

ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

**CAN THE MONTARY AUTHORITY CONTROLE THE STOCK OF
MONEY SUPPLY IN ETHIOPIA: AN EMPERICAL INVESTIGATION**

BY: GASHAW DESALEGN

JUNE 2014

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**A project submitted to the School of Graduate Studies of Addis Ababa University in
Partial fulfillment of the requirement for the Degree in Masters of Art in Applied
Economic Modeling and Forecasting**

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This is to certify that the paper prepared by Gashaw Desalegn entitled: Can the Monetary Authority Control the Stock of Money Supply in Ethiopia An Empirical Investigation, and submitted in partial fulfillment of the requirement of the Degree of Masters of Art in Applied Economic Modeling and Forecasting complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

BY: GASHAW DESALEGN

Approved by

Signature

Tadele Ferede (Phd)

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JUNE 2014

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DECLARATION

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

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Abstract

CAN THE MONTARY AUTHORITY CONTROLE THE STOCK OF MONEY SUPPLY IN ETHIOPIA: AN EMPERICAL INVESTIGATION

Gashaw Desalegn

Addis Ababa University, 2014

The aim of this paper is to investigate empirically the ability of Nation Bank of Ethiopia to control the stock of money supply. This investigation seems to conform to the ongoing controversy surrounding the exogeneity /endogeneity hypothesis regarding the money supply i.e. the controllability/non-controllability of the money supply by the Central Bank. The paper has first tested the money multiplier model which says money is exogenous and thus controllable by central banks. We examine the constancy and Stationarity of the money multiplier and the results suggest that the money multiplier remains non stationary for the entire sample period. We then tested cointegration between money supply and monetary base and find the evidence of cointegration between two variables. The coefficient restrictions are satisfied only partially. The result from this model shows it will be difficult to use the money multiplier model as a frame work for monetary policy.

The paper attempted to test the post-Keynesian hypothesis of endogenous money for Ethiopia using Granger Causality test. We have found that at all level of lag lengths credit causes broad money but at higher lag length broad money do not cause credit in the sample period. Though the result seems gloomy the endogeneity of money supply is strong.

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Oh friends! Abu my annoying friend! It is always my pleasure to confess about your intelligence and loving heart thank God you are my friend. Eyu it is you who understand not what I am thinking but what I am felling! and you are like a big brother and father nonetheless I am older than you.

I owe more than I can say to my family, Addis (my all thing in this and coming world), Aster, Bezusew, Wesen, Abi, Misho Andnet, Serawit, Misker, and Emeru this is the man you have created and molded in his personality and you are my true Support and family regardless of those things happened.

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1 SECTION: Background

1.1 Introduction

Changes in the stock of money deserve to be carefully watched and controlled, because such changes exert a powerful influence on changes in money income, prices, output, employment, distribution of income and wealth, balance of payments, etc. Therefore, if the monetary authority has definite policy objectives with respect to these variables, it cannot afford to be unconcerned about changes in the stock of money (Haghighat, 2010).

Money supply represents the stock of money at a certain point of time. It is obtained by summing up financial assets that can perform functions of money such as medium of exchange and store of value. Money supply process explains the creation of such a money stock in the economy. Understanding of money supply process is necessary for effective conduct of monetary policy to attain its prescribed goals. An analysis of money supply will give us a clear picture of money generating process, particularly the degree of control by the central bank, which is important for monetary management (Shrestha, 2011)

These days, few economists would disagree with the statement that inflation is a monetary phenomenon in the long run. Indeed, this statement is one of the central tenets of economic theory. The long-run relationship between money and prices has been confirmed by a number of empirical studies, both across countries and across time. Moreover, the ability to implement monetary policy ultimately hinges on a central bank's monopoly control over the creation of base money. Given the fundamental money-prices relationship and their monopoly power over the legal tender, the monetary authorities have a natural interest in monetary developments. At a more practical level, monetary data are collected in a timely manner and are more accurate than many other economic indicators. All these factors explain why money plays a prominent role in monetary policy-making and thus why the monetary analysis undertaken at central banks is both necessary and important (Issing, 2001).

The control of money supply is an important policy tool in conducting monetary policy within the monetary targeting framework. The success of monetary policy critically depends on the degree of controllability that the monetary authority has over money supply. The implicit assumption is that the central banks can determine the growth of money supply (Islam, 2008).

There are two main approaches to the determination of money supply. The money base approach (Friedman and Schwartz, 1963; Brunner and Meltzer, 1964) and the portfolio approach (Goodhart, 1989). However, there is no consensus over the issue of the stability of money multiplier and the controllability of the monetary base. The proponent of the money base approach argued that the variation in money multiplier depends on currency in circulation, demand deposits, time deposits and bank reserves. Variations in these factors may dominate in money stock in the short-run and become stable and predictable over the long-run (Brunner, 1997). Non-monetarist has pointed out that the determinants of money multiplier such as ratios of currency to demand deposits, demand to time deposits and bank reserve to total deposits are determined by portfolio behavior of the agents and are sensitive to changes in relative rates of return, risk, innovations in the financial markets, income and preferences of the market participants. With the increasing role of market forces in the financial transactions and continuous improvements in asset-liability management, there is very little reason to believe on the stability of money multiplier and the controllability of the monetary base by the monetary authorities (Goodhart, 1989). In recent Post Keynesian literatures this issues are labeled as an endogenous and exogenous money supply.

The issue of endogeneity or exogeneity of money is one that runs through the history of monetary theory, with prominent authors appearing to hold views on either side. Exogeneity theory has its roots from the classical economists. Brunner (1968) formally developed a multiplier model that explains the control of money supply via high powered money by the Central Bank. Friedman (1989) has proposed a constant money supply growth is the result of exogeneity proposition. However many economists challenged the exogeneity proposition and monetary targeting by the Central Bank. Tobin (1971) and Kaldor (1982) argued that where the public and the commercial banks manipulate the money supply through their control over the excess reserves and the public through changing their preferences between time and demand deposits can affect the money multiplier and in turn the money supply.

On the other hand, post-Keynesians believe that money supply is completely endogenous. Instead of the unidirectional causality that run from money supply to aggregate spending until equilibrium between the demand and supply of money is restored through income and interest rate adjustments, the post-Keynesians advocate a reverse unidirectional causality which run from

aggregate spending to the money supply. Kaldor (1982), Moore (1988), and (Rogers, 1989) argue that the Quantity Theory of Money in which the money supply is exogenous is consistent with barter economy, but is not compatible with modern credit economy. (Moor, 1988) and (Wary, 1992b) believe that central banks in a modern economy do not control money supply and their role is to accommodate any given demand for loans.

Narrowly put, those who plug for the exogeneity view take one or all among the cluster of variables-price level, interest and or real output as being determined by movement in the stock of money. Those who hold endogeneity view consider that the stock of money in circulation is determined by one or all of the variables mentioned above. (Chigbu et al, 2013).

In Ethiopia among the objectives of monetary policy include maintenance of price and exchange rate stability, ensuring soundness of financial institutions and facilitating economic growth. To achieve that, for the last years money supply(M2) has been targeted to grow in line with the expected or planned growth of nominal GDP.

Monetary policy targeting could then be formulated in terms of a real growth target plus a CPI or a core-CPI target. In developed economies there is no real growth target but a target for minimizing deviations from natural output. In a country like Ethiopia, a growth target can be defended: monetary conditions do matter for growth in a country with excess labor resources and an under-developed financial market (www.National Bank of Ethiopia.org) .

In achieving these objectives, the National Bank of Ethiopia (NBE) sets money supply as an intermediate target. It should be noted that intermediate targets are not directly controlled by the central bank. The operational target is an economic variable that the central bank wants to influence, largely on a day-to-day basis, through its monetary policy instruments. They can be used to link instruments of monetary policy to intermediate targets set by the central bank and represent the first impulse in the transmission process of monetary policy. The growth of base money/reserve money is being used as operational target of the National Bank of Ethiopia. Reserve money (Base money) is defined as the sum of currency in circulation and deposits of commercial banks at NBE (www.National Bank of Ethiopia.org).

1.2 Statement of the problem

The recent history of Ethiopia provides abundant evidence on the role played by the monetary factors in the macro economy. It can demonstrate that changes in the money supply exert profound influence on inflation, output growth and other financial activities.

Post Keynesians holds the position that money is endogenously or demand determined. The sequence of credit creation works the following way, as prices of factor inputs increase (or households cannot finance their current spending with their income), demand for credit increases. Banks supply the credit demanded at the interest rate they choose to offer on loans. This interest rate is determined by a mark-up over the central bank lending rate (base rate) and costs of other sources of financing. In this sense, banks are price-makers and quantity-takers. So, rather than deposits leading to new lending as in the money multiplier model, it is the loans that create bank deposits, as newly created money is used for purchasing of goods. In other words, banks first lend, and then look for reserves. So credit-creation is independent of savings, and debt matters! In essence, new credit will subsequently create the observed savings, not vice versa.

According to this view, the creation of money is demand determined hence The Central Bank is unable to control the volume of money stock in the economy. A framework of money supply endogeneity rules out monetarism as a policy. However, to understand financial development one needs to go beyond interest rate-money stock space.

This view is, however, in sharp contrast with the high-powered base, “multiplier” model of the money supply, originally developed by Brunner and Meltzer (1961, 1964) which has become the standard paradigm in macroeconomic and money and banking textbooks. The process whereby an injection of funds into a fractional-reserve banking system results in an expansion of the money supply by a multiple of the original injection is a familiar staple of economic analysis.

When an autonomous deposit is made, the bank reserves a portion and loans out the rest. When the loan funds are spent, at least a portion gets deposited in the banking system to generate additional loan funds. When loans from those funds are executed, another round of deposits is created and generates a further round of loans ad infinitum.

Given the manifest importance of the issue, it is perhaps surprising that there is little empirical evidence on endogeneity. Such evidence comes mainly from the U.S and Europe. The standard Granger causality tests have been used to establish the core of the endogeneity thesis, namely that loans cause deposits (Palley, 1994). Some have extended the search to the countries of G7 (Howells and Hussein, 1998). Research in this area on developing countries, however, seems to be lacking at best.

Though there is no such works on Ethiopia at the knowledge of the researcher, this work wants to extend the search for evidence of the loan-to-money causality even further by applying it to Ethiopia, using Granger causality tests to verify the endogeneity thesis; and to test the stability of the money multiplier in the simple money multiplier model. Hence Stability of the money multiplier is a necessary condition for exogeneity thesis and controllability of the base money (B) for the effective control of monetary stock (M) by the monetary authority is a sufficient condition.

1.3 Objectives of the study

General objective:

To investigate empirically weather the monetary authorities in Ethiopia have the ability to control the stock of money supply.

Specific objectives:

- To test the endogeneity or exogeneity of money supply
- To test for the stationarity of money multiplier in Ethiopia.
- To determine the long run relationship between money supply (M) and monetary base (B) and
- To provide recommendation on controllability of money supply according to the results.

1.4 Significance of the study

The result of the study could be used as an indicator for the current monetary policy stances whether it is on the right track to achieve its national as well as organization goal of National Bank of Ethiopia such as GDP growth, price and exchange rate stability etc. Since there is no

attempt before in case of Ethiopia it may initiate others to do further research on the issues raised.

1.5 Methodology of the study

The study employed both descriptive and econometric method particularly cointegration. To check the Stationarity of the money multiplier we used unit root test we also employed a co integration techniques to check the co movement of the money supply and base money¹. To test the endogeneity thesis we used the Granger causality test. Data is obtained from National Bank of Ethiopia annual bulletin. The data range is from January 1993 to March 2014.

1.6 Organization of the paper

The paper contains six chapters. The second chapter deals with the review of theoretical and empirical literature. Chapter three presents the financial sector of Ethiopia or the money supply process in Ethiopia at a glance. The fourth chapter deals with the methodology of the study. Chapter five presents analysis (result of the study) and the last chapter presents the conclusion and recommendation of the study on the result of the study.

¹ Base money/high powered money/ reserve money is used interchangeably. They have the same meaning.

2. SECTION : LITERATURE REVIEW

2.1 Theoretical Review

Is money exogenous or endogenous?

The issue of endogeneity or exogeneity of money is one that runs through the history of monetary theory, with prominent authors appearing to hold views on either side. Exogeneity theory that has its roots from the classical economists, Brunner (1968) formally developed a multiplier model that explains the control of money supply via high powered money by the Central Bank. Friedman (1989) has proposed a constant money supply growth is the result of exogeneity proposition. However many economists challenged the exogeneity proposition and monetary targeting by the Central Bank e.g. are Tobin (1971) and Kaldor (1982) argued that where the public and the commercial banks manipulates the money supply through their control over the excess reserves and the public through changing their preferences between time and demand deposits can affect the money multiplier and in turn the money supply.

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Narrowly put, those who plug for the exogeneity view take one or all among the cluster of variables-price level, interest and or real output as being determined by movement in the stock of money. Those who hold endogeneity view consider that the stock of money in circulation is determined by one or all of the variables mentioned above. (Chigbu et al, 2013). For better understanding of each hypothesis we present the details in the next section.

2.1.1 Exogenous money

In a broad sense, exogeneity of a variable simply indicates that its value is taken by theorists as given. But, the exogeneity of money supply may indicate one of three different meanings.

First, exogenous money is defined in terms of controllability by monetary authorities. In this sense, money is exogenous if money can be manipulated by the monetary authorities. Usually, exogeneity of money is used in this regard to indicate that monetary authorities have control over the quantity of money through their control of commercial banks reserves (Wary L. R., 1990a).

Second, in a theoretical sense money supply is considered exogenous if changes in money supply cause the changes in the endogenous variables such as, the price level, interest rate, and real output not the other way around (Wary, 1992b). In this respect, one should distinguish between strong and weak exogeneity. Strong exogeneity of money supply refers to the case where there is no feedback from endogenous variables to money supply. Weak exogeneity, on the other hand, allows feedback from endogenous variables to money supply (Hendry, Engle, and Richard, 1983). When the central bank sets its targets based on the values of the endogenous variables, money supply is weakly exogenous. On the other hand, if the monetary authorities set their ultimate targets irrespective from endogenous variables, money supply is strongly exogenous.

Third, money supply is exogenous in the statistical sense if error terms from the estimated equations are independent from unobserved independent variables. The exogeneity of money in the second and third senses which are identified as theoretical and statistical definitions of exogeneity of money supply are not satisfied in the real world even if the central bank has control over the quantity of money. Therefore, the exogeneity of money refers in most cases to controllability of money supply by the monetary authorities (Wary, 1992b). Exogenous money supply implies that base money supply is determined by the Central Bank, and credit money follows base money through the process of the money multiplier. Further, according to exogenous money, savings are the source of lending, therefore a shortage of savings leads to a decrease in lending.

Control of the Monetary Base (Mishkin, 2004)

The monetary base (also called high-powered money) equals currency in circulation(C) plus the total reserves in banking system(R).

The monetary base (MB) can be expressed as

$$MB = C + R$$

Open Market Operations:

The CB exercises control over the monetary base through its purchases or sale of government securities in the open market, called open market operations, and through its extension of discount loans to banks.

The primary way in which the CB causes changes in the monetary base is through its open market operations. A purchase of bonds by the CB is called an open market purchase, and a sale of bonds by the CB is called an open market sale.

The effect of an open market purchase on reserves depends on whether the seller of the bonds keeps the proceeds from the sale in currency or in deposits. If the proceeds are kept in currency, the open market purchase has no effect on reserves; if the proceeds are kept as deposits, reserves increase by the amount of the open market purchase.

The effect of an open market purchase on the monetary base, however, is always the same (the monetary base increases by the amount of the purchase) whether the seller of the bonds keeps the proceeds in deposits or in currency. The impact of an open market purchase on reserves is much more uncertain than its impact on the monetary base.

The effect of Open market sale is to reduce monetary base, if the buyer buys the bond by cash in exchange, the central bank collects its liability (currency in circulation) although reserve remains unchanged. If instead the buyer is a bank or the buyer pays for the bonds with a check written on a checkable deposit account at a local bank lead to the same reduction in the monetary base, although the reduction occurs because the level of reserves has gone down.

The following conclusion can be drawn from our analysis of open market purchases and sales: The effect of OMO on the monetary base is much more certain than the effect on reserves. Therefore, the central bank can control the monetary base with OMO more effectively than it can control reserves.

Open market operations can also be done in other assets besides government bonds and have the same effects on the monetary base we have described here. One example of this is a foreign exchange intervention by the Central bank.

Even if the Central bank does not conduct open market operations, a shift from deposits to currency will affect the reserves in the banking system. However, such a shift will have no effect on the monetary base, another reason why the Central bank has more control over the monetary base than over reserves.

Discount Rate (Bank Rate):

The discount rate is the rate of interest that Central Bank charges commercial banks for credit. Changes in the discount rate affect 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 money supply. Conversely, a fall in discount loans reduces the monetary base and shrinks money supply.

Deriving the money multiplier

By assuming that the desired level of currency C and excess reserves ER grows proportionally with checkable deposits D ; in other words, we assume that the ratios of these items to checkable deposits are constants in equilibrium:

It is now time to derive a formula that describes how the currency ratio desired by depositors, the excess reserves ratio desired by banks; and the required reserve ratio set by the Central Bank affect the multiplier m . We begin the derivation of the model of the money supply with the equation

$$R = RR + ER \dots\dots\dots (1)$$

Equation 9 states that the total amount of reserves in the banking system R equals the sum of required reserves RR and excess reserves ER .

The total amount of required reserves equals the required reserve ratio rD times the amount of checkable deposits D :

$$RR = rD \times D \dots\dots\dots (2)$$

Substituting $rD \times D$ for RR in the first equation yields an equation that links reserves in the banking system to the amount of checkable deposits and excess reserves they can support:

$$R = (rD \times D) + ER \dots\dots\dots (3)$$

A key point here is that the Central Bank sets the required reserve ratio rD to be less than 1. Thus 1 birr of reserves can support more than 1 birr of deposits, and the multiple expansions of deposits can occur.

Because the monetary base MB equals currency C plus reserves R , we can generate an equation that links the amount of monetary base to the levels of checkable deposits and currency by adding currency to both sides of the equation:

$$MB = R + C = (rD \times D) + ER + C \dots\dots\dots (4)$$

Another way of thinking about this equation is to recognize that it reveals the amount of the monetary base that is needed to support the existing amounts of checkable deposits, currency, and excess reserves.

An important feature of this equation is that an additional dollar of MB that arises from an additional dollar of currency does not support any additional deposits. This occurs because such an increase leads to an identical increase in the right-hand side of the equation with no change occurring in D . The currency component of MB does not lead to multiple deposit creation as the reserves component does. Put another way, an increase in the monetary base that goes into currency is not multiplied, whereas an increase that goes into supporting deposits is multiplied.

Another important feature of this equation is that an additional dollar of MB that goes into excess reserves ER does not support any additional deposits or currency. The reason for this is that when a bank decides to hold excess reserves, it does not make additional loans, so these excess reserves do not lead to the creation of deposits. Therefore, if the CB injects reserves into the banking system and they are held as excess reserves, there will be no effect on deposits or currency and hence no effect on the money supply. In other words, you can think of excess reserves as an idle component of reserves that are not being used to support any deposits (although they are important for bank liquidity management). This means that for a given level of reserves, a higher amount of excess reserves implies that the banking system in effect has fewer reserves to support deposits.

To derive the money multiplier formula in terms of the currency ratio $\{C/D\}$ and the excess reserves ratio $\{ER/D\}$, we rewrite the last equation, specifying C as $\{C/D\} \times D$ and ER as $\{ER/D\} \times D$:

$$MB = (rD \times D) + (\{ER/D\} \times D) + (\{C/D\} \times D) = (r + \{ER/D\} + \{C/D\}) \times D$$

We next divide both sides of the equation by the term inside the parentheses to get an expression linking checkable deposits D to the monetary base MB:

$$D = \frac{1}{r + \{ER/D\} + \{C/D\}} \times MB \dots \dots \dots (5)$$

Using the definition of the money supply as currency plus checkable deposits

($M = D + C$) and again specifying C as $\{C/D\} \times D$,

$$M = D + (\{C/D\} \times D) = (1 + \{C/D\}) \times D$$

Substituting in this equation the expression for D from Equation 13, we have

$$M = \frac{1 + \{C/D\}}{r + \{ER/D\} + \{C/D\}} \times MB \dots \dots \dots (6)$$

As you can see, the ratio that multiplies MB is the money multiplier that tells how much the money supply changes in response to a given change in the monetary base (high-powered money). The money multiplier m is thus

$$m = \frac{1 + \{C/D\}}{rD + \{ER/D\} + \{C/D\}} \dots\dots\dots (7)$$

It is a function of the currency ratio set by depositors $\{C/D\}$, the excess reserves ratio set by banks $\{ER/D\}$, and the required reserve ratio set by the Central bank rD

Factors that Determine the Money Multiplier

Changes in the Required Reserve Ratio rD

If the required reserve ratio on checkable deposits increases while all the other variables stay the same, the same level of reserves cannot support as large an amount of checkable deposits; more reserves are needed because required reserves for these checkable deposits have risen. The resulting deficiency in reserves then means that banks must contract their loans, causing a decline in deposits and hence in the money supply. The reduced money supply relative to the level of MB, which has remained unchanged, indicates that the money multiplier has declined as well. Another way to see this is to realize that when r is higher, less multiple expansions of checkable deposits occur. With less multiple deposit expansion, the money multiplier must fall.

The analysis just conducted can also be applied to the case in which the required reserve ratio falls. We can now state the following result: The money multiplier and the money supply are negatively related to the required reserve ratio rD .

Changes in the Currency Ratio $\{C/D\}$

Next, what happens to the money multiplier when depositor behavior causes $\{C/D\}$ to increase with all other variables unchanged? An increase in $\{C/D\}$ means that depositors are converting some of their checkable deposits into currency. As shown before; checkable deposits undergo multiple expansions while currency does not. Hence when checkable deposits are being converted into currency, there is a switch from a component of the money supply that undergoes

multiple expansions to one that does not. The overall level of multiple expansion declines, and so must the multiplier.

And this implies, money multiplier and the money supply are negatively related to the currency ratio $\{C/D\}$.

Changes in the Excess Reserves Ratio $\{ER/D\}$

When banks increase their holdings of excess reserves relative to checkable deposits, the banking system in effect has fewer reserves to support checkable deposits. This means that given the same level of MB banks will contract their loans, causing a decline in the level of checkable deposits and a decline in the money supply, and the money multiplier will fall.

The decline in money multiplier is small because in recent years the $\{ER/D\}$ ratio has been extremely small, so changes in it have only a small impact on the money multiplier. However, there have been times, particularly during the Great Depression, when this ratio was far higher, and its movements had a substantial effect on the money supply and the money multiplier. Thus our final result is still an important one: The money multiplier and the money supply are negatively related to the excess reserves ratio $\{ER/D\}$.

Implications of Exogenous Money

Broader measures of money must follow developments in high-powered money or the money multiplier must be greater than one by definition. Or in other words, base money cannot be greater than Broad money. Thus Central Bank must be able to control the volume of high powered money. Further, an increase in high powered money (through an increase in bank reserves for example) should increase lending and credit creation.

Some comments on exogeneity hypothesis

Though the hypotheses have the above implication, in reality and empirical studies has come with the opposite results to list some:

i. Several empirical studies have shown that broader measures of money do not follow the monetary base, rather the exact opposite holds:

The increase in high powered money occurs after the increase in broad money supply, and lags the business cycle.

ii. Following the expansionary monetary policies by Central Banks all over the world in the Post Credit Crunch period, money multiplier has been below one since 2009 and still falling! So monetary base is higher than the broad money supply.

iii. The attempt by Central Banks to control the money supply (in accordance with monetarist policy recommendations) had disastrous consequences during 1980s so central banks now implement inflation targeting through interest rate setting policy. Further, banks have accumulated significant amounts of reserves following the excessive money printing after the credit crunch, but lending remains very limited.

iv. The most critical implication, however, is the claim that the volume, or the change in debt does not matter in analyzing business cycles. This follows from treating money as any other commodity, assuming that to create loans, savings (or base money) should exist a priori, and finance lending. That is exactly why in all presentations of the money multiplier, the analysis starts with “an initial deposit” in a bank account, which are funds the household already had but had preferred to hold as cash until then.

2.1.2 Endogenous Money:

In essence, the sequence of credit creation works completely the opposite way. As prices of factor inputs increase (or households cannot finance their current spending with their income), demand for credit increases. Banks supply the credit demanded at the interest rate they choose to offer on loans. This interest rate is determined by a mark-up over the central bank lending rate (base rate) and costs of other sources of financing. In this sense, banks are price-makers and quantity-takers.

So, rather than deposits leading to new lending as in the money multiplier model, it is the loans that create bank deposits, as newly created money is used for purchasing of goods. In other words, banks first lend, and then look for reserves. So credit-creation is independent of savings,

and debt matters! In essence, new credit will subsequently create the observed savings, not vice versa.

Deposits are one way (in most cases the cheapest one) of obtaining these funds. Alternatively, banks can borrow from the Central Bank at the policy rate, or borrow from money markets (interbank borrowing). The Central Bank, as the lender of last resort, accommodates to the borrowing demands of banks, setting the cost of borrowing rather than its quantity. If the Central Bank refuses to lend to banks, money markets will collapse and a credit crunch will occur. Therefore, the Central Bank cannot control the money supply, but can affect the cost of credit through interest rate policy.

2.2 Empirical Literature

Though the money multiplier model is the most researched area in developed economies there are also reasonable numbers of studies in developing economies too.

There are a number of studies on the money multiplier hypothesis but much of the studies focus on the stability and predictability of money multiplier for policy and forecast purpose. For forecast purpose many studies employ a univariate time series method to investigate the money multiplier and some other uses both the above methods and compare the results and forecast accuracy of each method. For instance (HAFFER, 1984), (ARBY, 2000), (Chu1, 2006), and others use Cointegration time series method to study and forecast the components of money multiplier studies such as (Khan, 2010), (Kalaji, 2007.), (Rolle, 2000) used cointegration method to examine the link between the various monetary aggregates and the monetary base.

There are studies that has tested endogeneity hypothesis of post Keynesian hypothesis in developed economies of Europe and U.S and the result is almost to prove that money supply is endogeneous in contrast to main stream economists who believe that the montary base determine the money supply.

Though there are no many studies on developing economies there are few attempts and the result are somewhat mixed. There are some studies that rejects endogeneity hypothesis and accepts exogeneity hypothesis Luize.(2006)for Brazil, Naved et el(2006) for Pakistan, Khalid H. Alqudair (2002) for Saudi Arabia are some of the studies that have empirically support the mainstream economists of exogeneity hypothesis. J. Haghighat (2012) for Iran, Chigbuet el

(2013) for Nigeria, is some studies that have supported the endogeneity hypothesis in contrast to exogeneity hypothesis.

Even though the above mentioned studies have found a support of either hypothesis researchers have put some cases that are difficult to generalize either the exogeneity or endogeneity hypothesis (Greenidg, 2001).

3. SECTION: REVIEW OF ETHIOPIA MACROECONOMIC DEVELOPMENTS

Ethiopia has faced with macroeconomic imbalance, both internal and external during the 1970's and 1980's. The inappropriate policy of the then government and recurrent drought and civil war were the major reasons behind the sluggish economic performance and macro economic instability observed during the period. Real GDP growth averaged 1.5%, from 1974-1991, while the population grew by 2.9% per annum. The current account deficit deteriorated, while the stock of external debt amounted to SDR 6.4 billion, 127% of GDP by the end of 1990/91. Inflation, which on annual average basis had been held below 9% a year, jumped to 21% in 1990/91.

After the overthrow of the socialist regime in May 1991, the country was transformed to a market oriented economy. This was the time where Structural Adjustment Programs (SAP) was preached to be a stepping-stone to adjust macroeconomic imbalance and ensure sustainable economic growth. Hence the government has accepted and implemented the Structural Adjustment Programs (SAP) supported by IMF and World Bank since October 1992. According to this comprehensive economic reform program, a series of policy reform measures and deregulations have been made in view of correcting the distortions in the macro economy and fostering economic growth (Haile, 2002).

Policy measures were taken to improve the external sector imbalance, to liberalize trade and financial sector and remove fiscal and real sectors constraints. New monetary and banking law was promulgated in 1994, which was allowed private banks participation only for nationals. Following the proclamation eight private banks, twenty nine Micro financial Institutions and nine Insurance companies have emerged in parallel with the existing two public commercial banks, one specialized bank and government owned insurance company. Discrimination of interest rate between sectors is abandoned while differentiation is to be based on only maturity. Ceiling on lending interest rate is fully liberalized while the minimum deposit rate is still under control of the National Bank of Ethiopia. The major emphasis of interest rate policy has shifted into increasing saving mobilization, controlling inflation, maintaining positive real interest rate and increasing productive efficiency (PFP, 1998).

Another monetary policy shift is pursuing the objective of reducing monetization of budget deficit in order to lower inflation pressure. This is supposed to be achieved by depending non-inflationary sources of finance such as the non-bank public through the sale of T-bills and

external sources. In general those policy measures have been trusted to bring macroeconomic stability and to end the sluggish growth of the economy by improving the private sector participation (PFP, 1998).

The new monetary policy took net domestic assets and government credit as a major target to achieve the twine objectives of growth and price stability. Growth in money supply is aimed to be consistent with nominal GDP growth. And the control of money and credit is assumed to be achieved through direct control domestic credit to the government and open market type operation (OMO) (PFP, 1992). However, credit to the government is programmed to be replaced by indirect control method such as, OMO with public securities. Although the instrument OMO is not used in its standard sense, steps are taken to lay foundation by developing T-bills market which is operational biweekly with maturities of 28, 91, 180 days. Yet OMO type operations could not able to replace direct controls; and no other feasible indirect control substitute existed, mainly due to the under development of secondary markets. Efforts are made to facilitate the transition from direct monetary instrument to indirect ones and to develop financial markets; the introduction of Treasury bill Auction (OMO), interbank money market and discount window facility are some examples (Yemisrach, 2009)

During the year the year 1971 to 2013 broad money supply M2 has grown on average by 15.4 percent on annual base. It was 9 billion birr in 1992 reached 235.3 billion birr in 2013. Similarly the narrow money M1 has grown on average by 14.6 percent on annual bases. It was 6.9 billion birr in 1992 and it has reached 114.8 billion in the year 2013. O the other hand reserve money has grown by 14 percent between the years 1971 to 2013. (Weynshet, 2013)

Since 1998, interest rate structure is freely determined by the market force except minimum saving deposit rate. Commercial banks are free to pay depositors any rate they want above the minimum rate set by National Bank OF Ethiopia. As stated by monitory policy frame work of Ethiopia the major objective of the monetary policy of the National Bank of Ethiopia is to maintain price & exchange rate stability and support sustainable economic growth of Ethiopia.

In achieving these objectives the National Bank of Ethiopia set three targets: the final target, the intermediate target and the operating target. The maintain price and exchange rate stability and support sustainable economic growth are the final targets of monetary policy in Ethiopia and sets

money Supply as an intermediate target. The operational target is an economic variable that the central bank wants to influence, largely on a day-to-day basis, through its monetary policy instruments. They can be used to link instruments of monetary policy to intermediate targets set by the central bank and represent the first impulse in the transmission process of monetary policy. The growth of base money/reserve Money is being used as operational target of the National Bank of Ethiopia. Reserve money (Base money) is defined as the sum of currency in circulation and deposits of commercial banks at National Bank of Ethiopia.

The National Bank of Ethiopia monetary policy instruments is using the mix of both direct and indirect monetary policy instruments. These include setting a floor deposit interest rate, Use of selected credit control when necessary, reserve requirements open market Open and A standing central bank credit facility.

4. SECTION: METHODOLOGY, DATA AND MODEL SPESIFICATION

4.1 Methodology

4.1.1 The Stationarity of Money Multiplier

The necessary condition for the stability of long-run money multiplier is not the constancy but stationarity of money multiplier. The stationarity of money multiplier implies that money supply and reserve money are stationary or money supply and reserve money are cointegrated with cointegrating parameter is equal to one (Sahinbyoglu, 1995). The stationarity of money multiplier can be tested using the general specification of the following form:

$$m_t = \alpha_0 + \alpha_1 m_{t-1} + u_t \dots\dots\dots(8)$$

Or

$$\Delta m_t = \alpha_0 + \lambda m_{t-1} + u_t \dots\dots\dots (9)$$

Where u_t is a white noise error term and $\lambda = \alpha - 1$. Under the null hypothesis m_t has a unit root, that is $\alpha = 1$ and hence $\lambda = 0$, while in the alternative hypothesis money multiplier (m_t) is stationary, therefore, $\alpha < 1$ or $\lambda < 0$. Thus, the money multiplier model holds in the short-run if the null hypothesis of unit root is rejected. We have used augmented Dickey-Fuller (ADF) unit root test to determine the stationarity of the money multiplier.

4.1.2 Cointegration between Money Supply and Monetary Base

The finding that many macro time series may contain a unit root has spurred the development of the theory of non-stationary time series analysis. Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination exists, the non-stationary time series are said to be cointegrated. The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship among the variables.

Unit root tests confirm the non-stationarity of money multiplier and inappropriateness for short-run policy purpose. The alternative way is to check the cointegration between M and the B to determine whether the money multiplier model holds true for long-run using Johansen (1988) and Johansen and Juselius (1990) cointegration technique. Testing for cointegration may be possible only when M and B is I (1) variables.

After integration properties and the lag structure are specified, cointegration properties of the time series are analyzed using Johansen ML estimation procedure. The Johansen estimation method is based on the error correction representation of the VAR (p) model; (Khan, 2010).

$$Y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + Bx_t + \varepsilon_t \dots \dots \dots (10)$$

Where Y_t is a -vector of non-stationary I(1) variables, x_t is a d -vector of deterministic variables, and ε_t is a vector of innovations. We may rewrite this VAR as,

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + Bx_t + \varepsilon_t \dots \dots \dots (11)$$

$$\text{Where:- } \Pi = \sum_{i=1}^p A_i - I, \Gamma_i = - \sum_{j=i+1}^p A_j$$

Granger's representation theorem asserts that if the coefficient matrix Π has reduced rank $r < k$, then there exist $k \times r$ matrices α and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta'y_t$ is I(0). r is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector. As explained below, the elements of α are known as the adjustment parameters in the VEC model. Johansen's method is to estimate the Π matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of Π .

4.1.3 Granger Causality Model: Endogeneity hypothesis

The multiplier model assumes a one-way causation between the money supply and the monetary base. An increase in the monetary base causes an increase in the money supply by a multiple times – the value of the multiplier which is assumed to be stable.

$MB \rightarrow M$ where M is money supply in general.

But according to endogeneity hypothesis the causation is complete reversal and unidirectional from bank lending to deposits. To test the direction of causation and endogeneity hypothesis, we thus use the Granger causality model

$$1. Y_t = \alpha_0 + \sum_{i=1}^n \alpha_{1,t-i} Y_{t-i} + \sum_{i=1}^n \alpha_{2,t-i} X_{t-i} + \varepsilon_t \quad \dots\dots\dots (12)$$

$$2. X_t = \beta_0 + \sum_{i=1}^n \beta_{1,t-i} Y_{t-i} + \sum_{i=1}^n \beta_{2,t-i} X_{t-i} + \mu_t \quad \dots\dots\dots (13)$$

ε and μ are taken to be uncorrelated white-noise series.

The null hypotheses to be tested are

$$H_0: \alpha_2 = 0 \quad \quad \quad H_0: \beta_1 = 0$$

$$H_1: \alpha_2 \neq 0 \quad \quad \quad H_1: \beta_1 \neq 0$$

The definition of causality proposed by Granger implies that X_t is causing Y_t provided some α_2 is not zero. Similarly, Y_t is causing X_t if some β_1 is not zero. If both of these events occur, there is said to be a feedback or bivariate relation between X_t and Y_t .

4.2 Data

The study uses monthly data over the period 1993 to April 2013. Broad definition of money (M2) is used in the analysis. M2 is defined as currency in circulation plus demand deposits plus time and foreign currency deposits with the schedule banks and other deposits with the National Bank of Ethiopia (National Bank of Ethiopia). Reserve money is the sum of currency in circulation, cash in the tills, reserves of the schedule banks with the National Bank of Ethiopia and other deposits with the National Bank of Ethiopia and domestic credit are used in the study. Data on these variables is taken from National bank of Ethiopia's annual bulletins².

4.3 The empirical model specification

The Money Multiplier Model: Exogeneity hypothesis

² Money multiplier m is calculated as money supply (M) divided by base money (B).

High-powered money or monetary base is net liabilities of the CB held either by non-bank private sector or the banks. Money supply, on the other hand, is a multiple of the high-powered money. The money multiplier is, therefore, the ratio between the money supply and the monetary base. The identities below permit changes in money stock to be decomposed into changes in its “proximate determinants” the exogenous monetary base (MB) and the two endogenous ratios (C/D and R/D). Movements in the multiplier largely reflect the behavior of the public and banks. Over the very short run, monetary movements caused by changes in the multiplier predominate and precise control by the CB is impossible. However, over the long run, the monetary base is the more important determinant.

$$M1 = m1 \times MB \dots\dots\dots (14)$$

$$M2 = m2 \times MB \dots\dots\dots (15)$$

$$m1 = M1 \div MB = (C + D) / (C + R) = (1 + C/D) / (r + ER/D + C/D) \dots\dots\dots (16)$$

$$m2 = M2 \div MB = (C + D + TD + SD) / (C + R) = (1 + C/D + SD/D + TD/D) / (r + ER/D + C/D) \dots\dots\dots (17)$$

Where:-

C/D = currency ratio set by depositors

R = actual reserves which is the sum of required, RR and excess reserves ER.

r = RR/D = required reserve ratio

ER/D = excess reserve ratio set by banks

M1 = money supply in the narrow sense

M2 = money supply in its broader sense

D = demand deposits

TD = time deposits

SD = savings deposits.

m = multiplier

We take logs of the variables M1, M2, m1, m2, MB

Log M1 = log m1 + log MB, and

Log M2 = log m2 + log MB

Stationarity of k2 implies M2 and MB are stationary or that M2 and MB are co-integrated with a co-integrating parameter equal to 1, the same is true for k1. But, as shown above, m is a function of an array of variables: the required reserve ratio r_D ; the interest rate (i); and the ratio of currency held by the non-bank public as a percentage of demand deposits.

$$\ln M_t = \beta_0 + \beta \ln B_t + \mu_t \dots \dots \dots (16)$$

Where, β_0 is the logarithm of m3. For the multiplier model to be valid as a stable long-run equilibrium relationship, $\ln M_t$ and $\ln B_t$ are cointegrated such that $\beta_0 = 0$ and $\beta = 1$. ⁴The requirement of cointegration is a necessary condition, while the coefficient restrictions represent the sufficient condition. The analysis can be summarized with the help of following diagram

³ Let for convenience represent *m* for both *m1* and *m2*

⁴ Note that the intercept in equation (5) corresponds to money multiplier if the proportionality relation holds.

SECTION V: EMPIRICAL RESULTS

5.2 The Stationarity of Money Multiplier

The first step in testing the money multiplier model is to examine the integration properties of both the broad money supply and base money. The standard Augmented Dickey-Fuller (ADF), Phillips-Perron and the Kwiatkowski unit root tests are employed. Table 1 presents the unit root test results for the variables. The null of unit root tests cannot be rejected for all the variables in levels. This indicates that those variables should therefore be integrated at order one, $I(1)$.

Table 1 Unit Root Test

Variables	ADF	PP	KPSS
Level			
$(M_t - M_t^*)$	2.165533	0.578433	0.307481
$(B_t - B_t^*)$	-2.577484	-2.380154	0.272126
$(m_t - m_t^*)$	-2.326426	-2.199044	0.138317
$(Cr_t - Cr_t^*)$	-0.246047	-0.248086	0.290816
First Difference			
$\Delta (M_t - M_t^*)$	-3.141229	-10.55009	0.142018
$\Delta (B_t - B_t^*)$	-11.70956	-12.51782	0.140488
$\Delta (m_t - m_t^*)$	-10.61410	-10.85449	0.128266
$\Delta (Cr_t - Cr_t^*)$	-8.969314	-8.970256	0.072234

Note: ADF - Augmented Dickey Fuller; PP - Phillips-Perron; KPSS - Kwiatkowski-Phillips-Schmidt-Shin. Critical values for ADF and PP are from MacKinnon (1996) one-sided p-values while that of KPSS is from Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1). Bold values indicate significance

For confirmation, the same testing procedure is applied to the variables after first differencing. Money multiplier and base money are stationary and thus order one, $I(1)$. Broad money is non-stationary in ADF test and thus we follow the majority rule based on the PP and KPSS tests for

which the variable is stationary after first differencing. Therefore, a linear combination of both the broad money and base money should be stationary (i.e. cointegrated). The findings of unit roots in the variables have implications on whether to model the structural VAR in levels (i.e. with non-stationary variables) or first difference (i.e. with stationary variables). As suggested in the literature, if the variables are cointegrated then modeling in levels is appropriate

5.3 Cointegration between Money Supply and Monetary Base

Before applying the Johansen cointegration methodology (see Johansen, 1988, 1991; Johansen and Juselius, 1990), an optimal lag order must be chosen. The rationale is that the residuals in the system must be white noise, otherwise the relevant trace and maximum eigenvalue test statistics can be oversized (Cusham, 2000). For the VAR model estimated in levels for the two (2) variables, an optimal lag order of 1 and 5 is obtained, which is conflicting choice likelihood ratio statistic of Sims (1980), the Final Prediction Error (FPE) criterion, and the Akaike Information Criterion (AIC) selects 5 lag lengths but Swartz and HQ selects 1 lag length. The Breusch-Godfrey Lagrange multiplier (LM) test for serial correlation accepts the null hypothesis of no serial correlation at the lag order of 1 but rejects at lag 5 so the optimal lag length is chosen to be 1.

With an optimal lag of 1, the Johansen cointegration technique is applied to equation (16). The result is presented in Table 2 below. The trace and maximum eigenvalue test statistics which is statistically significant at 1% level suggest the existence of one cointegrating vector that implies cointegration between the broad money and base money. In other words, there is a long-run equilibrium relationship between broad money and base money for Ethiopia.

Table 2 Johansen Cointegration Test

Null	critical Value			critical value	
Hypotheses	Eigenvalue	Trace	(5%)	Max-eigen	(5%)
r=0	0.225575	22.77987	15.49471	20.70639	14.26460
r<1	0.025274	2.07348	13.841466	2.073481	3.841466

Notes: r indicates the number of cointegrating vector. Critical values are from MacKinnon-Haug-Michelis (1999) p-values. Bold values indicate significance of the test statistic at 1% level.

Although the preliminary evidence from the Johansen cointegration test gives some support for the existence of one cointegrating vector, it does not necessarily imply support for the money multiplier model except the estimated relationships among the variables are theoretically consistent with those implied by the multiplier model in equation (16). The existence of cointegration between M2 and R satisfies the necessary condition for the validity of the multiplier model. For the sufficient condition we normalized first Cointegrating vector on the constant and base money and then imposing zero restrictions on the constant terms $\beta_0=0$ and unity restriction on the slope parameter ($\beta_0=1$) the normalized coefficients are reported in (Table 3).

Table 3 Normalized Cointegrating Coefficients and Coefficient Restrictions

<u>Variables and Expected signs</u>			
	M2	B	C
		(+)	
Coefficients	1.0000	1.603039	5.075917
		(0.12830)	()
Restriction	coefficients	χ^2	p-values
	$\beta_0=0$	0.521253	0.470708
	$\beta_1=1$	3.27083	0.0025

Note: standard error in parenthesis

The coefficient values have been normalized with respect to the broad money so that the signs of the monetary base, if correct would match that implied by theory. With only one Cointegrating vector, the interpretation of the estimated coefficients is straight forward because identification of the Cointegrating space is not required as would be for several vectors. From the above table we can find that the coefficient restrictions satisfied partially only $\beta_0=0$ satisfies the restriction but the null hypothesis $\beta_1=1$ cannot be accepted.

Though Johansen cointegration test reveals that there is long run equilibrium between broad money and base money, this is only the necessary condition, for the money multiplier model to hold the sufficient condition, $\beta_0=0$ and $\beta_1=1$ must be satisfied. However it is clear from the above table that the sufficient condition holds partially. The main conclusion we could possibly drive from the above result is it would be difficult to use the multiplier model as a monetary policy frame work by the National Bank of Ethiopia to control the stock of money supply.

5.4- Exogeneity test result

A necessary condition for the estimation of an autoregressive distributed lag model-required for running a Granger causality test-is either the Stationarity of the series involved in the model or the existence of a co-integrating relationship between the regressors and the independent variable. If that is not the case, we would face the possibility of running spurious regressions (Granger, 1974) and that regression coefficients might not actually converge to constants with increasing sample size as in the standard case. Since it is unlikely that a co-integrating relationship between reserves, money multipliers and bank lending exists-for there is no theoretical basis for expecting such a relationship to exist-making the series stationary seems to be the only choice we have left when trying to run a Granger causality test (Kalaji, 2007.).

Table 4 Granger Causality test results

Null hypothesis	12 Lags	9 Lags	6 Lags	3 Lags
DCR does not Granger Cause DM2	1.64874 (0.0801)***	2.81134 (0.0038)*	2.93992 (0.0087)*	4.94768 (0.0024)*
DM2 does not Granger Cause DCR	1.64874 (0.0760)***	1.19631 (0.2983)	1.39585 (0.2170)	2.02399 (0.1111)

*significant at 1 percent **significant at 5 percent *** Significant at 10 percent

The post Keynesian endogeneity of money supply is tested and the result depicted in the above table. Credit causes money supply is highly significant at 1 percent at all level of lag length. Though in the higher lag length i.e. at 12 lags the result that money supply M2 causes credit is significant at 10 percent it is insignificant at lower and higher than 12 lag length. Although, the result is somewhat mixed type. At higher levels of lags (18 and 12 lags) M2 does not granger cause CR cannot be rejected. Although there seems to be two-way causality, the null hypothesis of (DCR) does not Granger Cause (DM2) is rejected in all selected lags. So endogeneity hypothesis seems to be strong although other way round also cannot be rejected fully.

6. CONCLUSION AND IMPLICATIONS

Money supply is a result of complex interactions of central banks, banks and financial institutions and public. This paper has analyzed empirically the abilities of Ethiopian National Bank to control the stock of money supply from two different perspectives – mainstream and Post-Keynesian.

For the monetarist exogeneity of money supply the study applied unit root test on money multiplier and founds that unit root is not rejected which has implication for the non stability if they have and predictability of money multiplier. Next cointegration test is applied to see whether broad money and base money are cointegrated or long run equilibrium relationship. The Johansen cointegration test indicates that there is long run relationship between broad money and base money. But this is only the necessary condition to use the money multiplier the sufficient condition of coefficient restriction should be satisfied, but in the current study coefficient restriction satisfied only partially. This implies it is difficult to use the money multiplier model for policy framework in Ethiopia during the study period. So the broad conclusion from the finding is the National Bank of Ethiopia cannot control the stock of money supply.

In view of Post-Keynesian exogeneity hypothesis the study employs Granger Causality test to see whether money is endogenous or exogenous and the result seems ambiguous at higher lag levels: broad money does not Granger causes credit is not accepted but at lower lag levels it is strongly accepted. But credits does not Granger causes broad money is not accepted at all levels of lags implying the exogeneity of money supply is strong.

There seems no clear cut finding between the competing theories of monetarists' and post-Keynesian was not found. Though the result shows strong result for post-Keynesian endogeneity of money supply it was also difficult to rule out exogeneity hypothesis of the main stream economists. So it will be good if other researcher investigate the area further to resolve the issue of controllability of money supply in Ethiopia.

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