order to attain its monetary objectives. Where *monetary policy targeting monetary aggregates*, assuming the

quantity theory of money, the government can determine the long run rate of inflation by determining the long run rate of growth of money the supply of money. Thus in the long run, $P^e = P$ and according to the quantity theory of money $P = M$, so the government can choose P by determining the rate of growth of M . However there are difficulties like what measure of money supply ($M1, M2, M3$) will be most relevant for controlling inflation (Warren and Khatkhate: 1976).

Where the *monetary policy targeting inflation*, in the view of the difficulties encountered by monetary authorities in the control of monetary aggregates as a prelude to fighting inflation, many countries have moved on to target inflation directly rather than its proxy. Countries choose inflation targeting over alternative policy frameworks because of achieving price stability is the major contribution that monetary policy can make to economic growth, and short-term manipulation of monetary policy to achieve other goals may conflict with price stability. In theory, central bank can determine monetary policy adjustments based on the difference between forecast and the target, with announcement of explicit inflation targets would provide a clear monetary policy framework. Other policy goals are excluded or given minimum attention, and there may be conflicts with other objectives (Sylvanus Ikhde: 2004).

2.1.5.4 Foreign Exchange rate

The foreign exchange rate is one of the most important prices in an open economy. It links the domestic economy with the rest of the world through both the goods and assets markets. There are two broad approaches to the conduct of exchange rate policy in developing countries: the real targets approach and the nominal anchor approach. Such approaches are their own implication on monetary policy effectiveness (Sylvanus I Ikhde: 2004).

In the *real targets approach nominal exchange rate* is a policy instrument distinct from domestic monetary and fiscal policies. This instrument can be varied to attain real objectives along the lines suggested by the internal-external balance model. This approach based on assumption of nominal wage and prices of non-tradable are sluggish, which cause a reduction in real wages in terms of tradable after nominal devaluation and hereby causes a real devaluation, real devaluation have significant real effects and the economy is subject to real shocks, originating domestically or externally, which differ from the shocks faced by its trading partners. When a country faces a current account deficit, the real exchange rate needs depreciating, along with an appropriate reduction in absorption, to correct it. In effect, the price of domestic goods in terms of foreign goods fall and this improves the competitiveness of the domestic economy (Warren and Khatkhate: 1976).

However the *nominal anchor approach* suggests that a country's exchange rate should be firmly and credibly fixed to the currency of a low- inflation country, so that inflation will, in effect, be imported. It constrains domestic monetary policy, restrains governments and sends out credible signals to private agents about prospects of inflation. An implication is that, if signals are credible, the real economy will adjust appropriately to any shocks, including anti-inflationary exchange rate policy. Within this approach, to maintain competitiveness the exchange rate leads rather than follows other nominal variables, such as domestic prices and wage inflation. For this approach to succeed there must be a firm commitment to maintain the exchange rate so that it brings discipline in credit creation, especially credit to government; the exchange rate commitment must be credible in foreign exchange market; the commitment must be credible in the labour market.

2.2 Empirical Literature on monetary policy reaction function

Philippine central bank attempts to specify the determinants of its monetary policy reaction function, before and after its adoption of the inflation targeting framework, as revealed by its interest rate setting behavior. Employing forward-looking model, it finds that the bank has indeed been stabilizing inflation accommodating with respect to the output gap. In addition, currency stability and expansionary money supply growth are other concern of the bank. There fore they were setting policy instrument consistent with achieving such targeting. In a case of Philippine central bank that took in January 2000 when the Monetary Board decided that the bank adopted in principle the shift to an inflation-targeting framework. Up on this framework modification, the bank uses a model of the inter bank lending rate for overnight loans as a policy variable to influence inflation dependent on the deviation of expected inflation from target and the expected output from trend output (R.John Michael Ian S.Salas: 2004).

In a case of Turkey, central bank develops reaction function by using the interaction between domestic credit and net foreign assets. In such a way that it can determine the offset and sterilization coefficients of the central bank, which could be useful in terms of measuring the scope and the stance of the monetary policy. Additionally it is important to know the degree of relation between the central bank's reaction function and the macro variables. The offset and sterilization coefficients, together with monetary policy reaction to inflation itself, measure the extent to which, monetary policy is accommodating or used systematically for monetary control (Olcay Yiicel and Almila Karasoy: 2000)

In a case of Mexico, Korea, India, and Zambia^{*}, there is the absence of broad and active financial markets. Hence, the primary obligation of the monetary authorities is to finance the government budget. Under these circumstances, monetary growth depends primarily up on fiscal policy. Accordingly, to know how central Bank responds and manages the economy first of all countries select the change in the central bank's holding of domestic credit assets was chosen as the most appropriate indicators of monetary policy, and the variables like foreign reserves, exchange rate, difference between real output and a value derived from a trend, inflation have been taken as determinants of monetary policy. The estimation of a monetary policy reaction function for those countries reveals some evidence of accommodative policies in all cases. These suggest that monetary policy ends in addition to budget monetization with a systematic fashion to various goal variables (Joyce Joseph: 1991).

When come to monetary policy reaction function for Taiwan, it based on an extended Taylor rule including the exchange rate, the stocks price, and the lagged interest rate. Two major monetary policy instruments like the discount rate and the collateral loan rate are considered. Its reaction function result shows that the discount rate or the collateral loan rate responds positively to a shock to the inflation gap and the stock price gap but does not react significantly to a shock to the output gap or the exchange-rate gap. Furthermore, except for the lagged interest rate, the inflation gap is more influential in explaining the variance of the interest rates than other endogenous variables, suggesting that the major focus of the monetary policy in Taiwan to contain inflation (Chang: 2000).

In attempting to estimate a monetary policy reaction function for the Dominican Republic, particular attention has to be given to its specification. The most likely demand management instrument to be used by the monetary authority in a developing country is the monetary base, or high-powered money while in developed countries the frequently policy instrument is interest rate. Accordingly, the Dominican Republic conducted exchange rate and inflation rate as a target of central bank with maintaining output gap low. Hence the central bank can respond to output gap, exchange rate gap and inflation rate gap by using management of monetary base.

Finally in a case of bank of Ghana, it has succeeded in reducing the gap between official and parallel exchange rates and partially succeeded in correcting the over/under valuation of nominal exchange rate by implementing various exchange rate regimes. The major instruments of monetary policy in Ghana have been the open market operation and liquidity ratios, credit ceiling and reserve

^{*} Indicates that the sample period were: Mexico, 1959-1981;South korea, 1962-1979; India, 1960-1971 and Zambia, 1976-1983

requirement and bank rate. The growth rate in money supply can be traced to the rapid growth net domestic and foreign assets. Hence the bank should try to follow a consistent lending policy in accordance with the exchange rate intervention policy and follow a consistent sterilization through open market operations' policy with respect to nominal exchange (Vijay K.Bhasin: university of Ghana).

Chapter Three: Macroeconomic overview and financial development

3.1 Overall Macroeconomic Performance

Ethiopia one of the poorest countries, it is characterized by nearly 60 percent of its population lives below the absolute poverty line, recurrent drought, rapid degradation and soil erosion, deteriorating terms of trade, low degree of financial deepening or transformation and high population growth. In line with, Gross domestic product with its growth rate is one of the crucial indicators of economic performance in a country. According to this indicator, economic growth during the Derge regime was very dismal. GDP by industrial origins at 1980/81 constant factor cost was growing, on average, at about 1.5 percent per annum. In the face of population growth rate of 2.9 percent per annum registered during the same period, it is clear that per capita income had been declining drastically. As indicated in many studies, the performance of centrally planning socialist regime (1974-1990) has resulted in macroeconomic imbalance and poor sustainable economic growth.

A recovery in economic performance has been registered since the introduction of the economic reform program (ERP) in 1992 to transform the system in to market oriented economy. Accordingly a series of policy reform measures and deregulation have been conducted to correct the distortions in macroeconomic. But the macroeconomic performance is still sluggish and reflected in macroeconomic indicators as below.

Table 3.1 Selected Macroeconomic Indicators

Indicators	1990	1992	1994	1996	1998	2000	2002
Fiscal Deficit as A % GDP	10.3	7.0	7.7	5.2	7.3	10.2	8.0
Inflation rate annual	21.0	10.0	13.4	-6.4	0.6	6.2	-8.6
GDP per capita growth in %	0.9	-6.7	-1.6	7.4	-2.8	2.3	2.8
Black market rate annual (average)	6.7	7.5	7.3	7.2	7.7	8.31	8.86
Exchange rate premium	1.92	3.61	0.22	0.21	0.02	0.02	0.01
Real interest rate annual (average)	-12.4	8.7	6.0	4.6	5.1	-0.2	-5.8
Money as % GDP	0.4	0.4	0.5	0.5	0.5	0.5	0.5
GDP growth rate	-4.2	12.0	6.2	5.2	10.6	7.1	-1.7
Narrow money growth rate	2.7	-0.4	18.3	2.4	-1.3	5.3	10.5
Broad money growth rate	-0.9	-0.6	24.2	2.7	-0.2	10.5	11.4

Source: CSA, MOFaD, and NBE various issues.

There was a declining trend in the level of fiscal deficit. But due to Ethio-Eritrea conflict accentuated the fiscal deficit to GDP ratio raised up to 10.2 % in 2000. In addition because of recurrent drought and high population growth, GDP per capita growth declined in some of the year. Regarding to inflation, the highest rate in the history of the country is 21% in 1990, which is lower

as comparing with sub-Saharan African. Annual inflation was low (less than 5 percent) until 2002/03, when it soared to 15.1 percent owing to the sever drought. In 2003/04, however, the headline inflation declined to 8.6 percent, reflecting a bumper harvest in agriculture and the effects of tight monetary and prudent fiscal policies pursued by the government (NBE: 2003/04).

Improved availability of inputs and spare parts to the highly incapacitated manufacturing sector made possible by the intensive emergency recovery and rehabilitation effort and the accompanied economic reform program which helped rectify are the major factors behind the profound growth registered in the industrial sector. Growth in agriculture sector has also averaged 3.4 percent per annum during the period 1992/93 to 1997/98. Finally gross domestic saving remained too small amounting to 4.4 percent for the period, and low as compared to actual investment, domestic resource gap widened to reach the target growth rate (MOFaED: 1998/99).

In general the permanent component of per capita growth under the reformist government in the 1992-2001 periods is estimated at about 1.1 percent per annum. That growth is explained by total factor productivity growth rather than by capital deepening. Most of the growth is due to non-agricultural sources, despite the government's commitment to agriculture-led development. This 1.1 percent growth rate also corresponds to the average growth payoff to the policy changes initiated by the current government, measured by variables: inflation rate, budget deficits, black market premium, ratio of M2/GDP, level of infrastructure, and real depreciation of the currency (William Esterly: 2002).

3.2 Features of Monetary Authority and Monetary policy

In a case of Ethiopia, the features depend on the existed economic and political condition of the government followed: Monarchy regime, command economy (Derg regime) and market-oriented economy. However the study concentrates on the last period monetary features.

During socialism Derg (1974 – 1991) in Ethiopia, there were direct monetary controls, and Central Regime and planning regulated the whole policy. It was characterized by nationalization of the existed financial institutions. So only governmental financial institutions remained in the country.

Monetary and banking proclamation No. 99 of 1976 came into force to shape the NBE's role according to the socialist economic principles that the country had adopted. The bank was allowed to participate actively in national planning, specifically financial planning, in cooperation with the

concerned state organs. The proclamation also revised the bank's relationship with government. It raised the legal limits of outstanding government domestic borrowing to 25 percent of the actual ordinary revenue of the government during the proceeding three budget years as against the proclamation 206/1963, which set it to be 15 %.

As stated in the beginning, under socialism, monetary policy used under the direct methods, in which the chief features were: fixation of interest rates at low level/repressed rates, differential interest rates for different uses and different sectors, direct credit allocation (discriminatory allocation of credit and forex in which social sectors like health, housing, education etc. got a priority), direct deficit financing and, direct controls of forex, fixation of exchange rates, and control on new entrants in financial market. Organizational setups were taken in order to create stronger institutions by merging those that perform similar functions.

Pertaining to the monetary policy, it was directly linked with and tailored to the five and ten year planning of the country. Apart from extension of credit had been growing slowly; the only viable means of financing budget deficit was the domestic banking system. This had to do a lot with the behavior of money supply. In accordance with the components of money supply, foreign assets are basic elements of for expansion of monetary base. However as in the case of any developing countries, foreign assets were apparently scarce due to poor external sector and its policies, foreign borrowing had been also effected for non-development purpose, fixed exchange rate that penalized the export sector and a number of restrictions like restriction on the import of some goods, rationing foreign exchange through licensing, introduction of protective tariff rates and the like.

Therefore the expansion of domestic credit that enhances aggregate demand including demand for to be imported commodities was constrained by the scarcity of foreign assets. Relative stability in the macroeconomic situations was achieved at the cost of overall economic growth because of limited private sector participation and poor resource utilization in the socialized sector. Financial intermediation and the development of financial sector were also severely affected by lack of adequate incentives.

At the end of the day the Results of Derg Regime were excess liquidity in the banks remained due to low amount of loans, so less profits for the banks, high collateral requirement from private investors or borrowers also meant few loans, seasonal trends were more dominating, existing economic conditions were also not encouraging and favorable for banking credit to grow, government turned

out to be the biggest borrower in the country, growth in inefficiency of CBE, Private savings were forcibly taken for government requirement.

Following the down fall Socialisms in Ethiopia, the Emergency of Market economy in 1991 came in to power with vast economic reform and financial liberalization. Monetary and Banking Proclamation of 1994 established the National Bank of Ethiopia as a judicial entity, separated from the government and outlined its main functions. It is only since 1994 that the government of Ethiopia has permitted private banks and insurance companies. 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. These services are limited to domestic concerns. Foreign firms are prohibited from investing in the banking and insurance sectors (MOFaED: 1998).

A new proclamation was issued in 1994 to reorganize the NBE according to the market-based economic policy so that it could foster monetary stability, a sound financial system and such other competitive credit and exchange conditions as are conducive to the balanced growth of the economy of the country. Autonomy was given to other banks and insurance companies. An inter-bank-money market was also made operational. Exchange rate was also devalued from Birr 2.07 to Birr 5 per US dollar. Auction based exchange rate system was introduced. Since there is stability in forex market exchange rate and official rate has declined. There is much better alignment between the two rates now (NBE annual reports various issues).

Two positive Posts – Derg Effects on the market: There was a sudden rise in the loanable funds in the market as people switched out their non-earning existing assets to earning assets. There was also rise in flow of credit to private sector, with a shift away from the government and cooperative sectors.

Broad objectives of the current monetary Policy are to foster monetary stability and a sound financial system, and to ensure that credit and exchange conditions are conducive to the balanced growth of the economy of Ethiopia. In addition, the *detailed objectives* are contain inflation, build international reserves, create a favorable external environment of banking, regulate the supply and availability of money & credit and applicable interest, build internal dynamics of banks; and fostering contestability of markets within the banking sector, improve the environment within which banks operate, narrow down the asymmetry of information, induce a culture of loan repayment, and promote efficiency, capacity building and competition.

By 2005, six private banks and nine private insurance companies and 25 micro-financing institutions have operating in the country were operating alongside the CBE (Commercial Bank of Ethiopia) and two state-owned banks. The state-owned CBE dominates the retail-banking sector.

The reforming of financial sector and monetary policies pursued were thus at the heart of the economic reform program launched with broader objective of stabilizing macro economy and create an effective and efficient financial sector which facilitate economic growth. Since early 1990s, which marks a period of transition to market-based economy, central bank has been at the forefront in formulating and implementing policies that enhance macroeconomic and financial stability. The coordination of fiscal and monetary policies, over the past fifteen years, has resulted in achievement of a relative economic progress with price stability. Maintaining the growth rate of monetary base in line with the growth rate of nominal GDP has been the immediate objective of monetary policies pursued during the reform period, which has helped contain inflationary tendencies and maintaining external balances (NBE: 2004).

3.3. Economic Reform and Financial Liberalization policies

Since the early 1990s, Ethiopia has undertaken a wide range of policy reform measures within the framework of the structural adjustment program. The policy package includes important provision to financial sector reform policies. The main provisions include: the amendment of the monetary and banking proclamation in an effort to strengthen the monetary policy and supervisory role of the National Bank of Ethiopia, relaxation of the entry of the domestic private sector in the financial services sector. Privately owned commercial banks were allowed to operate alongside government owned commercial banks, devaluation and subsequent determination of the exchange rate in the auction market, interest rates and lending rates were partially adjusted to reflect the cost of capital and to maintain positive real interest rate. Preparatory measures are being undertaken towards market determination of interest rate in the treasury bills and long- term bond market, in line with the fiscal and monetary policy tightening, credit allocation to the private sector has improved and lending to the central government was reduced, the enactment of foreclosure law and attempts to implement when borrowers default on their debt obligations.

The central bank introduced a 91day treasury bills and a 28 days and 182 day bills in January 1995 as a means of reducing the government's dependence on credit from the banking system and as an open market instrument to mop up excess liquidity in the economy. To buttress the effort in expanding the use of indirect monetary policy instruments and soak up excess liquidity, the bank

auctioned a two-year government bond in November 2000, which matured on November 2002. Since November 2000 no government bond has been issued. Moreover, the bank has established a rediscount window for commercial banks effective march 27, 2001. Inter-bank money market has also been introduced to enable banks to transact funds among themselves.

Following the monetary and banking proclamation no.83/1994 in mid 1990s, the central bank redirected its efforts towards enacting a series of regulations that would allow the establishment of financial institutions and strengthen the regulatory and supervisory capacity of the banks. With the introduction of the retail auction system in may 1993, and more recently the latter's replacement by the inter-bank forex market since October 24, 2001, the exchange rate continued to be adjusted or aligned to the developments in economic fundamentals and the world economy. The continued depreciation of the exchange rate coupled with the lifting of restrictions on current account transactions has significantly narrowed the premium between the marginal and the parallel rate. The balance of payment position has strengthened and relations with external creditors have regularized. Gross foreign reserves rose from a low level of 0.2 months in 1989/90 to 7 months of import cover in 1995/96. In general, summary of major reforms and measures after financial liberalization regarding the monetary aspects of both domestic and external sectors presented in annex one and two.

3.4 Behavior of Money supply and its policy

For the specification, and analysis of monetary policy reaction function, and to meet the objectives of monetary policy, the primary obligation of National Bank of Ethiopia is to control the behavior money supply.

3.4.1 Development in monetary liability

A) Components of Broad Money Supply

Broad money consists of both narrow money and quasi-money, where narrow money contains currency outside the bank and net demand deposits, and quasi-money embraces both saving and time deposits. Except Time deposits, the whole components were raised up thought the reviewing period with Narrow money supply has a greater share than Quasi-money supply. But time deposit was over shooting upward during the period between 1996 and 1998.

For the recent year, 2003/04, narrow money surged by 15.9 percent to reach birr 19.1 billion as currency outside banks grew by about 16.6 percent and demanded deposits by 15.4 percent both of them reflecting buoyant economic activity. The ratio of currency in circulation to broad money also slightly went up from 25.3 percent to 25.6 percent in 2003/04. Quasi-money namely, saving and time deposits, also surged by 14.3 percent, as saving deposits went up by 14.9 percent and time deposit by 7.0 percent despite negative real interest rate, suggesting that interest rate is not the only factor that determines financial savings in Ethiopia (NBE: 2003/04).

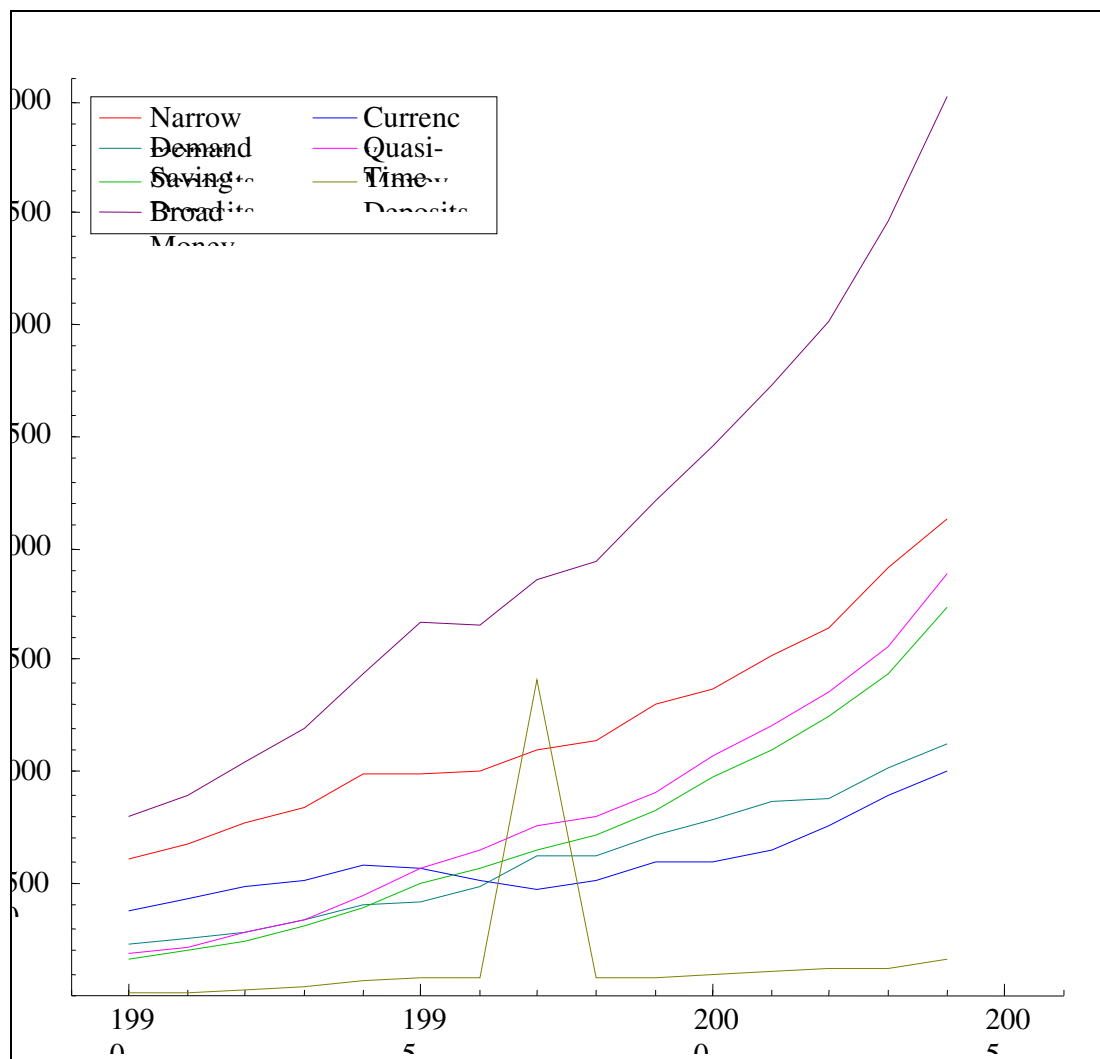


Chart 1: Components of Broad Money supply
Source: National Bank Annual Report (1990/91-2004/05)

Pertaining to percentage change of the components per annum, the percentage change in saving deposits increased at alarming rate for the period between 1992 and 1994 as compared to any other variables but coming down through time above zero. Variables like currency outside the bank and time deposit had been characterized by negative annual percentage change during 1995 through 1999. Both Narrow money and Broad money have been moving on the same pace with lesser swing.

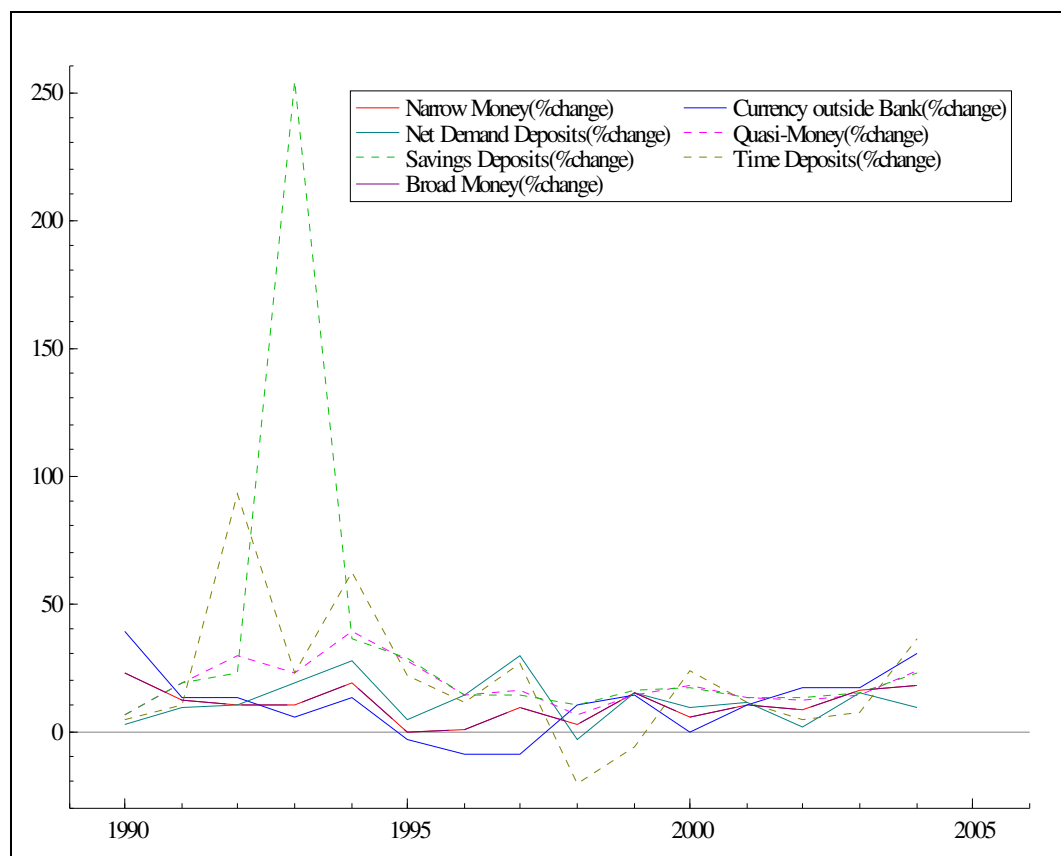


Chart 2: Annual percentage change in components of Broad Money supply
Source: National Bank Annual Report (1990/91-2004/05)

B) Determinants of Broad Money Supply

Broad Money can be determined by net foreign assets, domestic credit and net other items where domestic credit consists of claims on central government and non-central governments (other financial institutions). All the determinants are increased overtime in the review period. The significant share of claims on central government over on other financial institutions accentuated the remarkable role of domestic credit in the determination of Broad money comparing with net foreign assets. Through the period, within domestic credit, claims on government and non- government sectors went up. This signifies a revival in the private sectors' appetite for bank credit comparing

with the preceding year. The significant growth in net foreign assets also was partly attributed to improved performance in export, and foreign aid.

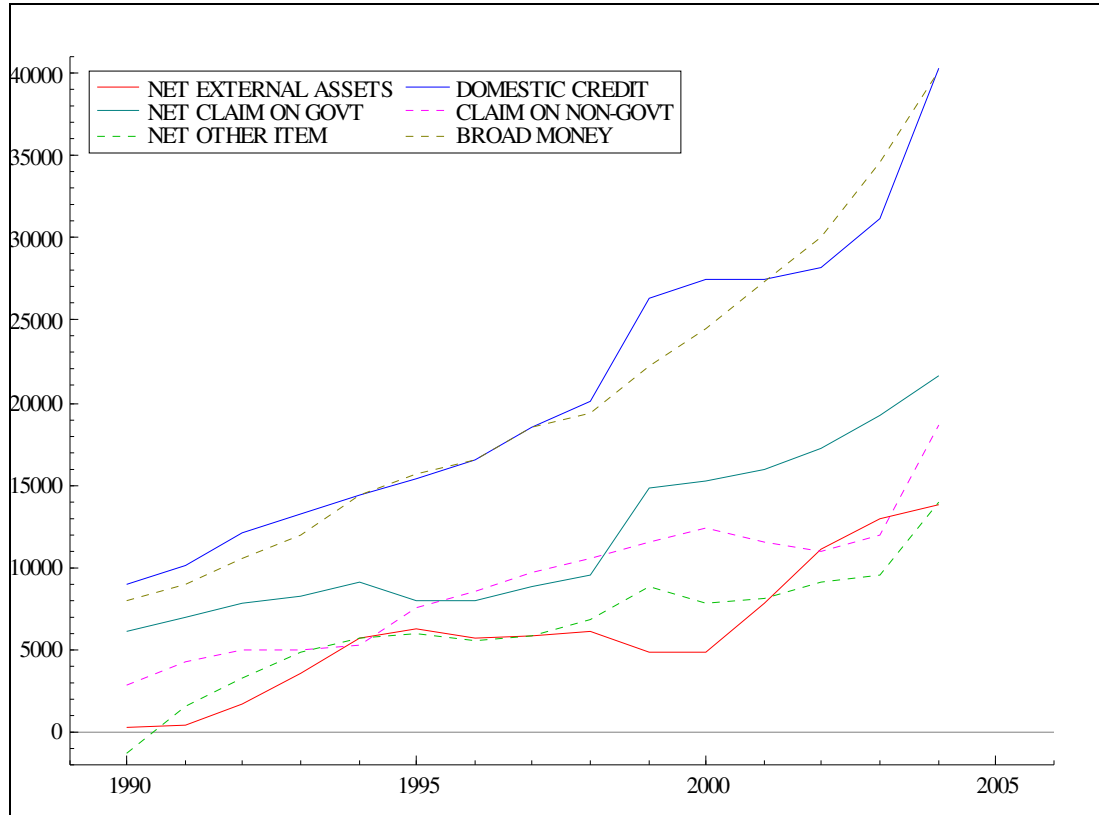


Chart 3: Determinants of Broad Money supply
Source: National Bank Annual Report (1990/91-2004/05)

Regarding to the percentage change per annum, net foreign assets' annual percentage change went up at faster rate during the period between 1991 and 1994 due to the combined effects of external resource inflows such as structural Adjustment support (SAS) obtained through Lome'4, African Development Bank loan for structural adjustment program (SAP), and The revaluation effects of exchange rate movements and came down even below zero. However domestic credit' percentage change per annum moved almost at lower rate with little fluctuation like what Broad money did (NBE: 1995).

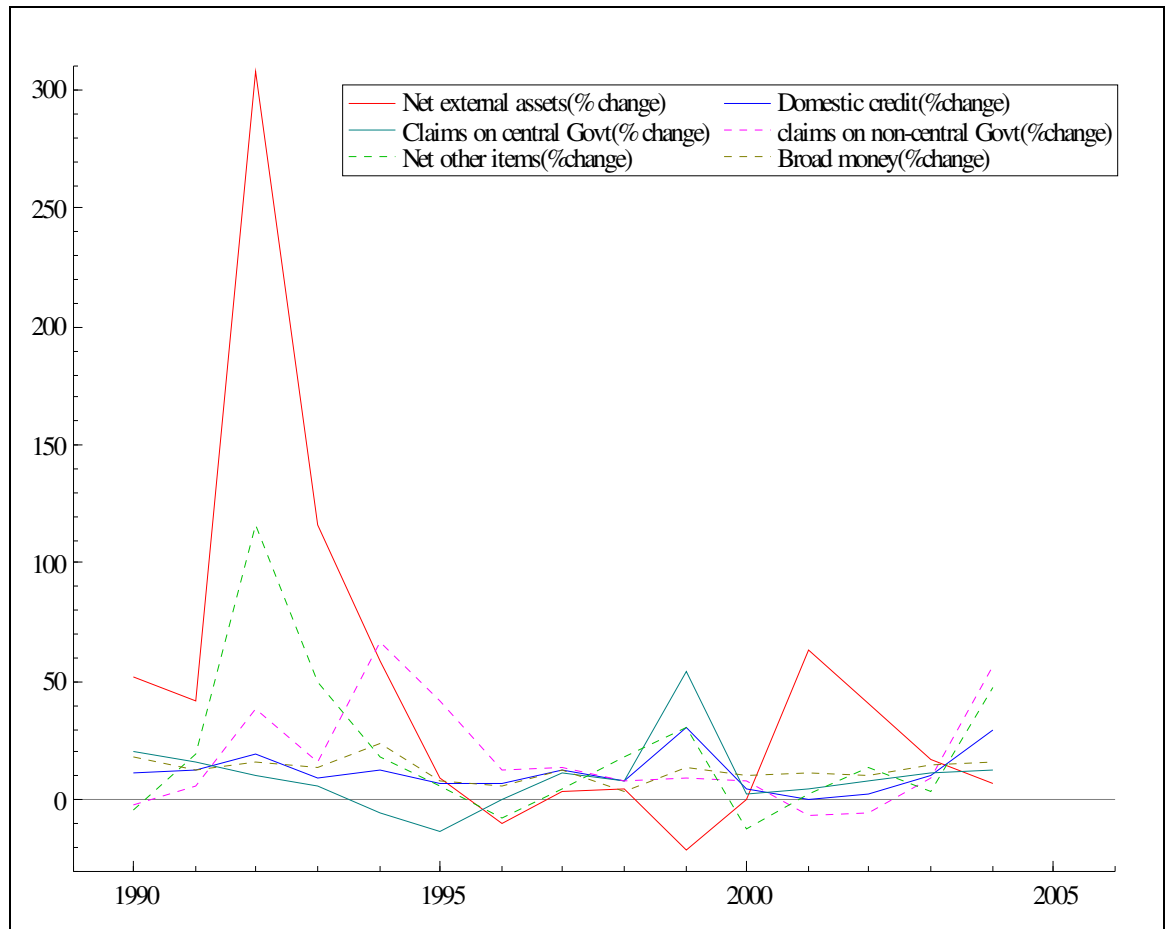


Chart4: Annual percentage changes in the determinants of Broad Money supply
 Source: National Bank Annual Report (1990/91-2004/05)

Variables like net foreign assets, claims on central government & other financial institutions, and net other items behaved negative annual percentage change in different year under the review period. In general, the determinants are the most monetary variables controlling the broad money supply in the sense of monetary policy objective.

3.4.2. Developments in Reserve Money

Monetary base (reserve money or high powered money) is the sum of currency in circulation and banks' reserve holdings with in the central bank. Under the review period, it has been highly increased overtime with the same fashion as actual and excess reserve trended. The actual and excess reserve amount through the review period was always higher than the required level of reserve. These might have an implication on monetary policy effectiveness using indirect policy instruments.

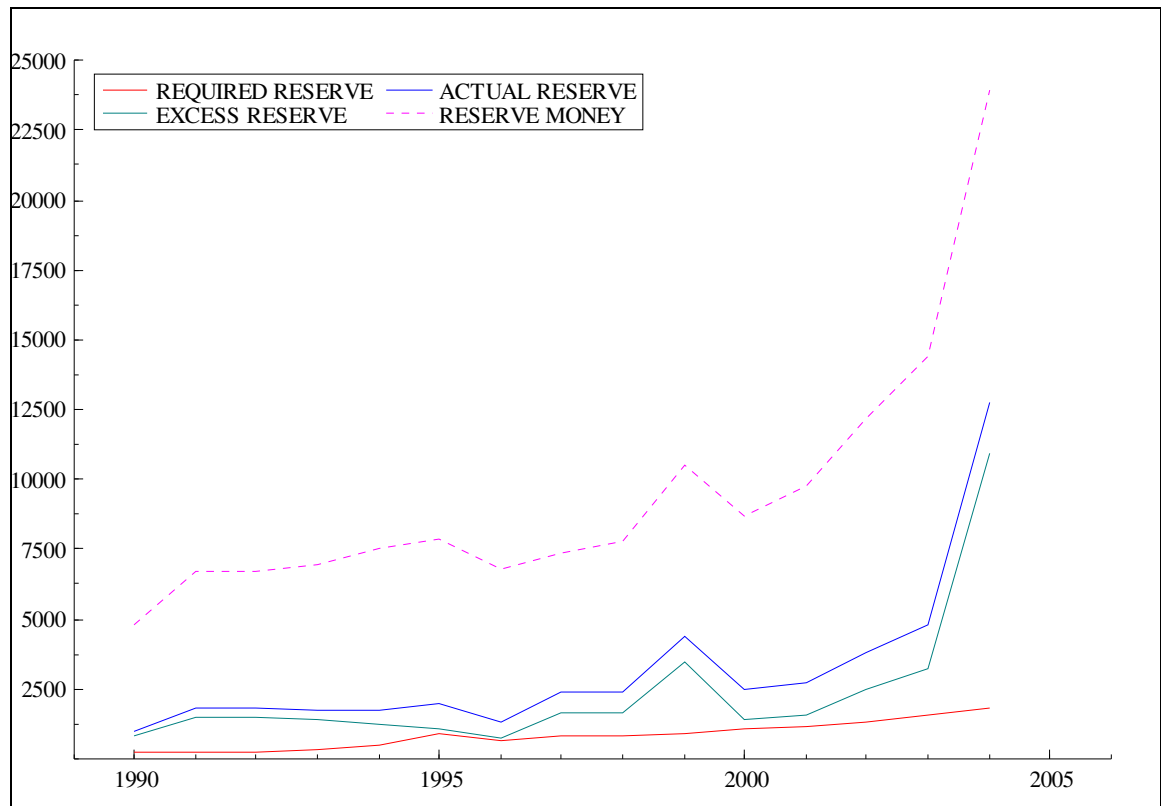


Chart 5: Monetary aggregates reserve money supply
 Source: National Bank Annual Report (1990/91-2004/05)

On average, Commercial banks' actual reserve at the central bank increased over times in the review period. For instance their excess reserves bloated up by about 29.8 percent and reached birr 3240.6 million at the end of fiscal year 2003/04. Though lending activities of commercial banks have revived during the year, faster pace of deposit mobilization and loan collection has led to a pile up in excess reserves. In general the annual percentage change of the given reserves fluctuates around zero in different years particularly in 1996 and 2000.

3.4.3 Monetary Ratios Analysis

Here there are two basic monetary ratios: money multiplier ratios and other monetary ratios percentages. They can be used for measuring the capability of the banks to create more money, credit and reserves overtime. Under money multiplier both narrow money (NM) to reserve money (RM) and Broad money (BM) to reserve money (RM) moved at lower rate constantly as compared with other monetary ratios. In other monetary ratios, quasi-money (QM) to broad money (BM) moved upward while currency (CU) to narrow money (NM), and to broad money (BM), and narrow money (NM) to broad money (BM) relatively moved down ward as depicted below.

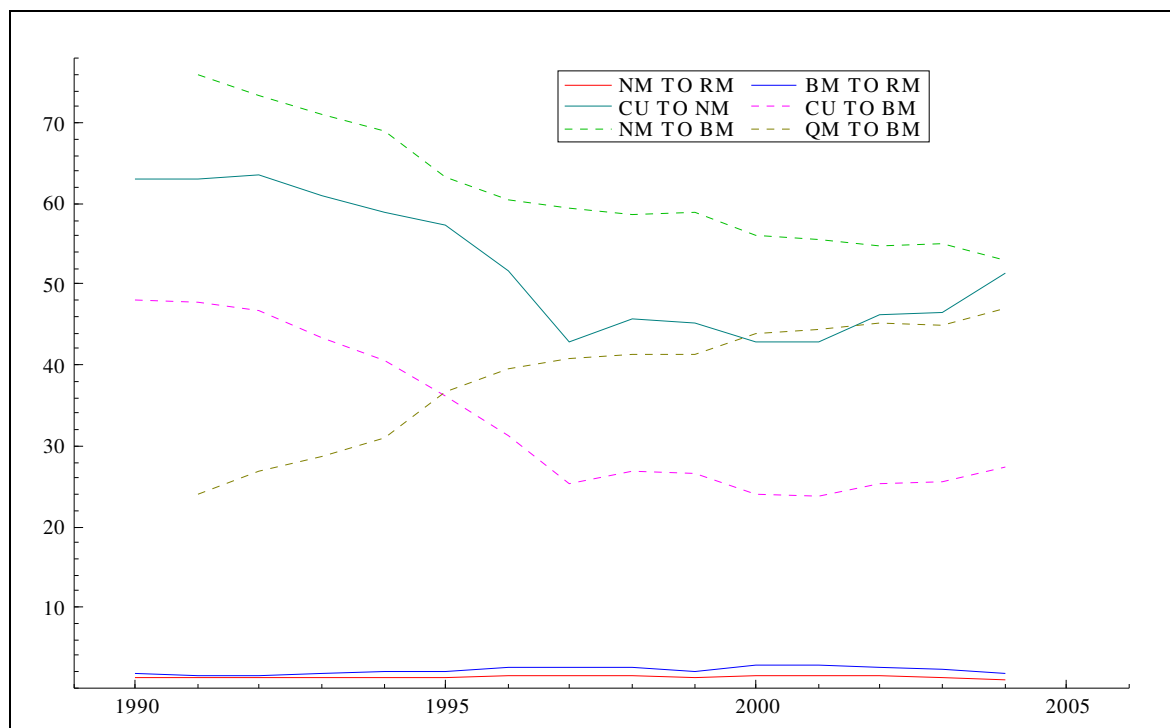


Chart 6: Money multiplier ratios, and other monetary ratios (%)
 Source: National Bank Annual Report (1990/91-2004/05)

Pertaining to the annual percentage changes of the ratios, there might not be had a clear pace as the level forms above. However all had been swings in either direction of zero except QM to BM ratio, and both BM to RM & NM to RM swing with similar fashion in the review period (NBE: 1990-2005).

3.5 Policies toward Financial Development

3.5.1 Development in interest rate

National Bank revised interest rate structure through time depending the objective of monetary policy. Since January 1998, interest rates assumed to be determined by the inter-play of the market forces. Accordingly the average interest rate on time and saving became 6.0 & 6.29 percent while the nominal lending rate by the Banks ranged between 10.5% and 13%, with some private Banks charging more. The development in differentiated interest rates, coupled with the expansion of private banks and their branches, indicated the slow but growing competition among banks. It is not yet open foreign participation in banking sectors. No significant changes have been observed in the interest rate structure of the banking system during 2004/05 compared to 1997/98.

Only three private banks are currently paying interest on demand deposits, whose weighted average reached 0.93 percent at the close of 2003/04. The minimum and maximum lending rates remained at 7.0 and 14.0 percent respectively, averaging 10.5 percent at the end of June 2004. In general, both time and saving deposit rates were negative in the real terms taking into account the 9.0 percent average annual headline inflation rate recorded at the close of 2003/04 whereas the lending rate remained positive in the real terms. When the non-food price index (core inflation) is considered, however, real saving and time deposit rate were also positive till February 2004 before they turned to negative thereafter due to increases in the prices of construction materials, fuel and other non-food-items.

Table-3.2 Interest Rate Structure Reformation: pre 1998

Particulars		Oct.1992 to Aug.1994	Sep.1994 to Dec.1994	Jan.1995 to Nov., 1995	Dec., 1995 to May, 1996	June, 1996 to sep, 1996	Sep.16, 1996 to Dec., 1997
1.Min. Deposits Rate on	Saving 1/	10.0	10.0	10.0	11.0	10.0	7.0
	Demand 2/	Nil	Nil	Nil	Nil	Nil	Nil
2.Lending Rate	On direct advance granted by NBE	12.0	12.0	12.0	12.0	12.0	6.0
	Maximum rate by CBBS	15.0	15.0	15.0	16.0	15.5	10.5

N.B: -2/ starting from July 2001, each bank is free to determine its interest rate on Demand Deposit but no Bank has to pay. And 1/ shows that a bank may charge an interests rate lower than the max rate or may Pay a rate higher than the min. deposits rate.

Source: BIRRITU bulletin No, 78 Published by NBE.

Table- 3.3 Interest Rate Structure Of Commercial Banks: post 1998

Particulars		1998/9	1999/0	2000/1	2002/3	2003/4	2004/5
1.Deposits Rate	Saving	6.0	6.0	6.0	3.01	3.01	3.08
	Time (Average)	6.29	6.41	6.51	3.6	3.62	3.71
	Demand	NA	NA	0.83	0.93	0.93	0.05
2. Lending Rate	Minimum	10.5	10.5	10.5	7.0	7.0	7.0
	Maximum	13.0	13.5	15.0	14.0	14.0	14.0
	Average	11.75	12.0	12.75	10.75	10.75	10.5
3.Real Interest Rate	Deposit 1/	1.2	-0.2	11.2	-12.1	-5.9	NA
	Deposit 2/	7.3	3.6	4.1	2.5	-1.6	NA
	Lending 1/	5.7	4.3	18.0	-4.9	1.5	NA
4.Yields on T-bill	Average	4.88	1.11	0.61	0.62	0.59	0.05

Source: National Bank Annual Reports (1990/91-2004/05)

N.B: - Real interest rate and real lending rates computed based on headline inflation. Real deposit interest rates computed based on core inflation.

In general, after the revision of interest rate structure during 1997/98, the level of bank deposits have been grown overtime indicating that people came to banks not for the sake of interest income in the case of Ethiopia. Hence interest rate is not the only determinant of bank deposits (MOFaED: 1999).

3.5.2 Development in the financial market

The treasury bills market is the only primary securities market actively functioning in Ethiopia. Secondary market doesn't exist at all. Long-term securities are not widely used and traded, although government bonds are occasionally issued to finance government expenditure and to siphon-off excess liquidity in the banking system (for indirect monetary policy instrument). The demand for treasury Bills is always higher than the amount supplied except year 1996 in the reviewing period, and all three variables were enhanced up ward.

During 1995, the total demand for T-bills was Birr 6669.1 while total supply, Birr 4526 that satisfies only 67.8 percent of the demand. However recently during 2003/04, the total demand for T-bills reached birr 61,143.2 million in 2003/04, which is increasing by 58.9 percent over the preceding year. The demand for 28,91 and 182-day-T-bills went up by 165.4, 34.7, and 7.0 percent respectively in the same period. The total supply, therefore, satisfied about 84.5 percent of the total demand compared to 77 percent last year. Of the total bill supplied, banks bought T- bills worth of birr 47921.8 million or 92.8 percent due to mainly the prevalence of excess reserves. Hence, of the outstanding bill worth of birr 12485 million, banks held 91.5 percent. Given the 9.0 percent annual headline inflation and 4.7 percent core inflation, average weighted yields of T- bills were negative in real term. As it was introduced in 1995/96, particularly to the period since 2000/01 the Treasury bill market has been increasing thought time and the amount demanded outweighs the supplied one that was almost the same as the amount sold (NBE: 2003/04).

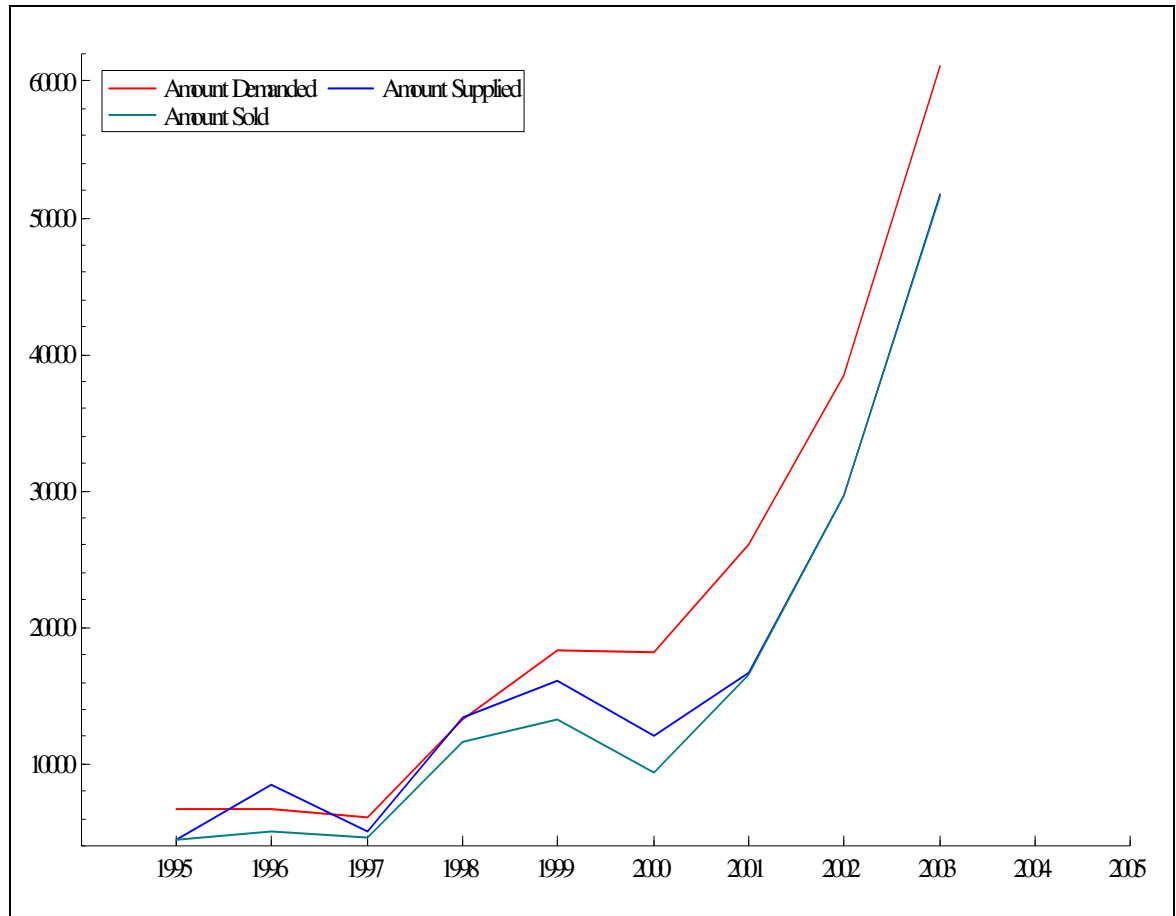


Chart 7: Treasury Bills Auction Result (1995-2003/04)
Source: National Bank Annual Report

Pertaining to Government Bonds and Inter-Bank Money Market, No government bonds were auctioned except a two- year bond was sold in November 2000, which matured in November 2002 and replaced by a 91 day T-bills. Besides bonds worth birr 910.6 million were issued during 2002/03-04 to the commercial bank of Ethiopia and the development bank of Ethiopia, outside the auction for the purpose of transferring bad debts of former public enterprises and other co-financed project loans to the central government.

On the Inter-Bank money market, since the introduction of the inter-bank money market in September 1998, only twelve transactions involving birr 166.7 million were traded in the market particularly between CBE and NIB bank. Persistent excess liquidity in the banking system and lack of collateral in the case of private banks has mainly contributed to the poor performance of the inter-bank money market in Ethiopia, which has an implication on the effectiveness of monetary policy using indirect instruments.

3.5.3 Development in the Foreign Exchange Market

In terms of relevant policy formulation, exchange rate stability has been recognized as a useful instrument to aid in overall stabilization efforts. As a matter of fact there is no universally accepted and therefore recommended one exchange rate policy. However, it can be said that an appropriate foreign exchange rate policy could be recommended on the basis of its specific macroeconomic policy objectives.

Macroeconomic policies in Ethiopia are mostly initiated in response to internal and external imbalances. The underlying economic disequilibria in these economies are associated with, mainly, structural rigidities and in several cases are seriously compounded by devastating droughts and political instability. Therefore the preferred course of policy action in most case is structural adjustment which aims principally at raising the economy capacity to produce tradable and which mostly involves the adjustment of exchange rate with the specific aims of correcting payment disequilibria through price incentives.

Therefore the primary task of exchange rate policy in Ethiopia is promoting exports and with other supporting domestic economic policies, building capacity hence leaving its task of minimizing the adverse effect of exchange rate instability of the major currencies with a residual role. More over it should primarily take in to account the limiting of the gap between effective exchange rates of domestic currency and its desirable real levels. Hence exchange rate policy stability is given secondary treatment in terms of policy action even though instability of exchange rates is a symptom of instability in the underlying economic structure (Hallowed and MacDonald: 1989).

Under development of Foreign Exchange Market, we can investigate how far the parallel exchange rate deviates from the official exchange rate and the real effective exchange rate indices from their nominal effective exchange rates. However since the devaluation of domestic currency made the deviation started to narrow down and, in some cases, even the real effective exchange rate indicating that the overvaluation of the Birr has substantially been reduced and the parallel market exchange rate premium has declined significantly. The gradual foreign exchange liberalization should be strengthened until the exchange rate is set by solely market forces so as to eliminate the adverse impact of the exchange rate premium on the economy. As it is well known large parallel market premium is an incentive for exporters and producers to channel their export to the illegal market, which leads to a reduction of foreign exchange earnings from exports. Consequently, a reduction in

foreign exchange earning leads to low level of inputs (imports) and low level of GDP. Therefore a parallel market has a negative impact on economic growth so that to reduce/eliminate these, exchange rate liberalization as the introduction of inter bank exchange rate is helpful (Birritu No. 56).

Regarding to development in the nominal exchange Rate, the average marginal rate the continuous depreciation in the value of the Birr could be ranged from 2.07 to 8.6518 in the period. In the parallel market however, the Birr appreciated on average stood at birr 8.711 per USD at the end of 2004/05. Hence, the premium between the official and parallel market narrowed down through time in the review period.

Table- 3.4 Inter-Bank and Parallel Forex Market Exchange Rates
(Daily inter bank foreign exchange market operation began in oct.25, 2001)

Period	Average weighted Rate	Amounted Traded in Millions of USD		Number of Trades		Parallel Market
		Total	O/W AMONG CB'S	Total	O/W AMONG CB'S	Average
2001/0	8.5425	104	30	534	108	8.6850
2002/3	8.5809	160	52	588	141	8.7091
2003/4	8.6197	228	96	978	343	8.6751
2004/5	8.6518	138.9	22.2	1290	62	8.711

Source: National Bank Report: 2003/04

3.6 An Examination of the Monetary Policy Effectiveness

The monetary policy including its instruments and objectives can be evaluated on the basis of the capability of NBE to control strategic variables using monetary policy instruments as designed, the analysis of the gap between actual and target values, its coordination with fiscal policy, and the performance of financial sectors. In general the sense of evaluation of monetary policy objectives is similar with the monetary policy reaction to macroeconomic shocks.

3.6.1 Major Monetary policy Instruments

One of the prerequisite requirements when the National Bank of Ethiopia needs to respond macroeconomic shocks is to design policy instruments up on the market-oriented economy. The slipping away of direct control power on money supply and the growing up of the private sector necessitated indirect controlling mechanism of money supply.

A) Reserve Requirement

Reserve requirement in Ethiopia is computed by netting out uncleared checks paid and uncleared effect foreign from the total deposits. The requirement is currently 5 percent of the net deposit and failing to comply with this requirement will be penalized. The National Bank of Ethiopia uses this instrument to control the liquidity of banks by varying the rate according with the targeted level. The higher Reserve Requirement contracts the liquidity as well as credit expansion power of commercial banks and the opposite will increase liquidity and credit expansion power of banks. This has to be undertaken consistently with macroeconomic conditions (Gazena: 2001).

However during Dec.1995-Feb.1997 in order to reduce the high lending potential of the biggest liquid bank CBE, the NBE set the requirement at 8 percent on CBE. One reason for this distinct treatment is that the rise in flow of foreign exchange following coffee price boom create additional liquidity for the CBE and that pressurized the exchange rate to appreciate.

On the other hand, the Banks asset in NBE doesn't earn interest but their liability bears interest it is mostly regarded as a tax and high reserve requirement is thought to create disintermediation on the banking system (Johnston and Sandararajan, 1999). From other countries experience, reserve requirement has little role and not frequently used in short - term money management Therefore some countries have abolished it while others reduced it to the level that couldn't influence liquidity significantly and some central banks pay interest on the banks required deposits.

B) Open Market Operations, OMO

OMO in countries, like Ethiopia where the institutional developments is not fulfilled is regarded as 'Open Market-type Operations' to distinguish it from those of the developed nations' OMO (Johnston and Sandararajan. 1999). This is because of it's conduct varies up on legal & institutional setting, financial structure system and stage of security market development.

In the condition of under developed financial market, treasury bills market is the first step for full-fledged open market operation. Hence the bi-monthly auction market is introduced in 1995 with the objectives of financing government deficit from non-bank sources. Besides that it has an intention of creating a base for the establishment of secondary market and to boost the NBE's controlling power on money stock and interest rate. To get private sectors participations, the minimum denomination

was reduced from Birr 50 thousand to Birr 5 thousands and interest proceed was tax exempted in t-bills market.

However the market failed to attract private bidders as expected, and it is dominated by public organization. This is because high competition among liquid banks and other financial institution make bill interest rate low, which is lower than three percent on average. So private sectors prefer bank deposits. In effect, liquid commercial banks willing to lend to government by a lower rate than the deposit rate they are paying to their deposit liability.

Therefore, except providing fund for government the treasury bills market is not serving most of its objectives that it is established for first in an attempt to develop secondary market. NBE has allowed inter-bank money market but still it is at rudimentary level largely and ironically because of the treasury bills market which cast a shadow on it development as the excessively liquid use treasury bills market that provides them with maximum security and lower cost as well as higher return (in absolute term) than inter-bank lending they give fund seeking banks lesser attention and even turndown their request (Gazena: 2001).

NBE conduct its OMO actively through Treasury bills market to influence the variables like liquidity level and net domestic assets of the banking system and money supply in the economy and monitor whether they are in conformity with the targeted level (NBE Birritu No.78).

In general the performance of treasury market in Ethiopia is not fully attain it's initial and most of the objective as designed. This is because

- The interest rate determined in the Treasury bills auction market in Ethiopia doesn't use to determine other rates in the economy.
- Around 60% of the treasury bills are purchased by those commercial banks using their excess reserve. On the side of the government, it spends the collected amount for short term financing like wage payment. In effect the treasury bills market is inflationary as opposed to its objective. Excess liquidity absorbed is a re-injected in to the economy.
- As the government financing rested on few public institution in auction, it might not be sustainable due to unexpected withdrawal of the bidders that resulted in jeopardizes financing as evidenced during January 2000 phenomena.
- NBE has limited power to affect the volume of sales of the treasury bills since it is largely dependent on the level of the government deficits i.e. treasury auction is continuing for the fiscal rather monetary reasons.

C) Discount Policy

This primarily involves changes in the discount rate, affects the money supply by affecting the volume of discount loans and the monetary base. A rise in discount loans adds to the monetary base and expands the money supply, while a fall in discount loans reduces the monetary base and shrinks the money supply. The central bank facility at which discount loans are made to banks is called the discount window.

Since the introduction of discount window facility for commercial banks on March 2001, no transaction has been made due to the over liquidity of commercial banks. This is because of those banks highly increased saving and time deposit poured over and above the actual loans granted amounts. There are so many justifications reported to why commercial banks were not able to extend Loan portfolios to reduce their liability, and eager to have reasonable liquidity: Such that the internal and external policy trap of the commercial banks and the economy respectively, thin and undeveloped financial market with no more secondary markets and the like. Thus these factors limit the effectiveness of monetary policy through discount window.

Finally the efficiency of indirect monetary policy largely depends on the development of secondary market. For instance central bank discount rate changes are easily transmitted in to commercial banks interest if there is well-developed secondary markets. If the financial sectors become responsive, the monetary authorities use central bank Bill, government Treasury bills and other security to regulate the stock of money in the economy. However central bank of Ethiopia T-bills is always sold but not purchased back and not guides the bank rates.

There fore it handicaps monetary authorities, since the government with annual deficits averaging about 6.2% of the GDP from 1990/1 to 1999/00 is not interested to repurchase bills for the sake of stabilizing the demand of money in the economy, as monetary authorities do. The NBE has limited area to influence and use it as a monetary policy instrument.(Birritu No.56).

Given these all monetary policy Instruments and targets, as any developing countries the central bank of Ethiopia has encountered a problem of time lags between setting the targets and its operation. This is basically because of the imperfectability in given market and uncertainty about demand, supply, the price and the stability of political sphere. Those factors intensify the lags

structure and lead to lack of sufficient information by the people and ends up with unsuccessful monetary policy performance.

3.6.2 Monetary Policy Framework and Gap Analysis: Post-1990/91

Since the early 1990s, Ethiopia has undertaken a wide range of policy reform measures within the framework of the structural adjustment program. The policy package includes important provision to financial sector reform policies. In the Mid-1996, the government of Ethiopia adopted a medium-term adjustment program for the period 1996/97-1998/99, which was supported by a three-year arrangement under the Fund's Enhanced structural Adjustment Facility (ESAF), by the world Bank in the form of new sector investment loans, and by other multilateral and bilateral donors. Ethiopia intends to deepen the reform and liberalization process while strengthening macroeconomic performance. Performance of the economy in 1996/97 was in most instances better than envisaged in the initial ESAF program. Output grew by 5.6%, marginally below the expected rate of 6%, while inflation decelerated to a negative 6.4%, broad money increased by 3.4% against a targeted rate of 9.1%, the fiscal deficit including grants was smaller than targeted, the external sector deficit excluding officials transfer estimated around 7% of GDP, was smaller than projected.

In 1997/98, the economy suffered from the adverse effects of El Nino on agriculture and transportation. As the effect of crop shortfalls on the food price was mitigated by buffer stocks and extraordinary food imports, while nonfood prices was subdued owing to prudent Monetary policy, inflation was kept well within the initial program target of 3%, broad money growth reached 12% which was higher than the target (9%) and government deficit excluding grants is estimated at 6.4% which is less than the budget and previous year (IMF: 1997).

However, the midterm review under the first annual ESAF arrangement could not be completed, and the arrangement was allowed to expire in October 1997. The government adopted a new medium-term adjustment program for the period 1998/99-2000/01 is requesting financial assistance from the fund under the ESAF, World Bank and other multilateral and bilateral donors.

The overriding objective of the government under this program is to attain relatively fast, broad-based, and more equitable economic growth with macroeconomic stability. These twine objectives of growth and price stability is also the aim of the integration with the global economy, which place effort to further liberalization of foreign trade. In line with the paper states that the target values for each variable like GDP, external deficit, international reserves, inflation and other. Consistent with

these objectives and targets, the macroeconomic policy package for the medium term focuses on continued pursuit of prudent fiscal and monetary policies, with virtually no net domestic borrowing by the public sector, a further reduction in import tariffs, full deregulation external current account transactions and development of a modern and sound financial system. Simultaneously, structural reforms will focus on export promotion and private sector development, regulatory & institutional framework.

To the subsequent, both monetary and exchange rate policies during 1998/99-2000/01 designed to be geared toward achieving the inflation and external sector targets envisaged under the program. Exchange rate policy would be consistent with the envisaged liberalization of the external current account and the need to foster export diversification and rebuild net foreign assets to a more comfortable level. Auction-determined exchange rate has been practically eliminated and abandoned to the market. As the time, in the wake of the financial sector reforms, the monetary program will be on an increase in the demand for broad that is consistent with the envisaged financial deepening. In addition, and to improve the efficiency of the financial system, the use of indirect monetary policy instruments, such as open market operations with public securities, will be stepped up, while less reliance will be placed on reserve requirements.

In general the policy matrix 1998/99-2000/01 of the program contained objective and target of ensuring monetary growth is consistent with inflation objective and net international reserves by using the strategies and measures of operational like an inter-bank money market, convert part of the government's overdraft with the national bank of Ethiopia in to treasury bills as necessary and introduced securities to be issued by the NBE. The exchange rate policy also focused on to maintain a flexible exchange rate using a strategies of operationalize an inter-bank market for foreign exchange, with a view to eventually phasing out the weekly auction of foreign exchange by the NBE. In line with monetary policy, the Fiscal policy is also intended to support macroeconomic stability and minimizing government crowding out of the private sector using by improving the domestic primary balance and preclude and increase in net credit to the government from the banking system.

Up on the adopted monetary policy framework, the practical performance swings around the target value of monetary variables. As the researcher gathered data from different years under review period, the variables like domestic credit (DC), domestic credit to the central government (NDCG) and the broad money (BM) were the monetary targets for the *adjustment program* while the aforementioned variables were set as performance criteria as important instruments of *stabilization*.

Due to the consequence of the coffee export booming and the substantial increment in credit expansion to the private sector, there was a significant change in the growth of money supply during 1994/95. It continues with fluctuations due to the EL Nino weather condition and Ethio-Eritrea conflicts during 1997/98 and The drought occurred all over the country in 2001/02 highly affect the growth rate money supply. That is why the gap between target and actual growth rate of money supply was relatively high during 1994/95 by 11.7 percent, and -3.4%, 3.8%, -5.2%, 4.7% and -2.9% fluctuations from the target value as presented the table below. This fluctuation is directly linked with the determinants of broad money supply. Higher fluctuations (in domestic credit and net credit to government) were existed due to 1999/00 by 24.9% and 53.9% respectively, and because of drought during 2001/02 -7.5% and 8.9% changes from the target in both domestic and net credit to government respectively.

Table-3.5 Target Vs Actual Monetary Values

Year	Money Supply			Domestic Credit			Net Credit to Gov't		
	Target	Actual	Diff.	Target	Actual	Diff.	Target	Actual	Diff.
1992/93	19.6	12.7	-6.9	18.3	14.4	-3.9	6.4	29.8	23.4
1993/94	13.4	13.8	0.4	9.7	10.4	0.7	2.2	7.7	5.5
1994/95	12.6	24.3	11.7	10.0	12.9	2.9	-0.4	-3.9	-3.5
1995/96	8.0	8.3	0.3	8.0	14.5	6.5	-1.6	-1.9	-0.3
1996/97	7.1	3.7	-3.4	5.0	0.4	-4.6	-2.9	-8.6	-5.7
1997/98	9.0	12.8	3.8	8.6	10.11	1.51	-0.3	6.5	6.8
1998/99	11.0	5.8	-5.2	8.1	8.7	0.6	-1.0	9.4	10.4
1999/00	9.2	13.9	4.7	6.9	31.8	24.9	-0.3	53.6	53.9
2000/01	12.5	9.6	-2.9	7.0	2.4	-4.6	-1.2	-1.3	-0.1
2001/02	13.2	12.3	-0.9	7.0	-0.5	-7.5	-4.2	4.7	8.9
2002/03	10.6	10.4	-0.2	8.3	2.5	-5.8	-4.0	9.8	13.8
2003/04	13.4	14.2	0.8	9.7	11.8	2.1	5.6	12.1	6.5
Average	11.6	11.8	0.2	8.9	10.0	1.1	-0.1	9.8	10.0

Source: Policy Framework For Different years.

N.B: The difference can be calculated using actual value less target.

The graph plotted below depicts that how the trends of the aforementioned monetary variables swing over the review fiscal period. The swings justify that even though the ESAF program gives monetary Authorities a higher position in money supply management, there is still no fully control over the money supply. This is because of fully managing net foreign assets is outside the monetary authorities where money supply's determinants are net foreign assets, domestic credit and other item. Hence money supply management can be done only through the domestic assets part by controlling net domestic credit to government and by this both the stabilization and Balance of payment objective can be achieved.

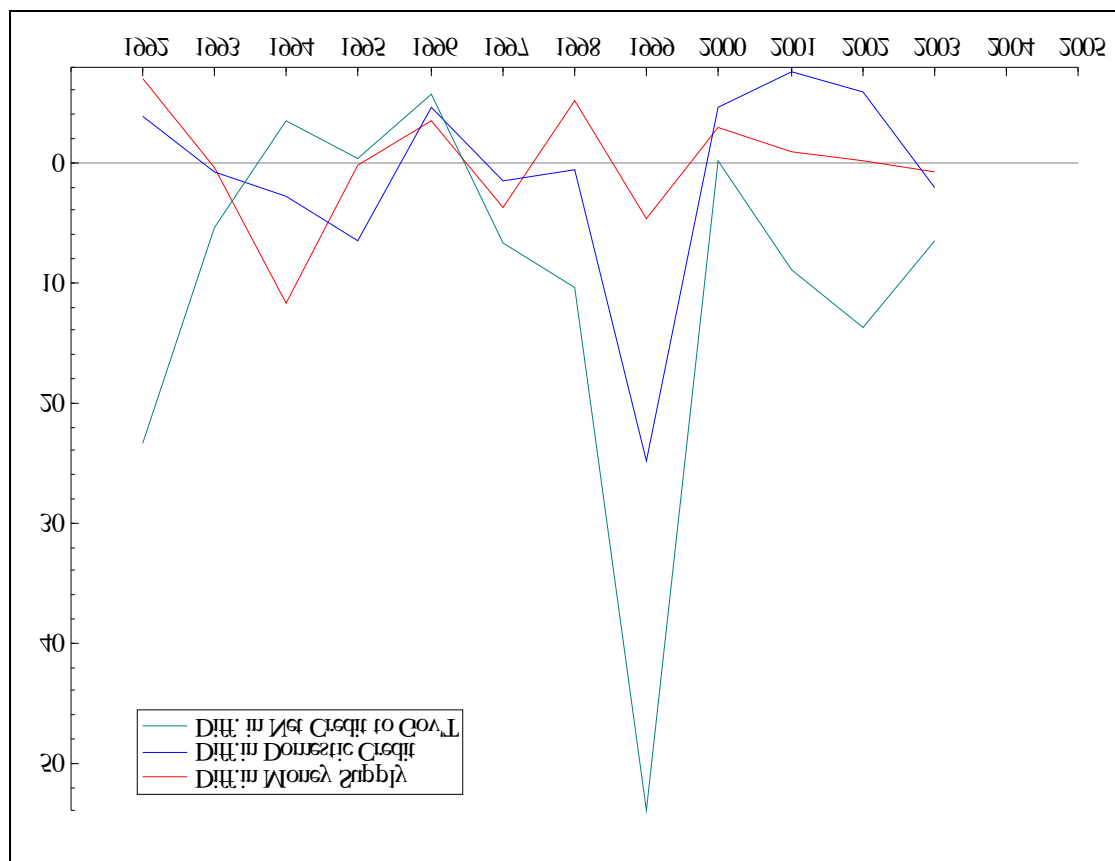


Chart 8: the trend of Gaps happened where actual less target values (1992-2003/04)
 Source: Monetary policy Framework paper for different years.

In the analysis of the average value during 1992/93-2003/04, the average growth rate of domestic credit was 10 percent per annum with 1.1 percent disparity against the targeted value of 8.9 percent growth rate, while one of the components of domestic credit i.e. net credit to government (NDCG) presented a higher disparity of 10 percent. Hence, the growth rate of domestic credit (DC) was almost attaining at the expense of domestic credit to private sector (DCP). As a rule, the National Bank always attempts to make the growth rate of money supply equivalent to the growth rate of nominal gross domestic product. But what is actually happened is that the average growth rate of money supply was 11.8 percent while 10.7 percent average growth rate in nominal GDP. This implies that the monetary policy during the reform period is relatively tight (Yimeserach: 2005).

- **Growth Rate Ratios Of Monetary Aggregates And Components of Broad Money**

As the very nature of monetary policy controlling the money supply urged policy makers to conduct critical research on the ratio of determinants and component of money supply as presented below. *Pertaining to determinants of broad money supply*, the average annual growth rate ratio of net

foreign assets took 31 percent while domestic credit accounted, 119 percent growth rate as both are in determination of broad money supply. Of the domestic credit, net domestic credit to government accounted 66 percent while domestic credit to the private sector registered 49 percent of total credit. *However regarding to components of broad money*, Narrow money went down through time in five years average and became 72 percent in the review period, which is greater than that of quasi money took, 42 percent. Correspondently, quasi money went up through time in the given period.

Table-3.6 Average Annual Growth Rate Ratios of monetary Aggregates and components

Year	NFA/M2	DC/M2	NDCG/DC	DCP/DC	M1/M2	QM/M2
1990/01-1994/95	0.19	1.10	0.66	0.38	0.73	0.27
1995/96-1999/00	0.32	1.04	0.50	0.50	0.60	0.40
2000/01-2004/05	0.31	0.99	0.58	0.42	0.55	0.45
Average	0.31	1.19	0.66	0.49	0.72	0.42

Source: Calculated from National Bank Of Ethiopia Annual Report (1990-2004)

- **Growth Rate Ratios of Variables To Gross Domestic Product**

Except year 2001/02, nominal GDP increased over time in the review period with average nominal GDP 48,463. Comparing M2, Deficit, Domestic credit, Net Foreign assets and the velocity of money is important in analysis of share from GDP. In general the average annual growth rate of Broad money to GDP accounted 51 percent, which implies that the average annual growth rate of velocity of money measured by GDP/M2 registered 2.56 to know the rate money circulation (the rate at which money circulates throughout an economy during a particular period, usually a year).

On the other hand the average growth rate of deficit took 7 percent of gross domestic product. Coming to the determinant of money supply, the average annual growth rate Domestic credit and Net foreign assets to GDP ratio took 53 percent and 14 percent.

Table-3.7 Average Annual Growth Rate Ratios To GDP

Year	GDP	M2/GDP	Deficit/GD	DC/GDP	DCP/GDP	NDCG/GDP	NFA/GDP	GDP/M2
1990/91-1994/95	25458	0.42	0.07	0.46	0.18	0.31	0.08	2.36
1995/96-1999/00	44923	0.42	0.05	0.43	0.21	0.22	0.13	2.41
2000/01-2004/05	60931	0.52	0.07	0.51	0.21	0.29	0.18	1.95
Average	48463	0.51	0.07	0.53	0.23	0.31	0.14	2.56

N.B: - Deficit here presented after the inclusion of Grants. Velocity of money can be calculated equivalently with GDP/M2. Sources: National Bank Annual Report For Different Years (1990-2004).

3.6.3 Fiscal deficit financing & Inflation

During Derg period, the government expenditure grew faster than revenue collection leading to widening of the budget deficits. In nominal term, fiscal deficits increased from Birr 535.4 million in 1980/81 to Birr 2.2 billion in 1989/90 with the average growth rate of 11.6 percent. Besides that the deficit to GDP ratio rose from 5 percent of GDP in 1980/81 to 12.5 percent in 1989/90.

Apart from grants, it remained more or less stable since 1991/92 as government enhanced its revenue collection and restrained growth in expenditure. Over all deficits excluding grant stood at Birr 2.0 billion in 1991/92 and rose to Birr 3.23 billion in 1995/96 and then declined to an estimated Birr 3.06 Billion in 1997/98. The marginal expansion of deficit in absolute term was showing 4.2% average growth per annum. Hence the ratio of deficit to GDP dropped from 10% in 1991/92 to 5% in 1996/97. However the level of deficit including grants for the period 1991/92 to 1997/98 stood at 5% of GDP on average.

During post reform period, the mode of deficit financing shifted from domestic resource to external resources. To be evident, in 1990/91, 1993/94 and 1994/95 about 25%, 79% and 94% of deficit including grants was financed from external sources respectively while 55%, 79% and 6% from domestic during 1990/91, 1991/92 and 1994/95.

Regarding to Borrowing from Banking sectors, it was steadily declined from 1162.0 million in 1992/92 (80% of the deficit) to Birr 1.6 million (21% of the deficit) in 1994/95 and also 32% of the deficit in 1997/98. In general the development of fiscal deficit and its mode of financing revealed that both external assistance and loan have had significant role in reducing and financing deficit. This helped the government to reduce or avoid the inflationary financing particularly by borrowing from the banking system and its impact on debt accumulation needs to be closely monitored. Moreover the variability and unpredictability of external resources may entail a resort of domestic sources of financing resulting in macroeconomic instability and inconsistency.

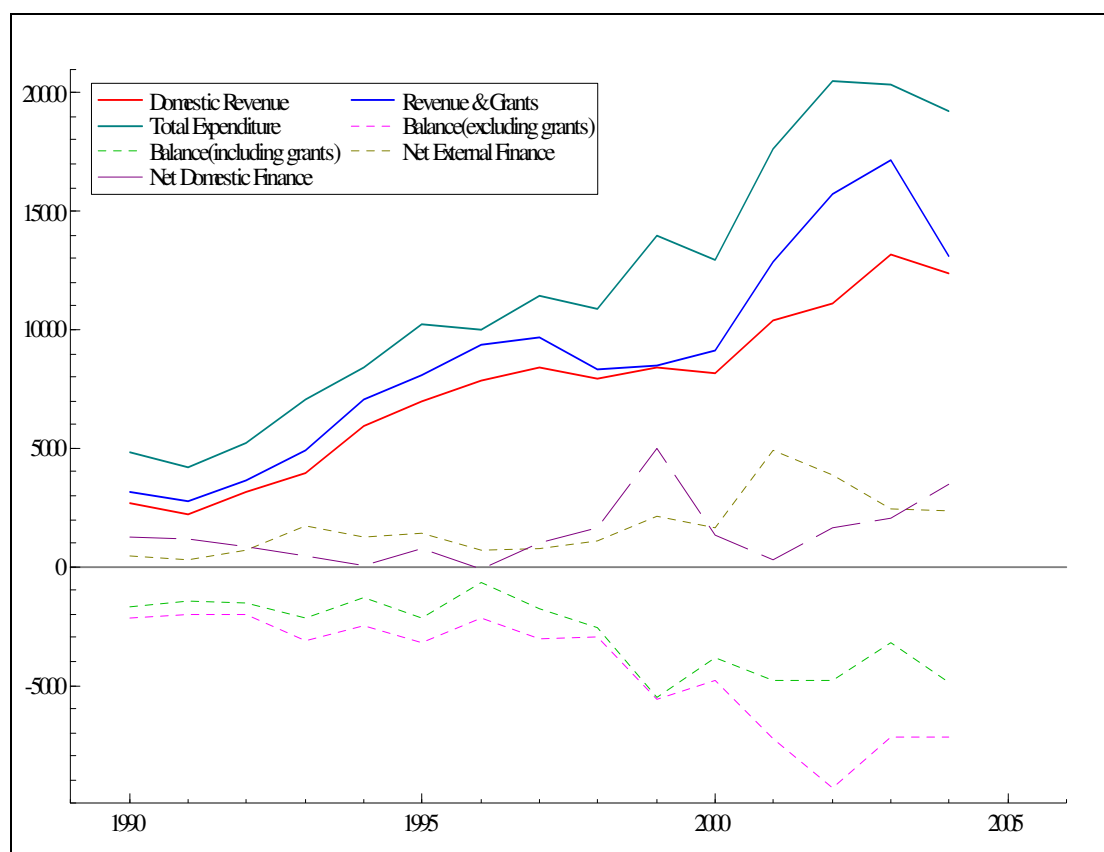


Chart 9: Summary of Fiscal Deficit Financing (Annual Base)
Source: MOFaD (1998) and NBE (2004)

Monetization of budget deficit is one of the links between fiscal and monetary policies. As we have seen in (Table 3.1) the government fiscal deficit was high at 12% of GDP in 1990. This is because of high public expenditure against low revenue collection accumulated by the higher tax rate structure led to tax elevation and narrow tax base as well as ever-increasing monthly power financing. This phenomenon has resulted in expansionary monetary power financing the fiscal defects (monetization of the defects even in the beginning of the reform period) mainly through printing of money and lack of external financing.

In the reform period, the fiscal deficit is squeezed due to the factors like fiscal reform, use of different non-inflationary source to finance budgetary deficits, cut on military expenditure, the introduction of treasury bills auction, which brings inflow of external resource in support of the reform program. In general the monetary policy is shifting to the objective of reducing budget deficit monetization in the reform period to lower inflation.

3.6.4 Challenges to Monetary policy Objectives

They are categorized on the bases of issues related like financial liberalization, financial sectors, monetary policy instrument and the like. We can discuss how the challengers affect the monetary policy instruments effectiveness and the effort to hit its monetary objective and create longer lags structures.

The main challenge for financial sector liberalization in Ethiopia emerges from the very nature of the economy. The financial sector in Ethiopia has been subject to overt government control and intervention in its operation, Government owned financial institutions dominated the financial market, financial intermediation was low, the financial depth of the national economy was rather shallow, and the mobilization of financial saving was not as such sensitive to rate of interest paid to bank depositors, and the supervisory power of the central bank was eroded by political interventions. The financial sector policy was made to serve the fiscal policy stance of the government.

The development of the financial sector in Ethiopia depends on the state of the national economy and financial liberalization measures. Severe limitation in the legal system and contract enforcement mechanisms, the tradition of keeping and reporting financial indicators according of acceptable standards, the reliance of creditors on non-legal institutions to prevent default in credit repayment are some of the main constraints in the development of the financial sector. These factors operate in an environment where the depth of financial is rather shallow and non-financial saving is still a dominant form of saving.

In general major problems in the Ethiopian Monetary Sector:

- Low level of human resources in the banking and insurance sector makes thing slow and inefficient. Training and experience are required. This is due to the fact that banking and insurance are at an early level of development.
- Supervision and regulation by NBE is below international level. This is also due to the fact that new and inexperienced staff is running the system.
- Entry in to financial sector is relatively slow resulting in gradualism. Faster development is needed to satisfy the overall demand. During 1998, High concentration of deposit (87%) and credit (60%) in CBE is giving it a strategic position, which may make it monopolistic or may market imperfect. Commercial Bank of Ethiopia (CBE) is dominating the money market and has now with it 90 percent share in total deposits of

the country and 71 percent of loans given. So, it is the largest bank in the country. In with passage of time, the importance of CBE is falling and Awash Bank, Dashen Bank, Wegagen Bank and Assyria Bank's positions are becoming stronger.

- High geographical concentration of the banks in Addis Ababa (80%)
- No Non-bank financial institutions like discount and Finance House, leasing companies, venture capital fund, stock and corporate bond market, mutual fund, unit trusts etc. This makes the money market rather limited and narrow. Many new services, monetary instrument, which are operational in other countries, are not available here.
- Poor status of assets as Non-performing loan (NPA) is quite large. This speaks ill of financial health of the banking institutions in Ethiopia. One negative aspect worrying the Central Bank is that there are large (some say 40%) non-performing assets (NPAs) in 2000, which is bad for CBE too. By NPL, we mean those loans, which are not likely to be returned to the bank, or on which it is not getting even any interest.
- The non-existence of secondary markets, and thin financial markets.

Specific to the monetary policy, due to excess reserve deposited by and excess liquidity held in commercial banks, monetary authority did not control the credit availability in the market which in turn not put the money supply under the control of it. That is why monetary policy instruments like discount window and inter-Bank money market are not well exercised since the date of policies intervention. To investigate cases deeply, let ask our selves why those Banks faced excess reserve and liquidity in the review period? The practical examinations tell us that there are two basic justifications: firstly, the existence of policy traps when the banks granted credit facility including short-term, medium- and long-term strictly limit the would be borrowers that may have an easy access for credit. The traps have two sides: external policy traps and internal policy traps. Regarding to external side, For instance the lack of macroeconomic policies and credit policy co-ordination like strict land lease policy in 1998-2000 restrain credit availability of long-term loan at Construction & Business Bank, which is the dominant bank granting the long term bases in the country. Later on the government sensed it and eases its policy side by side with adaptation of country's industrial policy focusing the objective to develop constructions. In effect, the aforementioned bank increasingly granted credit to the private sectors. In general it would be expected that the lack of macroeconomic policies like fiscal policy, investment policy, income policy etc and monetary policy & credit policy have trapped the monetary policy instruments effectiveness. The internal policy traps directly stemmed from the commercial Banks' credit and others policy. For instance, in CBB the would be borrowers might not get loan partly due to significant expected own contributions, no longer credit

for new entrance who don't have experiences in the applied business, unexhausted conditional credit policies with enough credit to collateral ratio. In general, procedures and level of management competence, internal policies with in the bank and with macroeconomic policies had pivotal role in the effectiveness of monetary policy.

Secondly, the performance and the response of real sectors were not developed which in turn put higher default risk in the view of financial institutions. This intention highly affected the financial institutions' decision to extend credit and then to reduce excess reserve. As many agree with, the Ethiopian economy was boom when there was only peace and favorable weather conditions during the period, Otherwise the cost of living (inflation) was going to be higher. However the monetary policy instruments might face difficulty to control this cost-push inflation (i.e. there was shortage of productions) during war and drought periods. Besides these, insignificant concentration of the banks out of Addis Ababa placed obstacles for monetary authorities in monetization of the economy. Finally even though the monetary authority reformulates the interest rate structure and reduce deposit interest rate from 6% to 3% during 1998, it was not followed by decreased level of saving as expected. This suggested that depositors would not have any more investment alternative due to the above (real sector problems) and other reasons (MOFaED: 1998).

Chapter four: - Model Specification, Results and Interpretation

4.1 Model specification *

There are different ways of specifying the monetary policy reaction function in theories, which try to explain how a central bank responds to macroeconomic shocks. Commonly, the monetary models that are applicable in developed countries may not have full satisfactory outcomes when they are applied in developing countries. This is because of the monetary agencies in developing countries do not have the latitude to engage in discretionary activities, and characterized absence of broad and active financial markets.

For our case we are basing ourselves initially on the rule-based monetary policy that means operating policy according to a predetermined rule, largely irrespective of prevailing economic circumstances. An example of monetary policy rule policy is the Friedman's rule, which suggests that money supply should go the same rate of growth of nominal GDP. This is evidenced that the NBE pursued maintaining the growth rate of monetary base in line with the growth rate of nominal GDP, which helped contain inflationary tendencies while maintaining external balances during the reform period.

This is the best known to be the **demand standard rule** advocates expanding money supply at same rate with the growth rate of GDP. The rationale for this rule is derived simply from the Irving Fischer 'exchange or transaction equation' of earliest quantity theory of money, $MV=PY$. So we have

$$M_t V_t = P_t Y_t \dots \dots \dots (1)$$

Making each variables one period lags and we obtain

$$M_{t-1} V_{t-1} = P_{t-1} Y_{t-1} \dots \dots \dots (2)$$

Deducting equation (2) from equation (1) and dividing by $M_t V_t$ and $P_t Y_t$

$$\frac{M_t V_t - M_{t-1} V_{t-1}}{M_t V_t} = \frac{P_t Y_t - P_{t-1} Y_{t-1}}{P_t Y_t} \dots \dots \dots (3)$$

* Sources: (Chang, International Journal OF Applied Econ. 2(1), March 2000.PP.50-61), World development Journal, vol.19, No.6, PP709-709, 1991), and Quarterly Journal of Business and economics, vol.25, pp16-37: Joyce, Joseph.

Assuming that V (velocity of money) and P (the price level) is constant over time, then

$$\frac{M_t - M_{t-1}}{M_t} = \frac{Y_t - Y_{t-1}}{Y_t} \dots\dots\dots(4)$$

If it is desired to stabilize the price level, then growth in money supply must equal to growth in output. The rule is concerned primarily with the long run rather than the short run. It recognizes that V is not in fact a constant, having short runs seasonal and cyclical fluctuations, but in the long run is a highly stable phenomenon.

However regarding to how NBE determines money supply at same rate with nominal GDP growth rate, the **Accounting Framework (Flow of Fund) model** suggests that money supply mainly consists of domestic credit and net foreign assets. By changing each other at desired magnitude with different direction, Central Bank can put change in money supply zero or positive or negative depending on the growth rate of GDP. Besides this, the Central bank considers factors that influence money supply and its policy. So in order to abide with demand standard rule, How Central Bank works and responds macroeconomic variables?

An interesting rule is **Taylor rule**, which is the foundation of our model. It prescribes setting for the bank rate i.e. the variable controls in order to influence the evolution of macroeconomic conditions. A policy induced increase in interest rates is generally representing a move towards more restrictive policy posture, one that tends to reduce aggregate demand. Accordingly, the Taylor rule calls for a higher setting of the bank rate when inflation is expected to be high and / or output is high relative to capacity. Specifically, the Taylor rule can be written as follows:

$$i_t - \pi_t = r_t + \beta_1(\pi_t - \pi^*) + \beta_2 (y_t - y^*) \dots\dots\dots(5)$$

Where r is the bank rate setting for period t that prevails when $(\pi_t = \pi^*)$ and $(y_t = y^*)$, π^* is target rate of inflation, and y is output at the capacity while y^* is the target rate of output. It shows that central bank responds to departures of inflation and output from their target values through interest rate.

However interest rates in developing countries are often set by the government, but are not adjusted in a discretionary manner like in developed countries. Other aggregates, such as the money supply, are subject to outside influences, particularly under fixed exchange rate. Therefore we have to extend the Taylor Rule along with the existing condition of NBE: **Extended and Modified Taylor Rule** can be applied here (Chang, International Journal OF Applied Economics, 2(1), March 2000.PP.50-61).

There are two major determinants of broad money supply namely domestic credit and net foreign assets. Of which managing net foreign assets is outside the National Bank of Ethiopia. Hence money supply management can be done only through controlling domestic assets to achieve both stabilization and balance of payment objective. Domestic credit consists of claims on government and claims on non-central bank. So, the change in the central bank's holdings of domestic credit assets was chosen as the most appropriate indicator of monetary policy (Joyce Joseph, 1991, World development Journal).

$$DC = \beta_0 + \beta_1 (\pi_t - \pi^*) + \beta_2 (y_t - y^*) \dots \dots \dots (6)$$

Once the indicator of monetary policy set, we have to identify the macroeconomic variables to be responded and the central bank considered to control them. Like equation (6), the goals of the monetary authorities will determine which variables affect monetary policy. Hence Gross Domestic Product and inflation rate are the objectives of central bank in long run and short run respectively. But it is in level form rather than in deviation from the target, and taking CPI in place of πG_t . This is because of for simplification & to maintain uniformity among considered variables and to obtain inflation rate in the short run analysis by first differencing of CPI. Therefore equation (6) can be written as below.

$$DC = \beta_0 + \beta_1 (CPI_t) + \beta_2 (GDP_t) \dots \dots \dots (7)$$

Goals are not the only variables to be considered in specifying the determinants of monetary policy. Moreover the domestic factor that monetary growth depends primarily up on fiscal policy in developing countries (World development Journal vol.19, No.6, PP709-709, 1991). As monetization of the fiscal gap (Fg), equation (7) will be extended below.

$$DC = \beta_0 + \beta_1 (CPI_t) + \beta_2 (GDP_t) + \beta_3 (Fg_t) \dots \dots \dots (8)$$

Along with domestic sectors, the openness of the economy will determine which variables affect monetary policy. The authorities would act to offset, or sterilize, the monetary impact of foreign reserves: NFA (net foreign assets) flows in order to maintain their autonomy. They would also respond to exchange rate changes by adjusting credit in order to accommodate resulting changes in the current account and output or they would adjust their domestic credit holdings to offset the impact of exchange rate changes upon output and to strengthen the international position in competition. So, we can take real effective exchange rate (REER) considering the competitiveness of the country.

Hence equation (9) can be written as below:

$$DC = \beta_0 + \beta_1 (CPI_t) + \beta_2 (GDP_t) + \beta_3 (Fg_t) + \beta_4 (NFA_t) + \beta_5 (REER_t) \dots \dots \dots (9)$$

- Where DC_t = Domestic credit
- NFA_t = Net foreign assets (Foreign Reserve)
- CPI_t = Consumer price index
- GDP_t = Real gross domestic product
- $REER_t$ = Real effective exchange rate
- Fg_t = Fiscal gap

There are two basic types of policy, which can guide their responses to these variables: Accommodating and Stabilizing. Accordingly under a policy directed toward accommodation, the coefficients take the following signs: $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$, $\beta_4 < 0$ and $\beta_5 > 0$ while strict stabilization policy would place the following constraints on the coefficients: $\beta_1 < 0$, $\beta_2 < 0$, $\beta_3 < 0$, $\beta_4 > 0$, $\beta_5 < 0$.

One-way estimating this model is using simultaneous equations approach, but with lags in all the variables. Such a model is called a **dynamic simultaneous equations model**. However rather than formulating using classifying variables endogenous and exogenous as well as imposing some constraints on the parameters to achieve identification, Sims argues that both these steps involve many arbitrary decisions and suggests as an alternative, **the vector autoregression approach**. Besides that in most literature single policy reaction function [equation] framework can be employed to estimate determinants of monetary policy. This approach is troublesome in the sense that it does not account for non-stationary and endogeneity problem. Rather this paper employs a simple co integrated VAR model combining co integration analysis and vector Auto regressive time series.

Use of co integrated VAR model helps account for spurious correlations, and exogeneity bias as it is designed for non-stationary time series and requires no endo-exogeneous division of variables. Further vector error correction model embodied in co integrated VAR technique distinguishes clearly between long- and short-run impacts and responses, providing a suitable tool for policy analysis. The VAR model where case $n > 2$ and $k > 1$, that is a **general VAR model** containing n variables and k lags is

$$Z_t = A_0 \Delta_t + A_1 Z_{t-1} + A_2 Z_{t-2} + A_3 Z_{t-3} + \dots + A_n Z_{t-n} + \epsilon_t \dots \dots \dots (10)$$

Where Z_t is an $n \times 1$ vector that containing n variables in the system. Namely: - DC, CPI_t , GDP_t , Fg_t , NFA_t , $REER_t$ Where Δt is a vector holding deterministic terms like trend, intercept, Dummies. ε_t is an n dimensional vector of multivariate random errors with zero mean and covariance matrix Σ , i.e. $(\varepsilon_{1t}, \varepsilon_{2t})=0$ that is innovation term and $A_1, A_2, A_3, \dots, A_n$ are $n \times n$ matrices of constants to be estimated.

An important issue in econometrics is the need to integrate short-run dynamics with long-run equilibria. The analysis of short-run dynamics is often done by eliminating trends in the variables, usually by differencing. This procedure, however, throws away potential valuable information about long-run relationships about which economic theories have a lot to say. The theory of co-integrated developed in Granger and elaborated in Engle and Granger addresses this issue of integrated short-run dynamics with long-run equilibria. Hence rather than the paper employs a simple vector Auto regressive time series, the model incorporates co- integrating regression with VAR model.

After some mathematical manipulations, the **Error correction model (ECM) for VAR model** can be derived and become

$$\Delta Z_t = \Psi \Delta_t + \Pi Z_{t-1} + \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \Gamma_3 \Delta Z_{t-3} + \dots + \Gamma_{k-1} \Delta Z_{t-k+1} + V_t \dots \dots \dots (11)$$

Generally, the ECM relates the change in the dependent variable to the change in independent variable(s) and the long-run relationship lagged say here one period. If variables are co-integrated is $I(0)$, all terms in the ECM are stationary. This equation shows how long run impacts and responses on the elements of Z_t are incorporated in the short-term dynamics. Where $\Pi = -I + A_1 + A_2 + A_3 + \dots + A_K$ and $\Gamma_1 = -(A_1 + A_2 + A_3 + \dots + A_K)$, $\Gamma_2 = -(A_2 + A_3 + \dots + A_K)$, and $\Gamma_{k-1} = -A_K$. If Z_t is $I(1)$, then ΔZ_t is $I(0)$,

4.2 Sources of the Data

Here in the model there are only six macro variables namely net domestic credit, net foreign assets (Foreign Reserve), consumer price index, Gross domestic products, real effective exchange rate, and Government deficit and other conditional variables.

Monetary data net foreign assets and domestic credit, and the fiscal date namely fiscal gap are taken from National Bank Ethiopia Quarterly and Annual reports of the years in the review period. Domestic credit consists of both claims on non-central government, and net claims on government which in turn composed of claims from National Bank and commercial banks while net foreign assets contains assets from national bank and commercial banks. The government deficit on quarterly basis purely considered the difference between total expenditure and total revenue

excluding grants. This implies that to know the distinct interaction between deficit and foreign assets. Quarterly data for consumer price index is generated on the basis of smoothing the different way calculation through review period, which is obtained from International Finance Statistics and NBE.

In order to make quantitative assessment of the competitiveness of the Ethiopian export with the rest of the world, it is important to construct the real effective exchange rate index, which is the measure of the price of the country's goods to the price of its trading partner countries, both expressed in domestic currency (NBE annual report 2003/04). The index is calculated by taking quarterly data on wholesale price index, which is used as a proxy for the world price of tradable while the consumer price index of the home country was used as a proxy for the domestic price of non-tradable. And exchange rate applying weighted trade index to the base year of 1995, which seems normal in that there was no war and drought in the country. Individually, Trading partner countries were selected by employing a one percent threshold in which countries having a trade share of more than 1% for inclusion in the construction of REER. Jointly countries have a share of 80% in total trade of Ethiopia. Hence all variables are computed and organized from the quarterly Bulletin of NBE. Not that an increase in REERI and NEERI indicates appreciation.

Pertaining to GDP, the national account unit of MOFaED has two annual series on GDP: Old series ranged from 1960/61-1992/93 and new series from 1980/81 to now. In any reports, it is not available in quarterly series. Therefore we have to assess several methods to generate it along with the existing economic condition of the country. Haile Kibret (2001) then tried to study the behavior of seasonality function of each sectors in its contribution to annual GDP based on seasonality adjustment coefficients. Recently Yimserech (2005) generated quarterly GDP from annual GDP by interpolation of either nominal or real GDP using a technique suggested by Goldstein and M.s Khan (1976). Others also attempted to generate based on a technique from Ichero Otani and studied the quarterly contributions of each sectors and came up with seasonality adjustment coefficient for each sectors and finally disaggregates using moving average method. by comparing each of them with prevailing condition of the country, we conduct the method of disaggregating like What Haile did. But it acts with a sort of limitation of constant coefficients, ignores private sectors contribution to industry and share to other sub-service sector is equally divided in to four quarter.

4.3 Unit root and Co-Integration analysis

In the work of time series regression, one often obtains a very high R^2 even though there is no meaningful relation among variables. It resulted spurious regression estimation and the classical t and F tests cannot work well. Hence there are two concepts to be analyzed to have non-spurious estimation outcome. Hence both unit roots test and co-integration analysis are the basic components of time series characteristics.

- **Unit roots test**

1

The formal test for the existence of stationary is to find out if a time series contains a unit root using Dickey-Fuller and augmented Dickey-Fuller test. The issue of whether a time series is trend stationary (TS) or difference stationary (DS) time series has both economic and statistical implications. Therefore testing unit root is not questionable and its testing procedure with three possibilities presented below.

Let y_t become a *random walk without drift*, which is a non-stationary stochastic process. $y_t = \rho y_{t-1} + e_t$ and subtract y_{t-1} from both side of equation to get $\Delta y_t = \delta y_{t-1} + e_t$. Where $\delta = (\rho - 1)$ and Δ is the first difference operator. A case where y_t is a *random walk with drift*: $\Delta y_t = \beta_1 + \delta y_{t-1} + e_t$ (it is stationary with a nonzero mean equal to $\beta_1 / (1 - \rho)$) and a case *where random walk with drift around a stochastic trend*: that is, $\Delta y_t = \beta_1 + \beta_2 t + \delta y_{t-1} + e_t$ (it is stationary around a deterministic trend). Formulate Hypothesis testing: $H_0: \delta = 0$ or $\rho = 1$. If it is zero, y_t is non-stationary but it is negative, we conclude that y_t is stationary. Dickey and Fuller have shown that under the null hypothesis, the estimated value of the coefficient that follow the τ (tau) statistic, which is called **Dickey and Fuller (DF) test**.

Dickey and Fuller, Said and Dickey (1984), Phillips (1987) and Perrson (1988) and other developed modifications of the DF test when the error term, e_t is not white noise. These tests, called the Augmented Dickey-Fuller test (ADF).

The study is adopted considering not white noise error term in each case as below:

- A random walk without drift: $\Delta y_t = \delta y_{t-1} + \sum_{j=1}^k \theta_j \Delta y_{t-1} + e_t$
- A random walk with drift: $\Delta y_t = \beta_1 + \delta y_{t-1} + \sum_{j=1}^k \theta_j \Delta y_{t-1} + e_t$
- A random walk with drift around a stochastic trend: $\Delta y_t = \beta_1 + \beta_2 t + \delta y_{t-1} + \sum_{j=1}^k \theta_j \Delta y_{t-1} + e_t$

Table 4.1 Unit Root Test using ADF procedure

	Without drift & Trend		With drift		With drift & Trend	
	I(0)	I(1)	I(0)	I(0)	I(0)	I(1)
LDC	4.2897	-2.6646**	0.4368	-4.2883**	-1.7847	-4.2993**
LNFA	1.6919	-7.6136**	-6.4286**	-8.2689**	-6.0156**	-8.8599**
LCPI	1.7081	-6.9607**	-2.6861	-7.6812**	-4.4635**	-7.5449**
LFg	-3.5956**	-9.1218**	-3.7114**	-9.0777**	-4.2410**	-9.0064**
LREER	-0.66180	-6.1579**	-1.9858	-6.2317**	-2.0478	-6.4538**
LGDP	0.42775	-19.177**	-2.8925	-19.597**	-15.731**	-19.434**
Critical values	Critical values: 5%=-1.946 1%=-2.603		Critical values: 5%=-2.912 1%=-3.546		Critical values: 5%=-3.488 1%=-4.122	

We transformed the variables in natural logarithms to make the interpretation of coefficient in elasticity concept. As presented above, the variable LFg is stationary in level and first difference form in all the three option but LDC and LREER are stationary if and only if they are in first difference. In general all are stationary when they are differenced once but a mixture of I(1) and I(0) in level form. Hence Johansen procedure can treat a mixture of them occurred at a time.

- **Co-Integration analysis**

The traditional approach to the modeling of short-run disequilibria is the partial adjustment model. An extension of this is the ECM, which also incorporates past period's disequilibria. The analysis of short-run dynamics is often done by first eliminating trends in the variables, usually by differencing. This procedure however throws away potential valuable information about long-run relationships about which economic theories have a lot to say. Hence the theory of co-integration addresses this issue on integrated short-run dynamics with long-run equilibria.

Engle and Granger two-stage test for co-integration in single equation is different from a VAR models. It assumes a predetermined one-way relationship between variables. i.e., it assumes only

one co integrating vectors which indicates only one equilibrium relationship in general, it has no systematic procedure for a separate estimation of multiple co integrating vectors. Moreover Engle and Granger procedure uses a two steps estimator: the error induced in first step directly used for the second step,

Johansen procedure: His maximum likelihood estimation can help us considering relax assumption of one co integrating vector and avoids the use of two-step estimation. Co integration relation ship is tested using VECM and it avoids arbitrary selection of dependent and independent variable. It is a multivariate generalization of DF test for the unrestricted VAR model with K lags (Harris and Johansen). Unlike a single equation using Engle and Granger procedure, For instance, under the two equations system of VAR there are three possibilities: the two series are not co integrated if the two roots λ_1 and λ_2 are both equal to one (that is non stationary), the series are co integrated if one root is unity, and the third possibility is that the series are stationary (neither integrated nor co integrated) if neither of the roots is unity.

Equation (12) contains information of both short run and long run adjustment to changes in Z_t through Π and Γ_i . The rank of Π denoted by p , which determine the number of co-integrating vectors. If p is zero, no stationary linear combination can be identified and hence the variables in Z are not co integrated. If p has full rank, Equal to the number of variable in the regression, the variables are stationary in levels.

If some linear combinations of Z_t are stationary, that is there is some co integrating relationships among the variables in Z_t , then the matrix Π should have a rank $p < n$. Also this Π matrix can be decomposed and written as **long run matrix** $\Pi = CB'$. Where C and B are $n \times p$ matrices. After normalization can be interpreted as long –run parameter, the rows of B' are the p distinct co integrating vectors. In the case where there are $(n-p)$ unit roots and p co integrating vectors, there exist p long run stationary relationships between the variables in Z_t . In general, B -matrix designating the long run coefficient of p distinct co-integrating vector that makes the linear combination $B'Z_t$ stationary, even if Z_t is non-stationary, while the C -matrix represents the coefficient of speed of adjustment to the disequilibria (Harris 1995). In co integrating analysis matrix B gives the co integrating vectors, Matrix c in the decomposition of the Π ($\Pi = CB'$) gives the speed of adjustment of particular variables with respect to a disturbance in the equilibrium relation. The matrix C is called the **adjustment matrix** or **feedback matrix**. The number of co-integrating vector is identified

based on λ_{trace} : λ_{Trace} statistics = $-T \sum_{i=r+1}^n \ln(1-\lambda_i)$ and λ_{Max} statistics = $-T \ln(1-\lambda_{r+1})$. Trace (A) or trace Π

is $\sum_{i=1}^n \lambda_i + \lambda_{i+1} + \dots + \lambda_n$

Where λ_i is the estimated value of the characteristics roots and T is the number of observations. The null hypothesis under λ_{Trace} is that the number of distinct co integrating vector is less than or equal to r against the general alternative, while λ_{max} tests the null hypothesis that there are r co integrating vectors against the alternative of r+1 and λ_{max} is a more powerful test than λ_{trace} (Enders, 1995).

- **Test for the number of co integrating vector for DC**

The VAR system of equations is estimated over the period 1990 first quarter and 2005 second quarter using variables: domestic credit, net foreign assets, consumer price index, real effective exchange rate, real gross domestic product, and fiscal gap. Determining the element of deterministic components: AoDt and ΨDt is an important issue in VAR analysis results (including diagnostic tests) depend on whether constant and/or trends are existed in VAR and VECM (A.Badawi, 2004). Accordingly the study follows Doornik and Hendry that state equation (10) is estimated by restricting the trend to enter co-integrating space while equation (11) with constant & without a linear trend because existence of linear trend in difference series come from the quadratic trend in level, unusual in Macro time series.

On top of this, determination of the lag length 4 is decided on the basis of general to specific procedure for favorable diagnostic tests: to the best approximation for auto correlation process in our series. Having specified VAR model we need to test for co-integration using statistical hypothesis: $\text{rank}(\Pi) \leq p$, and report both lambda-max test and trace statistics presented below.

Table 4.2 Co integration analysis and testing for co integration rank r

$H_0: p \leq$	Eigen value	λ_{trace} Stat. TSum log (.)	95%	λ_{Max} Stat. - Tlog (1- λ_{r+1})	95%
$P \leq 0$	0.65796	156.2** [0.000]	114.9	62.22**	44.0
$P \leq 1$	0.500356	94.01* [0.018]	87.3	40.24*	37.5
$P \leq 2$	0.327553	53.76 [0.265]	63.0	23.02	31.5
$P \leq 3$	0.214529	30.75 [0.464]	42.4	14.01	25.5
$P \leq 4$	0.176613	16.74 [0.445]	25.3	11.27	19.0
$P \leq 5$	0.090028	5.472 [0.539]	12.3	5.472	12.3

* Indicates Statistical Significance at 5% and ** at 1%, if any. The test is done using PC GIVE and PCFMIL.

Diagnostic Test:

Vector portmanteau 7 lags= 234.5

Vector AR 1-4 F (144, 25) = 1.288 [0.2339]

Vector normality $\chi^2(12)= 62.183 [0.0000]$ **

Vector hetero test: $\chi^2(546)= 541.77 [0.5431]$

The results indicate that there are two co-integrating vectors in the system as both statistics report on respective magnitudes greater than critical values at 1% and 5%. Regarding to diagnostic tests, there is no problem of auto correlation and heteroscedasticity, but it indicates vector normality problems. However econometrics theory states that the existence of normality problem does not affect and distort the estimators' BLUE and consistency property, because the main purpose of normality tests is for testing hypothesis about the population parameter using confidence interval (Enders, 1995). Therefore the in-existence of vector normality in our model doesn't affect the coefficients and t-values. If the sample size gets larger and larger, we can easily remove the normality problem & the distribution approaches normal.

The existence of two co-integrating vectors implies that there is two long run relations/equilibrium points in the system, which can be directly added into the short run equation after netting out the exogeneity problem (Badawi, 2004 and Doornik and Hendry, 2001).

- **Unrestricted Long Run Elasticities and Loading Coefficient**

Once rank of long run matrix identified, which is $P=2$, we obtain the two co integrating vectors as the first two row of the Eigen vector, β matrix (long run coefficient) and the first two column of the α matrix (speed of adjustment matrix). But, to have unique co-integration relations, we remove the trend from the first co- integrating vector and β_{2t} from the second co-integrating vectors in Π matrix (Doornik & Hendry, 2001 and A.Badawi, 2004). The co- integrating space is now just identified Note that the restricted variables are $\beta_{11}=1$, $\beta_{17}=0$, $\beta_{21}=0$, $\beta_{22}=1$ in β 's matrix. Therefore the unique co-integrating vector β 's and α 's results are reported below.

Unrestricted variables: [0] = Constant, Restricted variables:[0] = Trend Number of lags used in the analysis: 4, Linear co integration restrictions: $\beta_{12}=1$; $\beta_{18}=0$; $\beta_{19}=0$; $\beta_{20}=1$;

Table 4.3 Unrestricted standardized Eigenvectors β'

	LDC	LNFA	LCPI	LREER	LGDP	LFg	Trend.....
β'_1	1.0	0.0217	0.325	0.287	-1.411	-0.3045	0.000
	(res.)	(1.20)	(1.65)	(2.54)	(-7.42)	(-5.35)	(res.)
β'_2	0.0	1.0	-5.067	1.745	3.765	1.700	-0.104
	(res.)	(res.)	(-4.04)	(4.83)	(2.64)	(9.09)	(-6.25)

t-value presented in the parentheses. β'_s shows long run elasticities as they are in logarithms form.

Table 4.3 present us the unrestricted model, the two row of the Eigen vector of β matrix (long run coefficient) in long run matrix $\Pi=CB'$ are the basic determinants of broad money supply namely domestic credit and net foreign assets and can be explained by other aforementioned macro variables..

Table 4.4 Unrestricted standardized adjustment coefficient α

	α_1	α_2
LDC	0.0066 (1.72)	-0.0047 (-1.23)
LNFA	0.4897 (1.68)	0.0509 (1.58)
LCPI	0.1170 (2.41)	0.0432 (2.86)
LREER	-1.1307 (-3.53)	-0.1570 (-2.08)
LGDP	-0.3924 (-2.69)	-0.0772 (-2.75)
LFg	-0.5886 (0.32)	-1.4327 (-3.10)

Regarding to α matrix, there are two column, of which our interest is the first column of the (speed of adjustment matrix) in long run matrix $\Pi=CB'$ in unrestricted model characterized by dominant long run feed back effect from those variables whose coefficients are relatively higher: LREER, LFg, LNFA, LCPI, LGDP and LDC in descending order with very lower statistically insignificant of LFg.

- **Test for Long Run Weak Exogeneity**

The values of adjustment coefficients with their respective t value give some information about weak exogeneity to domestic credit vector. Taking both adjustment coefficients and t-value in to account simultaneously, we suspect that LFg would surely be exogenous to LDC due to its very low t-value. But, the formal test whether there is weak exogeneity or not, can be conducted using likelihood ratios χ^2 and to identify endogenous and exogenous variables in the model.

Table 4.5 Tests for Long-Run Weak Exogeneity

(H0: Variables is exogenous to domestic credit vector)

Variables	Chi ²	F-probability	Decision over H ₀	Inference
LNFA	1.6772	[0.0195]**	Rejection	Not Exogenous
LCPI	3.8446	[0.0499]**	Rejection	Not Exogenous
LREER	7.9688	[0.0048]**	Rejection	Not Exogenous
LGDP	8.6526	[0.0033]**	Rejection	Not Exogenous
LFDD	0.62678	[0.4285]	Acceptance	Exogenous

Associated likelihood ratios, which the report indicates that only LFg is weakly exogenous to the domestic credit vector while others rejected the null hypothesis that states variable is exogenous. This implies that fiscal gap is exogenous to the domestic credit vector.

- **Restricted long-Run Elasticities and Loading Coefficients**

Using information about weak exogeneity of LFg and preserving the rank of 2, the VAR system putting restriction on α 's of LFg equal to zero. This is very important to netting out the adjustment coefficient of LFg due to its exogenous nature to the domestic credit, LDC. And the compare the result of unrestricted and restricted models (A.Badawi, 2004). Results of restricted model reported below

Table 4.5 Restricted standardized Eigenvectors β'

	LDC	LNFA	LCPI	LREER	LGDP	LFg	Trend.....
β'_1	1.0	-0.3507	1.520	0.0012	-1.360	-0.246	0.0000
	(res.)	(-9.72)	(1.83)	(-0.0048)	(-2.36)	(-1.81)	(res.)
β'_2	0.0	1.0	-3.880	1.143	1.246	0.518	-0.037
	(res.)	(res.)	(-2.9)	(2.89)	(5.63)	(2.31)	(-5.28)

Table 4.6 Restricted standardized adjustment coefficient α

	α_1	α_2
LDC	0.02072 (1.78)	0.01714 (-1.93)
LNFA	0.45895 (1.65)	0.11133 (1.61)
LCPI	0.15795 (2.95)	0.13353 (3.57)
LREER	-1.1043 (-3.92)	-0.16206 (-3.35)
LGDP	-0.33726 (-3.02)	-0.16206 (-2.79)
LFDD	0.000000 (res.)	0.000000(res.)

Diagnostic Test:

Vector Portmanteau (7): 225.379

Vector Normality test: $\chi^2(12) = 84.463$ [0.0000]**

Vector hetero test: $\chi^2(1050) = 1066.4$ [0.3552]

Comparing results of restricted from unrestricted models, the magnitude of β_1 for LNFA, LCPI, LREER & LFg have changed significantly, with no change in respective signs except LNFA. These relations indicate that the exogeneity of LFg is great importance for relation b/n LDC and LNFA, LCPS, LREER. But LGDP remains to be significant in explaining long run LDC in both restricted & unrestricted models. This suggests that all variables are expected signs as the central bank follows a mixture of both stabilization and accommodates policy. Both LNFA and LGDP have significant long run relation with positive effect. LREER is completely statistically insignificant to explain the long run relation with LDC.

As the National Bank of Ethiopia reacts to, $\alpha_1 (=0.02072)$ for LDC indicates that the speed of adjustment of feed back effects towards the long run equilibrium is 2.072 percent per quarter and 8.288 percent per annum. On this pace the adjustment towards long run equilibrium takes many years for full adjustment.

4.4 Vector Error Correction Model & Stability Test

- **Vector Error Correction Model**

As we know, determination of the coefficient of short-run dynamics is conducted by estimation of parsimonious VECM after the determination of long-run relationships. It is very important to specify how short run adjustment of macroeconomic variables is took place, and a fertile ground for policies analysis & implementation (Harris, 1995).

From table 4.5 we can derive the error correction terms lagged one period in order to analyze the short term dynamic. Thus, the two co-integrating vectors $\beta'1$ and $\beta'2$ are domestic credit and net foreign assets and can be defined in error correction term as follows: -

$$CIa = LDC -0.36 * LNFA +1.53 * LCPI +0.0013 * LREER -1.37* LGDP -0.25* LFg$$

$$CIb = (LNFA-0.038 * trend) -3.89* LCPI +1.14 * LREER +1.25 * LGDP +0.52 * LFg$$

There are two equations in the form two-error correction terms and contain restricted long-run stationary relation ship. Taking both lagged one period as explanatory variables in the system, we can produce the short-term dynamics, which consists of six equations of changes in LDC, LNFA, LFg, LREER, LGDP and LCPI.

Our interest is to know National Bank of Ethiopia reacts to macroeconomic shocks using domestic credit as monetary policy variable. So the equations as whole system can be estimated by unrestricted OLS, 2SLS, and FIML. The results are similar. Out of that equation our interest of LDC reported as below. The VECM in equation is estimated with three lags: (to have same formation, the lags could be t-k in equation (10) and t-k+1 in equation (11) as presented by Badawi, 2005 and Hendry 2001).

Table 4.7 SHORT-RUN DYNAMICS

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
DLDC_1	-0.106	0.204	-0.52	0.605	0.0077
DLDC_2	0.214	0.199	1.08	0.289	0.0321
DLDC_3	0.114	0.180	0.63	0.529	0.0114
Constant	0.076	0.723	0.10	0.916	0.0003
DLNFA_1	-0.044	0.042	-1.04	0.306	0.0300
DLNFA_2	-0.001	0.043	-0.01	0.995	0.0000
DLNFA_3	-0.013	0.033	-0.41	0.680	0.0049
DLCPI_1	0.361	0.237	1.52	0.137	0.0621
DLCPI_2	0.088	0.236	0.37	0.710	0.0040
DLCPI_3	0.136	0.218	0.62	0.534	0.0111
DLREER_1	-0.081	0.079	-1.02	0.313	0.0290
DLREER_2	0.043	0.078	0.54	0.586	0.0086
DLREER_3	0.020	0.065	0.31	0.754	0.0028
DLGDP_1	-0.001	0.097	-0.00	0.992	0.0000
DLGDP_2	0.020	0.077	0.27	0.788	0.0021
DLGDP_3	0.100	0.079	1.26	0.217	0.0432
DLFDD_1	0.005	0.010	0.54	0.589	0.0084
DLFDD_2	0.005	0.009	0.58	0.561	0.0098
DLFDD_3	0.004	0.008	0.51	0.613	0.0074
CIa_1	-0.003	0.116	-0.03	0.973	0.0000
CIb_1	-0.006	0.074	-0.08	0.930	0.0002

Sigma=0.0396673, RSS=0.055072405, R^2= 0.349386, F (20,35) = 0.9398 [0.547], Log-likelihood 114.424, DW=2.02, No. Of observations=56, no. Of parameters=21, mean (DLDC)=0.0283409 var (DLDC) 0.00151155.

Diagnostic Tests:

- AR 1-4 test: F (4,31) = 0.72290 [0.5829]
- ARCH 1-4 test: F (4,27) = 0.30387 [0.8728]
- Normality test: Chi^2(2) = 1.7534 [0.4162]
- Hetero test: Chi^2(40)= 33.833 [0.7431]
- RESET test: F (1,34) = 0.62931 [0.4331]

But we cannot take this model due to its statistically insignificant coefficient for the aforementioned all explanatory variables. In general and theoretically there are reasons why we cannot take the model as it is: statistically insignificant coefficient (small t value), the lack of meaningful relation, and the inexistence constancy of parameter or taking variable as exogenous in the system where it is endogenous (Doornik and Hendry, 2001). So, we have to follow general-to-specific modeling specification by deleting statistically insignificant regressors to obtain a parsimonious model (leaving from over parameterized equation) and check the validity of the model through tests (Doornik and Hendry, 2001).

Therefore let's set the lag length at eight (over parameterized equation) and follow the general-to-specific procedure to the most parsimonious dynamic LDC equation considering t-value and other criteria. Finally it yields the following parsimonious short run dynamics of monetary variable, LDC. (Please see annex six that states the short run dynamics for the system as a whole following general to specific procedure of LDC).

Table 4.8 Modeling DLDC by OLS (using monetary data.xls)

Parsimonious-dynamic-LDC-equation

	Coefficient	Std.Error	t-value	t-prob	Part.R ²
DLDC_2	0.2348	0.137	1.71	0.095	0.0663
DLDC_5	0.3908	0.139	2.80	0.008	0.1607
DLNFA_1	-0.0452	0.024	-1.86	0.127	0.0560
DLCPI_1	0.4107	0.166	2.47	0.018	0.1292
LREER_1	-0.0941	0.046	-2.03	0.048	0.0917
DLGDP_5	-0.1692	0.045	-3.73	0.001	0.2538
DLFDD_5	-0.0050	0.003	-1.69	0.240	0.0335
CIa_1	-0.1512	0.066	-2.28	0.028	0.1126
CIb_1	-0.0649	0.032	-2.01	0.051	0.0894
Constant	U 0.7028	0.329	2.13	0.039	0.0997

Sigma = 0.0342166, RSS=0.048001793, R²=0.428059, Log-likelihood: 107.897, -T/2log|Omegal
181.681776, No. Of observations: 52, no. Of parameters=11, Mean (DLDC) 0.02777, Var
(DLDC)= 0.001614, Sigma = 0.0342166, DW = 1.88

Diagnostic Tests:

AR 1-4 test: $F(4,37) = 0.35190 [0.8410]$
ARCH 1-4 test: $F(4,33) = 0.71613 [0.5869]$
Normality test: $\chi^2(2) = 0.16248 [0.9220]$
Hetero test: $F(20,20) = 0.79611 [0.6925]$
RESET test: $F(1,40) = 2.1383 [0.1515]$

In the short run dynamics equation, real effective exchange rate, and consumer price index are statistically significant at lag one. On top of this, both domestic credit and GDP are statistically significant at lag five. However only DLDC-5 and DLCPI-1 have positive short-term effect on domestic credit while others placed on negative effect. For your surprise, both error correction terms are statistically significant with negative short-term effect on DC. It means that the coefficient is $C1a-1$ and $C1b-1$ indicates the speed of adjustment towards the long run equilibrium or relation for equation LDC and DLNFA respectively.

In equation of DLDC the coefficient of DLNFA is equal negative 0.0452, while in equation of DLNFA the coefficient of DLDC is negative 0.29 (see annex seven that states the single equation of LNFA up on general to specific procedure) is that it is closer to zero. The coefficient's signs for DLCPI-1 is positive while DLNFA-1, DLREER-1 and DLGDP-5 reported with a negative sign. DLFg is statistically insignificant to explain the variation or change in LDC. Moreover ECM reported with correct sign and statistically significant.

Finally, regarding to diagnostic tests, there is no autocorrelation and heteroscedasticity problem among residuals. On top this, the normality condition is satisfied and RESET test also depicted that there is no model specification problem in the system. (Note that variables at specified lags are included in the model to maintain the best of diagnostic tests as reported and very important for evaluation of monetary policy objectives against theory).

- **Stability tests**

The intuition behind stability test is to check the monetary policy reaction function stability and predictability for policy analysis in responding to macroeconomics shocks. To test the stability of parameter, the study conducted the *recursive least square graphic test* which can overcome the limitation of *chow test* (it does not indicate the source of instability whether from the intercept or the coefficient up on dividing the sample in to two group). The recursive method uses by increasing the

sub-sample size and then estimate the parameters continuous until the total sample data is completed. So finally plot the paths of the estimates overtime. In recursive plots, there are two standard errors band around the selected coefficients. As the sample size increase and significant variation occurs within the bands, then the coefficient is stable over the entire period and indicates the constancy of the variance of the estimated model. Therefore up on this theory, the recursive graphs that plot 1-step ahead residuals, break point chow tests and 1-step ahead chow-test for the LDC and other variables in the system reported graphically below. Hence the graphs presented below suggest that the model is stable and can be used for prediction of monetary policy reaction function.

When you mark the 1-step residuals entries in the PC-GIVE dialog window, the 1-errors lies within their approximate 95% confidence bands with constant standard errors reported that the time path of estimates plotted within errors band justify the stability of model and accept constancy of the parameters.

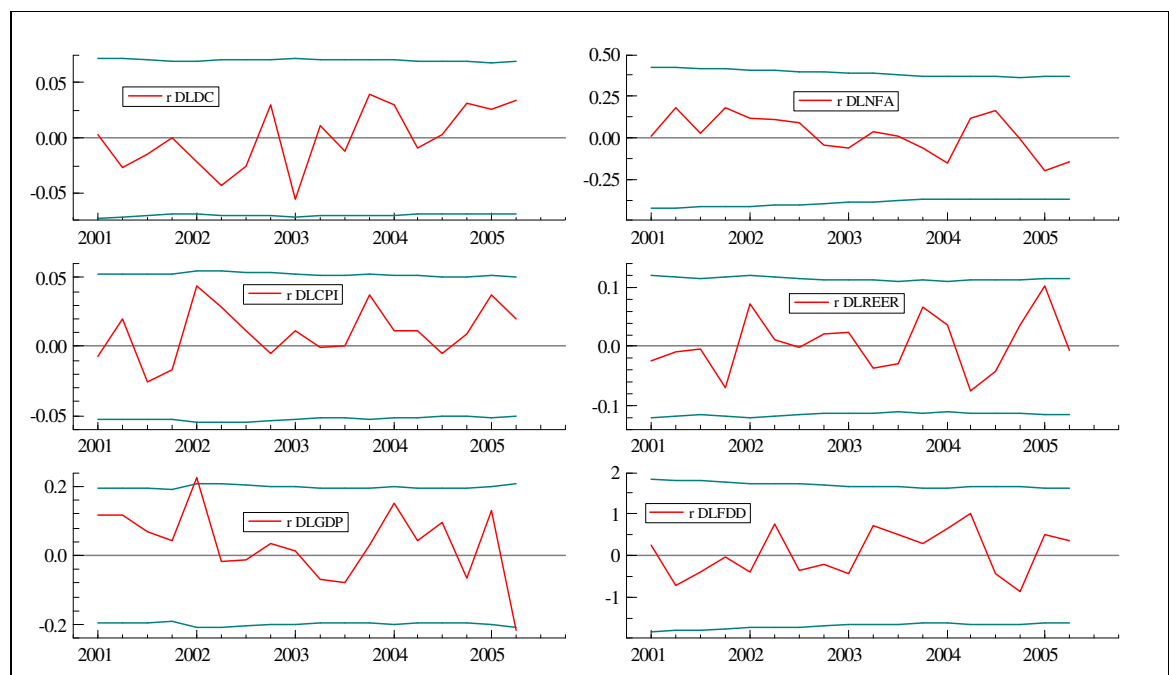


Chart 10: - Constancy Parameter statistics: 1-step ahead residuals

When we mark the break point chow tests with a 1% significance level, we have the following graphs indicate that there is no break-point chow test anywhere significant given the 1% line plotted on top of each of the graphs. The last plot is the overall system constancy test that justifies the model is stable.

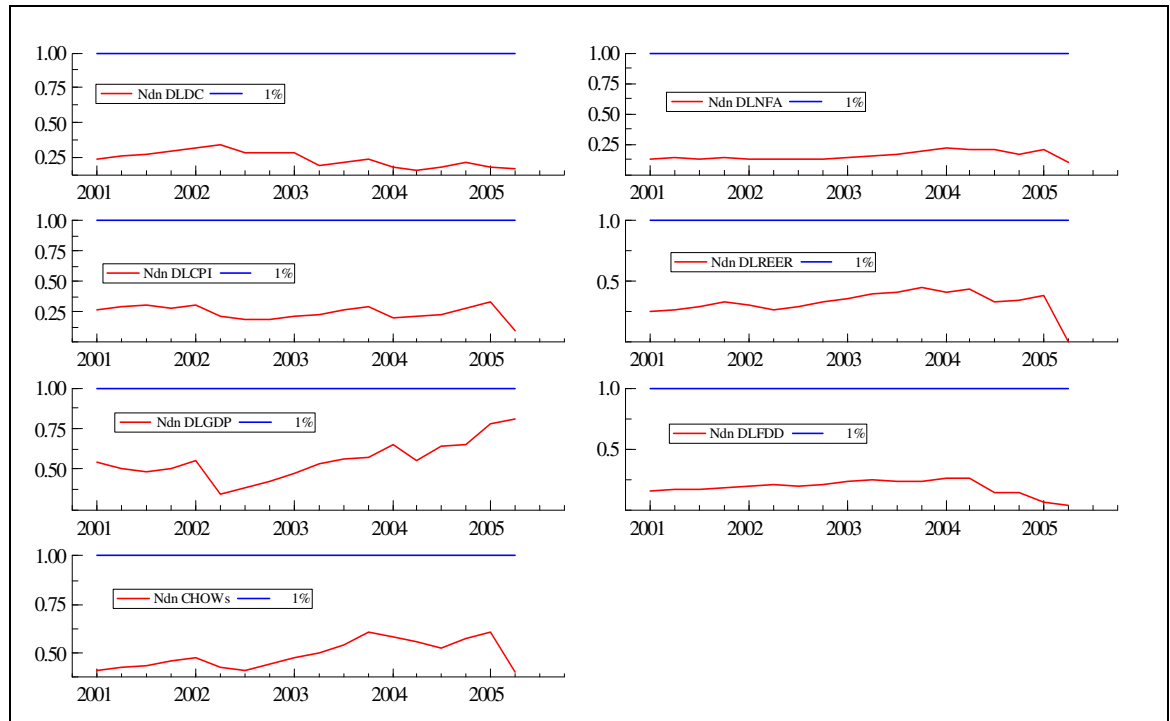


Chart 11: - Constancy Parameter statistics: Break point chow tests

- **Granger Causality Tests: - Interaction Between NFA and DC**

In short broad money supply basically consists of net foreign assets and domestic assets, and we know that the National Bank of Ethiopia needs to equalize the growth rate of money supply at the growth rate of GDP using considerable management of both determinants.

In addition, the monetary approach to the balance of payment states that the movement of net foreign assets (NFA) can be influenced by the domestic credit (DC) expansion. Their relation extended to determine the internal and external imbalance of the economy, but Killick (1990) gave reasons for reverse causality between NFA and NDCG. During a decrease in NFA before NDCG is cut, the crowding out effect of the government credit cut DCP and secondly the decrease in NFA leads to lower the reserve base (the summation of currency in circulation and Bank deposit in National Bank), which has effected on commercial banks' lending. But their lending is not as such responsive to reserve base due to the already existing excess reserve above the requirement.

Following both variables are assumed to be stationary at first difference level and the errors terms entering the causality test are uncorrelated, the Granger causality test of net foreign assets and domestic credit up on quarterly periods of 1990/91-2004/05 can be presented below depending on the number of lagged terms

Table 4.9 Granger causality test

Null Hypothesis:	Lag	F-Statistic	Probability	Decision
NFA does not Granger Cause DC	2	5.38887	0.00729	Reject
DC does not Granger Cause NFA	2	1.46674	0.23956	Accept
NFA does not Granger Cause DC	1	4.19365	0.04511	Reject
DC does not Granger Cause NFA	1	0.14983	0.70012	Accept

As noted above, at lag length one and two, only unilateral feed back effect direction from net foreign assets to domestic credit. It implies that National Bank of Ethiopia can control the availability domestic credit to react macroeconomic shocks given net foreign assets that causes domestic credit and it is consistent with our model.

4.5 Interpretation of the Results

Up on the results presented above, we can now interpret both long run and short run dynamic analysis. This empirical discussion summarized the response of National Bank of Ethiopia to macroeconomic shocks.

Since the exogeneity nature of fiscal gap (LFg), Domestic credit has positive long run effect to net foreign assets and gross domestic product while it has very low elasticity to the real effective exchange. This implies that the Bank took action using domestic credit on the basis of net foreign assets, as both are the determinants of money supply. In turn both are needed to be changed at the same growth rate of GDP. But monetary policy of domestic credit plays insignificant long run role to enhance the international position of the country in competition with the rest of the world, because the major determinants of international position of Ethiopia are the very nature of developing countries like backward technology, poor quality products, structural problem, instability and so on.

Regarding to consumer price index, the policy variable had loose elasticity to the change in CPI in the long run reviewed period, which implies that inflation happened not only from the monetary effect but also from aggregate supply shortage evidenced by positive correlation between drought & war with inflation in the country. Due to the consequence of the coffee export booming and the substantial increment in credit expansion to the private sector, there was a significant change in the

growth of GDP during 1994/95 and followed lower inflation. It continues with fluctuations due to the EL Nino weather condition, and Ethio-Eritrea conflicts during 1997/98 and the drought occurred all over the country in 2001/02 negatively affect the growth rate GDP & brings higher upward change in consumer price index (World Bank paper for ESAF).

Regarding to fiscal gap, domestic credit has positive long run effect to fiscal gap if we take fiscal deficit as endogenous variable (but became weak effect when we treat it as exogenous variable for the system). This is also directly consistent to theories for the case of developing countries. In the absence of broad and active financial market the primary obligation of monetary authorities is to finance the government deficit. Under such circumstance monetary growth primarily depends on fiscal policy (Joseph P. Joyce, 1991).

Even though the National Bank does not have full control over it, net foreign assets have positive long run relation with LCPI and trend while it has negative relation with LREER, LGDP and LFG (similar out put done by Haile Kibret, 2001 in the study of BOP and policy). On top this all-explanatory variables are statistically significant and LNFA has strong relation with them: that is why national bank articulates policies using domestic credit on the condition of status of net foreign assets as both are the determinants of money supply to set the rate at GDP growth rate.

Restricted standardized adjustment coefficient, $\alpha_1=0.02072$ tells us that the speed of adjustment or feed back effects towards the long run equilibrium is 2.072 percent per quarter when there is macroeconomic shock in the system, which is very weak took 8.288 percent per annum. In general it took many years for full adjustment. This is a rationale for the longer lags structure and undeveloped financial sectors resulted in obstacles for the effectiveness of monetary policies, and disable its ability to govern macroeconomic shocks within short period. It is obviously noted that one of the efficiency measurement criteria for monetary policy is the time taken for adjustment and the controllability of macro variables under central bank.

Bearing the long run dynamic analysis in mind, we can interpret the short run empirical outcomes for policy prescription from table 4.9. Both domestic credit and GDP have positive and negative short run impacts respectively, and are statistically significant at lag five indicating monetary policy variable, DLDC responded after a year when both were changed, and the growth rate of money supply set at the growth rate of annual nominal GDP. However DLNFA is a loose significant & negative short run impact indicating that variations in LDC were not much more explained by a change in LNFA in short run period, and also DLFG could not explain the change in DLDC. Both

error correction terms are statistically significant with negative short-term impacts on DLDC, which is consistent with the two co integrating vectors. It means that the coefficient is CIa-1 and CIb-1 indicate the speed and direction to correct equilibrium errors towards the long run relation are 15.12% and 6.49% per quarter where there is a shock in the short run dynamics implying that inconsistent with the long run dynamic analysis.

In equation of DLDC, the coefficient of DLNFA is known as sterilization coefficient, which measures how much change in the net foreign assets deriving from the interventions in the exchange rate market is sterilized by the monetary authority. In general it is an indicator of the degree of sterilization of net foreign assets. The coefficient ranges from zero to minus one. If it is negative one, the sterilization is complete; while it is greater than one, the degree of sterilization is less than full (Olcay Yucel, Almila Karasoy and Kursat, 2000). Therefore from table 4.8, the coefficient of -0.0452 tells us incomplete sterilization activities done by National bank.

In equation of DLNFA (see annex seven) the coefficient of DLDC is known as the offset coefficient, which gives the amount of capital outflow per domestic currency of expansion of domestic credit. It closes to -1 if domestic and foreign assets are close substitutes indicating a higher degree of capital mobility and a low degree of control over the money stock. If it closes to zero, a higher degree of monetary control and a low degree of capital mobility are available (Olcay Yucel, Almila Karasoy and Kursat, 2000). Accordingly the coefficient of model under investigation 0.29 is that it is closer to zero even though its t-value is statistically insignificant. Therefore the National bank of Ethiopia adopted a higher degree of monetary control with a low degree of capital mobility in practices.

Comparing the result against the theories, the coefficients' signs for DLNFA-1 and DLCPI-1 indicate that NBE follows *accommodating monetary policy* while DLREER-1, DLGDP-5 and DLFDD-5 reported like where there is strict *stabilization monetary policy* is exercised. In general the N.BE conducted a mixed pattern of coefficient value indicating a combination of both policies was followed.

Chapter Five: Conclusion and Recommendation

5.1 Conclusion

The EPDRF government came in to power in 1991 and introduced market-oriented economy with so many adjustment and stabilization programs of World Bank and IMF. These include improving external imbalance, liberalizing trade and financial sectors, and to remove fiscal and real sectors constraints. Our interest, monetary policy of the reform period has been played as stabilization the whole macroeconomic system particularly maintaining price stability and achieving international targets in the review period. This could be conducted using indirect monetary policy instruments like removing discriminatory interest rate among sectors, treasury bill market as a stepping stone for open market operations, remove restriction on deposit and lending interest rate floors through time. More over, comparing from the Derge regime, the monetary policy shifts towards the objective of reducing monetization of budget deficits in order to lower inflation.

Along with the policy adopted, the National Bank of Ethiopia reacts to macroeconomic shocks by specifying its monetary policy reaction function that might be needed to make the broad money supply growth rate at the rate of nominal GDP. To make proper responses to macroeconomic shocks of policy & non-policy shocks or foreign & domestic shocks, and to maintain its monetary policy objectives, the bank attempts to consider the monetary growth rate as determined by domestic credit and net foreign assets, the extent of monetization towards fiscal deficits, the movement of consumer price index, and the position of Ethiopia in world market using real effective exchange rate. Such determinants of monetary policy claims the National Bank to adjust its operating and instruments targets to new information mostly using quarterly and annual frequency in the sense that to create a link between short term and longer horizon monetary objectives.

Therefore as identifying the proper monetary policy indicator prior to reaction function specification, the domestic credit assets (monetary policy indicator) have strong long run and positive relation with net foreign assets and real GDP. But it has short-run relation with the change in domestic credit & real GDP at lag five, and with the change in both CPI & REER at lag one. Besides that the equilibrating error terms derived from both LDC and LNFA in the long run have strong negative relation with LDC in the short run. Eventually, the result justifies

that National Bank of Ethiopia follows a combination of both accommodating and stabilizing policies in the review period.

In conclusion the Bank can strongly meet the objectives of reducing the monetization of budget deficits and the effort of setting the monetary growth rate at the growth rate of nominal GDP as the empirical results reported in the table. In addition, the objective of stabilizing the price level and achieving the international reserve target can strongly be satisfied in the short- and long run period respectively. (Note that this explanation doesn't mean that objectives in other horizon were not be maintained, Rather they were not strongly managed by national bank like the aforementioned variables). The longer the speed of adjustment and correcting the errors, the longer lags structure and undeveloped financial sectors which manifested the poor effectiveness of monetary policies as evidenced by the efficiency measurement criteria for monetary policy.

5.2 Policy Implication

As the NBE specifies its monetary policy reaction function using domestic credit as policy indicator, the policy implication of the empirical result tells us that the net foreign assets (international reserves), inflation, real effective exchange rate and real GDP should be considered in conducting & analyzing monetary policy. Accordingly, the bank should also pay attention to part of the broad money determinants, net foreign assets to respond macroeconomic shocks, and more emphasis should be continued to the objective of price stability and achieving international reserve target. In addition the effort to reduce deficit monetization has been successfully satisfied in short & long run in the review period to control inflationary condition in the country. The low long run adjustment coefficient 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. Therefore the following policy implications are suggested.

- The effectiveness of monetary policy including the controllability of National Bank over macro variables depends on the demand pattern of the economy, which is activated by performance of investment. Thus, the government should conduct policies that improve structural bottleneck in the real sectors. These enable the commercial banks to extend credits (short term and long term) to private sectors and minimize their over-liquid cash position. In effect, the National Bank will have an access to grant loans for these banks, when they are in shortage of liquidity and control the money supply using the interest rate.

- Therefore the monetary authority have to made investigation and pursue policies that enable commercial banks to utilize their over-liquid assets and need credit from National Bank, In effect the discount window faculty will be activated
- National Bank has to continue to pursue policies of reducing budget deficits monetization to control inflation rate where there is monetary implication of inflation.
- But, as we have seen in restricted long-run model, the domestic credit does not have significant elasticity and relation with consumer price index in the long run indicating that NBE controlled inflation only to some extent due to the non-monetary nature. However the bank controlled consumer price index in the short run. Therefore the government should pay attention for policies that improve aggregate supply bottleneck then after monetary policy, domestic credit, might have long run relation with and controlled consumed price index.
- Even though developing treasury bill market were taken to lay ground for open market operation through auctioning to the public and financial institutions, it was delayed to move out to a full fledged open market operation even at the end of fifteen years after liberalization. Hence the monetary authority has to make the transition period short with establishing economically and institutionally strong financial and privates sectors.

Finally, The econometric outcome of estimating such a function be rationalized not only from the point of economical analysis, but also we have to consider it in the view of institutional strength. So policies that improve financial infrastructure should be drawn. For instance deepening the financial sector liberalization to enhance competition in the banking sector, and financial sector allow transparency and public confidence in the financial system, strengthening supervision of the financial institutions, widening the geographic coverage monetization, and maintain the autonomy of the bank

Annex Six: - Short run dynamics for the System As a whole

(Up on general to specific procedure for DLDC)

Short Run Dynamics For the System As A whole						
Explanatory	DLDC	DLNFA	DLCPI	DLREER	DLGDP	DLFG
DLDC-2	0.234[1.71]	0.480[-1.66]	0.019[0.18]	0.204[-0.90]	0.198[-0.04]	1.954[-.59]
DLDC-5	0.390[2.80]	0.276[-0.37]	0.082[-0.79]	0.031[0.13]	0.523[1.22]	3.240[0.97]
DLNFA-1	0.045[-1.56]	0.180[1.16]	0.007[-0.34]	0.015[-0.31]	0.070[-0.79]	1.738[2.53]
DLCPI-1	0.410[2.47]	0.150[0.16]	0.414[3.35]	0.020[0.07]	0.865[1.72]	2.324[0.58]
DLCPI-5	0.169[1.01]	0.695[0.78]	0.334[-2.73]	0.084[1.11]	1.366[2.73]	5.692[-1.45]
DLREER-1	0.094[-2.03]	0.397[1.69]	0.0012[0.03]	0.024[0.31]	0.038[-0.27]	3.502[3.19]
DLGDP-5	0.169[-3.73]	0.210[0.868]	0.090[-2.68]	0.084[1.121]	0.419[3.02]	5.007[-4.66]
DLFG-5	0.005[-1.19]	0.043[1.67]	0.002[-0.80]	0.012[1.52]	0.019[1.34]	0.087[-0.760]
Cia-1	0.151[-2.28]	0.312[0.88]	0.057[1.18]	0.084[-0.76]	1.135[5.59]	5.612[-3.57]
Cib-1	0.064[-2.01]	0.088[0.51]	0.045[1.88]	0.046[-0.86]	0.612[6.17]	4.281[-5.58]
Constant	0.702[2.13]	1.010[-0.57]	0.418[-1.71]	0.476[0.86]	6.210[-6.14]	40.712[5.21]
F test	3.069[0.005]	1.103[0.38]	3.59	1.02	1.3	8.9
Log-Likelihood	107.897	20.6899	123.37	81.1343	49.6431	-56.7478
Tlog/Omega (-)	181.681	164.2654	197.155	154.9191	123.42	17.036
Sigma	0.034	0.183	0.025	0.057	0.1048	0.8115
RSS	0.048	1.373	0.026	0.134	0.4511	27.003
R ²	0.428	0.211	0.567	0.218	0.7631	0.6888
Mean	0.027	0.047	0.008	-0.0018	0.0142	0.0101
Var	0.001	0.033	0.0011	0.003	0.036	1.665
DW	1.888	2.05	1.97	1.99	2.07	2.35

System Diagnostic Test

Log-likelihood=339.208601,-T/2log|Omega|=781.917424,|Omega|=8.69235791e-014,Log|Y'Y/T|=-25.8814

R²(LR)=0.984888, R²(LM) = 0.426652, No. Of observations = 52, No. Of parameters = 66

DLDC: AR 1-4 test: F(4,37) = 0.35190 [0.8410]

DLCPI: AR 1-4 test: F(4,37) = 0.85732 [0.4985]

DLDC: Normality test: Chi²(2) = 0.16248 [0.9220]

DLCPI: Normality test: Chi²(2) = 0.90522 [0.6360]

DLGDP :Normality test: Chi²(2) = 1.0902 [0.5798]

DLDC:ARCH 1-4 test: F(4,33) = 0.71613 [0.5869]

DLCPI: ARCH 1-4 test: F(4,33) = 0.70140 [0.5966]

DLGDP:ARCH 1-4 test: F(4,33) = 0.059327 [0.9932]

DLDC: hetero test: F(20,20) = 0.79611 [0.6925]

DLCPI: hetero test: F(20,20) = 0.27590 [0.9971]

DLGDP: hetero test: F(20,20) = 0.57098 [0.8906]

DLNFA : AR 1-4 test: F(4,37) = 0.86157 [0.4960]

DLFDD: AR 1-4 test: F(4,37) = 0.23366 [0.9176]

DLNFA: Normality test: Chi²(2) = 26.076 [0.0000]**

DLREER: Normality test: Chi²(2) = 2.4208 [0.2981]

DLFDD: Normality test: Chi²(2) = 1.8089 [0.4048]

DLNFA: ARCH 1-4 test: F(4,33) = 0.25144 [0.9067]

DLREER: ARCH 1-4 test: F(4,33) = 0.76777 [0.5539]

DLFDD: ARCH 1-4 test: F(4,33) = 0.31532 [0.8657]

DLNFA: hetero test: F(20,20) = 0.92522 [0.5681]

DLREER: hetero test: F(20,20) = 0.72123 [0.7643]

DLFDD: hetero test: F(20,20) = 0.67828 [0.8036]

Vector Portmanteau (6): 203.356

Vector AR 1-4 test: F(144,78)= 1.2544 [0.1348]

Vector Normality test: Chi²(12)= 36.598 [0.0003]**

Vector hetero test: F(420,66)= 0.22312 [1.0000]

Annex Seven: - Short run dynamics for the DLNFA

(Up on general to Specific procedure for a single equation)

Modeling DLNFA by OLS (using MONETARY DATA.xls)

	Coefficient	Std.Error	t-value	t-prob	Part.R ²
DLDC_5	0.29	0.13	2.15	0.037	0.0992
Constant	0.40	0.30	1.30	0.200	0.0388
DLNFA_4	-0.05	0.02	-2.19	0.034	0.1028
DLCPI_1	0.38	0.16	2.41	0.021	0.1212
DLCPI_5	0.32	0.17	1.89	0.066	0.0781
DLREER_1	-0.06	0.03	-1.77	0.084	0.0694
DLGDP_3	0.11	0.03	3.20	0.003	0.1962
DLFDD_2	-0.004	0.004	-1.10	0.276	0.0282
CIa_1	-0.08	0.06	-1.45	0.155	0.0476
CIb_1	-0.03	0.03	-1.17	0.249	0.0315

Sigma= 0.0343824

RSS= 0.0496502832

R² = 0.408418

F (9,42) = 3.222 [0.015]

Log-likelihood = 107.019

DW = 2.02

No. Of observations= 52

No. Of parameters=10

Mean (DLDC)=0.0277731

var (DLDC) =0.001614

AR 1-4 test: F (4,38) = 1.2102 [0.3225]

ARCH 1-4 test: F (4,34) = 0.43727 [0.7807]

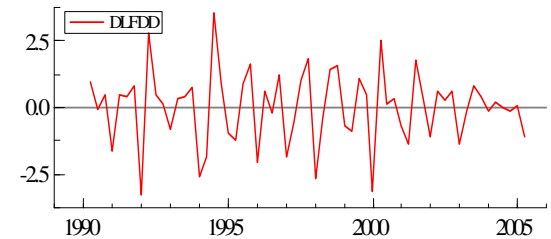
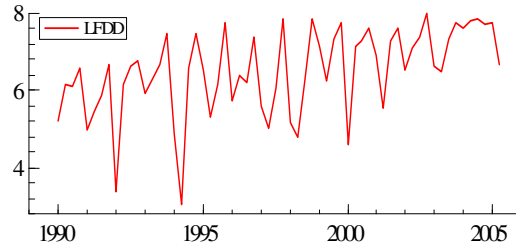
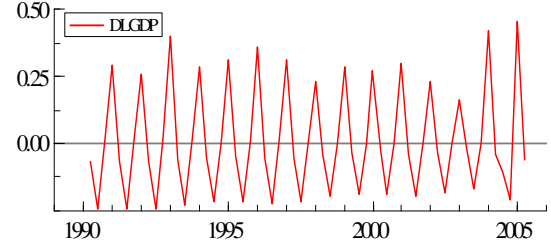
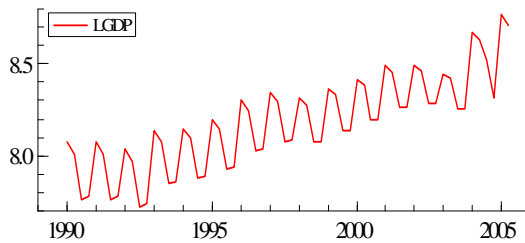
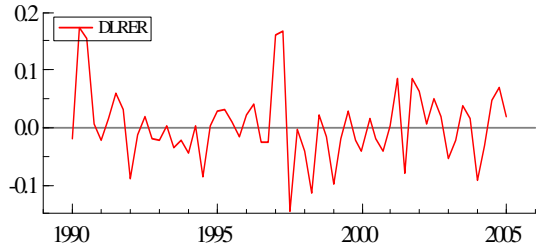
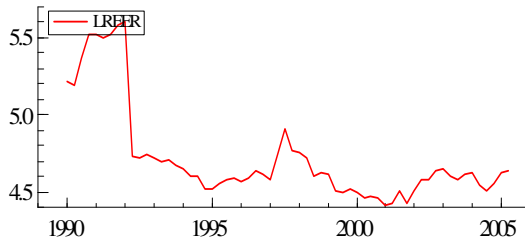
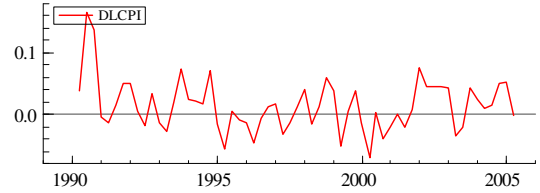
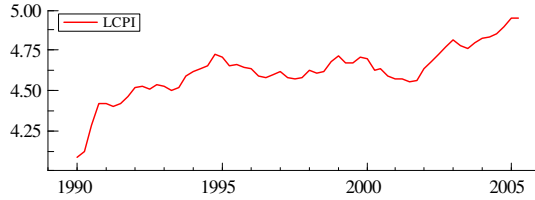
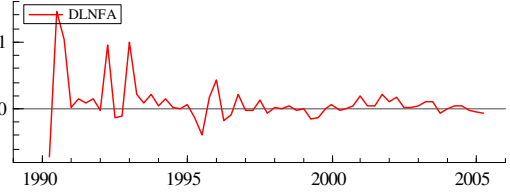
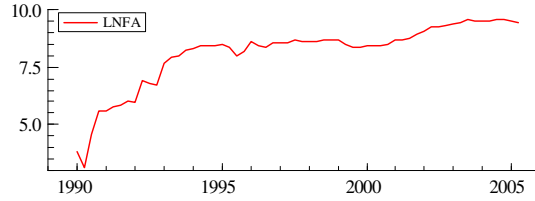
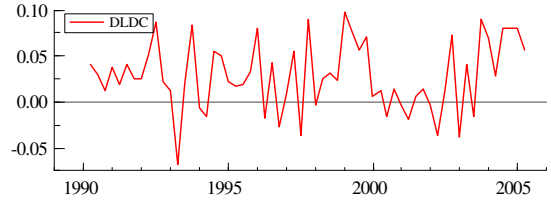
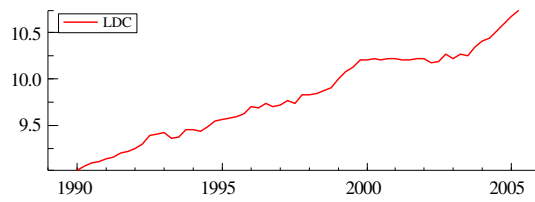
Normality test: Chi²(2) = 0.26310 [0.8767]

Hetero test: F (18,23) = 0.44293 [0.9589]

Not enough observations for hetero-X test

RESET test: F (1,41) = 1.3021 [0.2604]

Annex Three:-Stationary Test Using Graphic Presentation



Annex Four: -Generation of quarterly GDP from Annual GDP

(Directly Taken from Haile Kibret-NBE paper of “BOP and monetary policy”)

Ethiopian GDP is highly affected by seasonality of agricultural harvest. This is mainly due to the fact that agriculture is rain fed. The structure of agriculture harvest is divided in to main harvest, which account about 95% of the total agriculture GDP, and the belg harvest that accounts for the balance. According to information obtained from CSA, any thing harvested between September & January is classified as main harvest; And the rest are belg harvested. More over, a survey by CSA has also suggested that about 80 % of agricultural GDP are cereals.

Studying the behavior of quarterly contribution of the Agricultural sector to the total GDP is computed based on the amount of labour exerted to each activity in the production of cereals for which date is available. The data and the computed coefficient are presented below:

Labour requirement for different activities for selected cereals (in man-days)

	Barely	Wheat	Teff	Maize	Sorghum	Average	Cash
1 st ploughing	4	4	5	7	5	5	0.075
2 nd ploughing	4	4	5	7	5	5	0.075
3 rd ploughing	3	3	5	3	-	3	0.045
Planting, sowing covering	4	4	6	8	4	5	0.075
1 st weeding	15	11	22	20	24	18	0.268
2 nd weeding	-	-	-	24	7	6	0.089
Harvesting	13	18	18	9	9	13	0.194
Threshing, Widowing(shelling)	7	10	17	19	9	12	0.179
Total	50	54	78	88	63	67	1.00

Source: - CSA, Development Bank of Ethiopia, and ministry of Agriculture

The allocation of each economy to each activities and the derivation of the coefficients are performed as follows. These coefficients give the quarterly weight of agriculture output. July, August & Sep (Q1) = Sowing and first weeding; Oct, Nov, Dec (Q2) = 2nd weeding & harvesting; Jan, Feb, Mar (Q3) = threshing; April, May, Jun (Q4) = ploughing (1st, 2nd, 3rd). For each quarter the coefficient are: $Q_1 = 0.075 + 0.268 = 0.343$, $Q_2 = 0.089 + 0.194 = 0.283$, $Q_3 = 0.179$, $Q_4 = 0.075 + 0.075 + 0.045 = 0.195$. Since the belg season (small rain season) is very small, about 5% relative to the main season, it is ignored.

Regarding to services_Sectors (as represented by the distribution sub- sector), the quarterly seasonal adjustment coefficients are calculated for the distributive sub-service sector based

on loan disbursement from the banking system. The distributive sub-sector includes trade, hotels & restaurants & transportation & communication. The distributive sub-sectors accounts for about 75 % of the total service sector's GDP. It is also believed that the distributive sub-service sectors activity uses bank credit in the form of OD facility & term loans, the time series quarterly disbursement of bank loan to the distributive service sector is available from NBE bulletin & data. For other service, however, the annual data is equally divided in to the 4th quarter because this sub- sector is beloved to be less seasonal sensitivity. The average quarterly disbursed as well as the corresponding ratios are provided in the following table:

Average Quarterly disbursement for distribution service & computed coefficients.

Distribution Service	Q1	Ratio	Q ₁	R	Q ₁	R	Q ₁	R
Domestic Trade	458.00	0.164	3351.5	0.377	2705.3	0.304	1368.6	0.154
International trade	791.40	0.184	1006.4	0.234	1476.2	0.344	1019.8	0.237
Hotels & Restaurants	300.20	0.258	314.70	0.271	247.40	0.212	299.8	0.257
Transportation & Comm.	459.10	0.198	598.60	0.258	566.40	0.244	693.1	0.299
Average Ratio		0.201		0.285		0.276		0.237
Other service		0.25		0.25		0.25		0.25

Source: Various issue of NBE

N.B:-other service: - inclusive banking, industries, administration, defense, justices, Educ, health & like.

Regarding to industrial Sector, the coefficient for seasonality of industry in the total GDP are computed from quarterly production data compiled by MEDaC on twenty eight manufacturing public enterprises which data is available since fiscal year 1993 the coefficient are,

	Total	Ratio
Q ₁	1162178	0.217
Q ₂	1385103	0.259
Q ₃	1412160	0.265
Q ₄	1388841	0.259
Total	5348282	1.00

After getting the coefficient of agriculture, industry and service sector, for each Q, we multiply the annual GDP by each coefficient to get quarterly sectoral value & then add them to generate the quarterly annual GDP.

Annex Five: -How NBE generate real effective exchange rate

(Calculated data taken from National Bank of Ethiopia: Economic Research Department)

REER is the index is computed by taking quarterly data on wholesale price index & exchange rate of 19 major trading partners (Belgium, Kenya, Italy, France, Germany, Us, Uk, S.Arabia, nether land, south Korea, Sweden, Japan, India. are selected by their weight of import plus expire to total hade of Eth and accounted 80% of total trade jointly) & applying weighted trade index to the base yeane of 1995 which seem to be normal in that there was no war/ drought in the country.

$$NEER = \sum_{j=1}^n W_{ji} \cdot E_{ji}$$

Where W_{ji} is trade weight of country J at time I
 E_{ji} is nominal exchange rate defined as domestic currency per a unit of foreign currency

$$REER = \sum_{j=1}^n W_{ji} \cdot E_{ji} \cdot (P_i/p_i)$$

Where n= Number of partners
 P^*_i = Wholesale price index of partner countries
 P_i =Consumer price index of Ethiopia

Annex one: - Summary of Major Reforms and Measures after Financial Liberalizations

Strategies and Measures	Timing of implementation
* Birr was devalued by 141.6% to correct over-valuation Of currency and promote exports	October 1990
* New interest rate structure was introduced resulting in Positive real interest rate	October 1992
* Domestic credit expansion particularly to Public sector Restrained	October 1992
* Banking law and regulations revised to increase bank Autonomy and permit of private domestic bank and Insurance business	Since Jan.1994
* Market entry for privately owned financial institutions Was eased.	Since Jan.1994
* Treasury bill auction was introduced	Jan.1995
* Positive real rate of interest maintained	October 1992
* NBE began setting only minimum deposit and Maximum lending rates	Since Jan.1995
* Structural reforms were made in the monetary And financial sector and NBEs capacity for supervision And prudential regulation of banks strengthened	Since 1994
* New maturates and denominations for T-bills were Introduced and modalities were improved. In other words 28,day and 182 day bills were introduced and the Minimum denomination of bills reduced to Birr 50,000 From Birr100, 000.	Dec.1996
* Previous 25% cover requirement for forex auction was Removed and replaced by 2% bid bond.	October -96
* Frequency of T-bills auction increased from monthly to Fortnightly basis.	Aug-96
* Law and regulations are designed for the establishment Of small scale and micro financing institutions	October 1996
* Minimum deposit rate was set at 6% and Maximum Lending rate was liberalized	Jan.1995
* Required reserve ratio for CBE reduced from 8% to 5 %	Feb.1997
* Restriction on payment for invisible are largely related	Since Feb.1997
* A Legal framework is created to establish inter-bank Market through the issuance of interest rate Directive No.NBE/INT/7/98	1998
* T-bills cut of pries on individual bid was revised up Wards from 5 to 7 percent for 28 days, 7.5 percent for 91 days and 8 percent for 182 day bills to allow bid days To bid above the floor deposit rate of banks.	Aug-98
* Currency Union with Eritrea was terminated and All transactions to be effected in foreign currency.	Dec.1997
* Code of conduct for over-the counter whole sale Money market enacted	Sep.1998
* Exchange control Mechanisms for the use and Acceptance of credit cards enacted	Jun-98
* The Minimum paid-up capital required to establish A bank raised to Birr 75 Million	Jun-99
* The procedures for inter-bank money market introduced	Sep.1998
* Inter-bank foreign exchange market introduced	Sep.1998

* Growth in inflation rate has successfully been Put under control	Since 1996
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Annex two: - Reformation of External Sector policies related to Banking Services

Strategies and Measures	Timing of implementation
* Forex auction system first introduced to determine Exchange rate applicable to the most transactions	May-93
* Issuing procedures for export and import licenses Were streamlined	January.1993
* Discriminatory credit and foreign trade treatment Of private sector eliminated	1993
* The number of items in the forex auction negative List has been reduced	1993
* Provision of foreign exchange to licensed import Through action has continued	Since May 1993
* Availability of foreign exchange for business Travelers has been increased and tax clearance Requirement eliminated	1994
* The auction market and official exchange rates Were unified	July-95
* Procedures for the retention and utilization of export Earning and inward remittances was streamlined	October.1996
* Forex Bureaux are allowed to operate with in Commercial banks	September.1996
* Commercial Banks are allowed to freely buy and Sell forex on behalf of three clients and for eligible transaction	October.1996
* The NBE's foreign exchange functions are Transferred to commercial banks	August-98

Source:-NBE of various issues and Policy Framework Paper of different years

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