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Monetary Policy and Inflation Dynamics in Ethiopia: An Empirical Analysis

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Monetary Policy and Inflation Dynamics in Ethiopia: An Empirical Analysis

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Abstract- While inflationary sources have been linked with various issues, its attachment to money supply had especial consideration in inflation theories. The Classical version of Quantity Theory holds for inflation as being 'always and everywhere a monetary phenomenon'. On the other side, Keynes's version departed by claiming neutrality of money in an economy where idle capacity exists. Motivated basically by these theoretical departures on the link between the two variables, and the limited availability of literatures particularly in the spirit of the subject it is concerned with, the present study aimed to empirically examine the share of money supply in explaining the dynamics of inflation in Ethiopia, using Error Correction Model by employing the time series data set for the period ranging from 1974/75 to 2014/15. The Johnson's Maximum likelihood approach for cointegration has indicated the existence of long run relationships amongst variables entered the inflation model. Moreover, the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) Unit Root tests confirmed that the variables concerned are all integrated of order one, (I(1)). ECM regression suggest that money supply, real Gross Domestic Product, trade openness, real exchange rate, budget deficit and the nominal deposit interest rate variables have together been important in explaining the long run dynamics of inflation. Except real Gross Domestic Product and nominal deposit interest rates, the effects of the remaining ones persist also in the short run. Moreover, money supply was estimated to impose the dominant effect towards validating the classical version of QTM in the context of Ethiopian economy. Besides, monetary policy is found to be more important in the dynamics of inflation compared to fiscal policy. Furthermore, VAR Granger Causality test suggests the causation running from budget deficit to money supply; and, from money supply to inflation, but no causality was suggested in reverse. This also reveals partly the applicability of the Sargent and Wallace (1981) aspect of the so called 'fiscal dominance' in Ethiopia. Finally, the study suggests for the enhancement of effectively designed and implemented network of both monetary and fiscal policies considering the power of money supply on inflation. Moreover, investments in food and agricultural sectors could considerably support the process of ensuring price stability.

Keywords: cointegration, ethiopia, inflation, money supply, stationarity, vector auto regressive, vector error correction model

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I. Introduction

Though economies may vary in structure and performance, they all possess a common vision of realizing economic development to the end; which could only be assisted by stability in macroeconomic environment. Martin cited by [26] and [30] has more to say in favor of this fact. The Today's strong economy of China has been said to result from stable growth in *RGDP* for more than three decades, particularly from 1978 to 2009 [40].

Inflation, therefore, is one of these macro-economic variables who still remained a policy issue in most economies. Inflation beyond an optimum is ruthless in general. Its mal effect is in multiples, particularity, on those in the lower income ranges via its role on income distribution and purchasing power of the currency with the poor; see [28] and [45]. Inflation is relatively rich in theories with sufficient hypothesis on its causes, though, remained an issue of debate among economic policy makers. The traditional Quantity Theory of Money *(QTM)* appears first when we talk of the causes of inflation. Via Fisher's quantity equation *(MV = PY),* the traditional *QTM* claimed for the existence of equi-proportional relationship between inflation and money growth. Where, *M, V, P*, and *Y* are the stock of money, velocity of money, the aggregate price level and real income, respectively. In the model, inflation is always and everywhere a monetary phenomenon [26] and [27]. Aggregate demand is the proposed channel through which monetary impulse is viewed to directly transmit its full impact on general price *(P)*. In economies where resources are not fully employed, money could have real effect, Keynes insisted. In other words, where resources are idle, the additional money reduces interest rate, but not price, and induce investment and hence, output increases. The initial rise in price can be offset by the latter falling prices because of larger outputs and, hence, money could finally impose neutral effect on price level [13].

Basically motivated with this theoretical controversies complemented with the limited availability of literatures in the country, especially, in the present sprit it is concerned with, and the controversial empirical evidences in various economies on the forms of relationships between inflation and money supply, the present study aimed to investigate which theory explains

the case in Ethiopia, with a particular focus on the classical *QTM.*

II. Problem Statement

It is not impressive to regard inflation as being a public enemy since its effect is distributed to every section of the society, but more harshly the poor. Inflation retards the growth process and public welfare there by shrinking the domestic marginal propensity to save [43]. Citrus paribus, in countries like Ethiopia where the wage remains rigid for long, the devastating effect of inflation could be in multiples. So that, it is a big concern in the country to identify its sources and then tackle it, but doing so is not such simple task to apply a policy action.

Even though, inflation is relatively rich with theories, none of the theory fully explains it in various economies. According to the classical *QTM*, money supply is the primary factor to persistently cause inflation always and everywhere. In the model, money creates no real effect both in the short and the long run. But for Keynes, money could impose economically real impact where idle capacity exists [3] and [14]. This theoretical controversy accounted for the leading motivation to the present study. Hence, it is aimed to test which of the two big theories explain the case in Ethiopia. Furthermore, despite the sufficient availability of the cause-effect analysis of inflation in Ethiopia, the trend of inflation in the country has been exhibiting the highly volatile and unstable pattern even to date. It suggests the need for further careful examination on how inflation behaves in a relation to other macroeconomic variables. More importantly, previous cause-effect analyses of inflation in Ethiopia share one or more of the major statistical limitations: variables employed as well as the number of observations were of limited size, and some others have been concerned only with the short run issues. For instance, studies by [10], [12], [17], [29] and [41] are among mentioning. The present study addressed all this statistical gaps with the previous studies. Uncommon with the previous works, the relative inflationary role of monetary and fiscal policies in the country has been critically examined in the current study.

III. Objectives of the Study

The current study is primarily intended to empirically examine the power of money supply in explaining the dynamics of inflation in Ethiopia both in the short and long run. Specifically, the study has been directed to identify the potential sources of inflation in Ethiopia and evaluating the relative share of each determinant in the process, to assess the trends of inflation and broad money growth (M2) for the study period covered, to examine the possible causality among the dominant variables in the model and to determine the relative importance of monetary and fiscal policies in the dynamics of Ethiopian inflation at large.

IV. Theoretical Literature Review

a) The Classical Quantity Theory of Money

The theory bases its analysis on the Fishers (1911) quantity equation given by *(MV = PY)*: where, M (money supply); V (Velocity of money); P (general price) and Y (real GDP). Assuming V and Y to be constants in the model, the theory claims that *(%M = %P)*, implying the existence of equiproportional relationships between monetary growth and the rate of inflation. Therefore, inflation is always and everywhere a monetary phenomenon and in that no other factor could have a role as money plays in the determination of inflation process see [11], [18], [30], [31] and [36].

b) The Reformulated QTM (Keynes's Version)

In contrast to the case with classical economists, money creates real impact where idle capacities are present for Keynes. He claimed in such an economy that, any additional money balance reduces the rate of interest, increases investment and, hence, output. As a result the initial rise in price could be completely offset by the latter reduced price, hence, no way for it to directly transmit to the general price level [21]. Keynes identified three basic reasons why an economic agents demand money balance; the transaction demand (in line with the traditional economists), the precautionary demand (for emergency cases) and the speculative demand (money even as store of value); with the latter being the key tool in his attack against the *QTM* [21]. He contained these three motives together in his money demand function given by ($\frac{M^d}{P}$ == f (-i, +Y)), and related money demand positively to income and negatively to the level of interest rates: thereby recognizing the role of interest rate in affecting the demand for money. Price being determined by the demand and supply for money, Keynes formulated his own quantity equation given by P $= \frac{M}{D}$, or, $\frac{M}{P}$ = D. Where; M is the nominal stock of exogenously determined money supply; D, the demand for money and P is the general price level [20]. With the nominal interest rate included in his money demand function, Keynes stressed that, changes in the quantity of money affect price level only after impacting the level of interest rate, and hence investment output and employment [14]. So that, the transmission mechanism between money and the price level is indirect. The immediate impact of change in the quantity of money rests on the interest rate but not on price. It implies that when interest rate decreases (following positive shock in the quantity of money), the level of investment responds by increasing. Hence, the levels of output, income and employment increase also as well. The additional level

of employment, in fact, imposes additional pressure on aggregate demand, and that the rising wage and other costs together induce the price level to rise. Here, the transmission of monetary impact on price is not only indirect, but the effect is not complete, since part of the money balance is held by the speculators, see [21] and [31].

Both versions of the quantity are, however, similar for an economy operating at its full capacity. For Keynes money could impose even a higher than full inflationary effect in the long run being aggravated by inflationary expectations. The Keynes's version reveals that the elasticity of price with respect to any monetary shock be equal to zero ($e_p = 0$) in an economy with idle resources to utilize. According to him, in such an economy, monetary injections would enable utilize idle resources and employment which increases output in a proportion to changing aggregate demand, hence there wouldbe no impact on prices in the short run [18]. The elasticity becomes one, given the level of output and employment fixed at full capacity and is *'True inflation'* for Keynes. Any monetary growth while the economy is operating at full capacity induces proportional change on price.

Secondly, the constant assumption of velocity was no more guaranteed in Keynes's version of *QTM*. In his Tract, he claimed that velocity of money is rather pro-cyclical (subjected to shocks)by considering the impact of interest rate on demand for money. Capturing velocity by $\left(V = \frac{PY}{f(i,Y)}\right)$, Keynes argued that velocity is a positive function of interest rate. It works like this; when interest rate increases, money demand decreases and, as a result velocity of money increases. The implication is that, increased interest rate induces cash holders to save more to gain extra benefit from rising rates. So that, they put more of their balance at bank and remain with few and since the amount of balance available in the economy is now less, it frequently changes hands to serve the remaining unsatisfied motives for money. With unstable velocity, no way for money to directly transmit to price and vice versa; i.e. any change in price or income would also be absorbed by the same process as a result no increasing response from money supply [39].

c) Demand-Pull Theory of Inflation

As the name implies this type of inflation is the result of excess demand in the economy. From the Keynesians traditional national income identity (Y = C + I + G), aggregate demand is a function of aggregate consumption (C), investment (I) and government expenditure (G). The demand pull inflation occurs when this sum exceeds the total level of supplies in the economy. Any factor causing aggregate demand to increase above its potential level would result in inflation. According to [34], Keynesians' had a simple and direct tool to deal with this type of inflation. Their advice is to absorb money back from the public sufficient enough in reducing the extra effective demand imposing adverse shock on the price level.

d) The Cost-Push Fallacy

These types of inflation emerge from any negative shocks in the supply side of the economy. Following [21], the supply side of the general economy explains output, inflation and the economy's adjustment to equilibrium at the potential level of output. The argument here is that, any factors contributing negatively to the production side of the economy are all inflationary. For example, increasing raw material costs, rising labor costs and indirect taxes could direct reflect in the form of increased prices or induce price to increase thereby reducing outputs. It is frequently stated in theoretical literatures like, [6] and [14], for this type of inflation to take place in the following manner: to cope up with the rising living costs in a condition of rising aggregate prices, employees may bargain and form a union demanding additional wage income; rising wages in turn can help drive inflation. This type of price surge also is regarded to spread in other sectors of the economy. It implies that, if a given production sector involves the input use of goods and services produced in another sector for which the production costs are increasing; then the prices of the goods produced in the first sector also increases.

e) The Structuralist's Explanation

This theory briefs the causes of inflation particularly in less developed economies by identifying structural rigidities commonly underlying these economies. For instance, [35] has identified three structural factors commonly explaining inflation in under developed economies. These are inelastic supply of agricultural products, insufficient national resource (government budget constraint) and foreign exchange bottlenecks. The implication with the first case is that, the unbalanced growth trends in agricultural sector and urbanization could result in higher rate of inflation in most *LDCs*. That means agricultural productivity is insufficient to meet its growing demand as urbanization is going ahead. Besides, due to weak domestic capacity complemented with loss of trust by external lenders, most LDCs resort to monetization of their deficits which is inflationary in practice in line with the traditional *QTM*. The structuralis' maintain that factors forcing monetization of deficits in LDCs are accounted for this type of inflation but not money supply as it is induced by those structural rigidities. Moreover, [8] and [16] also highly stress the case in line with [35]. Foreign exchange limitations and huge price differentials in the international trade are also among the main headaches of underdeveloped economies. Finally, structuralists' have a message to *LDCs* at least to minimize the effect of inflation resulting from structural rigidities. That is to develop any optimum measure as well as capable

institutions enough to avoid structural rigidness and imbalances in various sectors of the developing economies and bring these changes in the economy.

f) Some Empirical Evidences

[19] has examined the dynamic impact of money supply on inflation for the ECOWAS member states; and found the positive and statistically significant impact of money supply on inflation for Cote D' Ivore, Senegal and Togo and insignificant relationship for Burkina Faso, Gambia, Ghana and Niger.

[38] applied a VAR model to investigate the impact of GDP, domestic deposit rate, foreign interest rate, nominal exchange rate and money supply on inflation in Iran, using the times series data from 1973-2008. The study confirmed the positive and significant impact of money supply, domestic deposit rate and foreign interest rate on inflation; whereas GDP and nominal exchange rates were suggested to have negative influence on inflation in Iran.

[35], on their part, found that shocks in money supply and inflation are closely related and are moving in the same direction in the economy of South Africa in the long run. The association, however, is not suggested to be proportional in contrast to the case with the monetarists. It implies that there is still free space for other factors in their inflation model for South Africa; the negative and significant impact of nominal interest rate on inflation was estimated, and that real GDP was found to positively contribute to the long run dynamics of inflation. The implication with this finding could be that the hypothesis of proportional link between money supply and price level is not welcomed in the economy of South Africa.

[23] applied the OLS estimates to determine the factors explaining price in Tanzanian economy and found that output and money supply govern inflation in the short run, and the parallel exchange rate works together with the first two in the long run. According to his estimates, the long run elasticity of money was found to be 0.77, implying that 77% of the variation in general price level was explained by the variations in money supply. This result was consistent to the monetarist's argument of monetary power in determining inflation. However, money alone is not still the only issue to deal with the concept of inflation: the rest 23% of inflation in the long run would be explained by output, exchange rate and other elements subject to shocks.

[12] analyzed the short run dynamics of inflation in Ethiopia, using a parsimonious ECM fitted with monthly observations ranging from (1995M01-2006M12) using the time series data of money supply, nominal exchange rate and agricultural out puts (proxied by a cereal–weighted agricultural production index). The results of their study confirmed that, inflation in Ethiopia is strongly of past inflation determined, with money supply being the second deriver of inflation in the short term. They revealed further that, inflationary expectations explain more than half of it, even after three years of a shock; while in the medium-run, the nominal exchange rate and the output factors were found to have the positive and a greater than money supply impact on inflationary dynamics. The study argued hence that, with prevailing structural factors causing rigidities in price formation, tightening of monetary policy alone to contain inflation would become ineffective, and claimed rather to make policy reforms bringing flexible price formation, together with the credible and transparent central bank in curbing inflationary expectations and enhancing the effectiveness of monetary policy in Ethiopia. Here, we found that, money supply variable had only a limited role in explaining inflation for the period exceeding the short run; but rather, the exchange rate (the external influence) and the output shocks together with inflationary expectations were found to be important both in short and the medium-term periods.

[24] has estimated an *ECM* to determine the short and long run importance of various factors on food and non-food inflations in Ethiopia, using monthly time series data set ranging from 1999 to 2008. The results confirmed the importance of external factors (the exchange rate and international foods and goods prices) in explaining the domestic food and nonfood prices in the long run; while agricultural supply shocks and inflation inertia being important in the short run. Moreover, the exchange rate depreciation and international prices were found to have the biggest share in Ethiopia's inflation in the long run; excess money growth with insignificant role on inflation. They had three possible arguments for the insignificant role of money in the long run; first, the lower number of observations (with only ten years monthly data); second, the involuntary excess reserve holding by banks could affect banks behavior thereby causing unstable demand for money; and finally that instability in demand for money following non monetization of large part of Ethiopian economy, mostly, inrural section of the country.

[46] investigated the causal link amongst the time series of money supply, budget deficits and inflation in Ethiopia, applying the Granger causality test to detect the short run causality, and the bounds test approach to the long run issues, for the period ranging from 1964 to 2003. The results of the study confirmed the existence of long run cointegrating relationships among the series and only uni-directional [for ward Granger Causality running from $M \rightarrow P$]. Furthermore, budget deficits were found to have no impact on the growth of money supply; and that both money supply and budget deficits impose positive and statistically significant impact on inflation, with the largest pressure sourcing from money supply while confirming the dominancy of money in the dynamics of inflation. He recommended finally that, since both the fiscal and

monetary variables were important in determining inflation, the simultaneous exercising of proper fiscal and monetary policies would be effective to achieve the national objective of maintaining low inflation in Ethiopia.

V. Methodology

a) Data Source and Type

The study has employed the time-series secondary type data set for the period ranging from 1974/75 to 2014/15. The data are sourced primarily from the National Bank of Ethiopia, and other organizations like, Ministry of Finance and Economic Development, Central Statistics Agency, Ethiopian Economic Association and the Central Statistics agency were also referred. The World Bank data box, Internation Monetary Fund and African Bank of Development were also important providers of the required data set. To be able to determine the relative impact of both the domestic and external factors, the study employed both the home side and external variables in the inflation model adopted. The home side variables include; broad money supply, domestic nominal interest rate, government fiscal deficit and real exchange rate; while, the external once are, the country's openness to trade ratio and real exchange rate.

b) Empirical Model

The Consumer Price Index *(CPI)* is the proxy to inflation variable, which is the dependent variable in the model adopted. As far as the largest share of spending goes to the consumption of final goods and services in Ethiopia [42], *CPI* best represents inflation of the country. Broad money *(M2)* represents the definition of money supply for the National Bank of Ethiopia (NBE), hence, is the principal independent variable in the inflation model adopted. Moreover, the government's budget deficit (BD), Real Exchange Rate (RER), openness to trade (OT), Real GDP (RGDP) and the domestic nominal interest rate variables are controlled.

The guideline to the present study is the Classical Quantity Theory of Money; provoking the existence of equi-proportional relationship between money supply and inflation explained by the identity;

$$MV = PY \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where, *M, V, P*, and *Y* are, respectively, the nominal money stock, velocity of money, general price and the real Gross Domestic Product. Since the intention is to determine the impact of M on P in the model, equation (1) can be expressed in terms of price as follows;

$$P=\frac{MV}{Y}\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

The natural log of equation (2) becomes;

$$\ln P = \ln M + \ln V - \ln Y\ldots\ldots\ldots \quad (3)$$

The variables included in the model are considered so that they could reflect the structural effects, demand-side effects, the cost or supply side effects as well as external effects on home side price level. Accordingly, the deterministic relationship between the dependent and all the independent variables employed can be expressed as;

$$CPI_t = f(M2_t, NDIR_t, FD_t, RER_t, RGDP_t, OT_t) \ldots\ldots\ldots \quad (4)$$

Where CPI (proxy to inflation) is Consumer price index, M2 is the broad money supply, NDIR is the nominal Deposit rate of interest, RER is real Exchange Rate, RGDP is Real Gross Domestic Product and OT is Openness to Trade variable, which measures the degree of country's exposure to international trade. Because not everything is controlled, the model has made to consider the effect of other shocks not specified individually with it, hence, calls for the adoption of an econometric model where stochastic terms are well recognized. Therefore, based on [1], [3], [4] and [5]; an econometric model estimated has been set as follows:

$$\ln CPI_t = \beta_0 + \beta_1 \ln M2_t + \beta_2 \ln FD_t + \beta_3 \ln RER_t + \beta_4 \ln RGDP_t + \beta_5 \ln OT_t + \beta_6 \ln NDIR_t + \varepsilon_t \ldots\ldots\ldots \quad (5)$$

Where, ε_t is the white noise error term, and the parameters $\beta_1 \ldots\ldots \beta_6$ are the long run elasticities of the corresponding variables. β_0 is the intercept.

c) Econometric Model Estimation Procedures

1. The Unit Root Tests

The goal of econometric model is prediction which is impossible with spurious regression. That means any time series analysis require stationarity of the variables under consideration. For a time-series to be stationary, as of [9], it should exhibit time invariant mean, variance and auto covariance (possibly at various lags). We adopted the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) approaches to examine the unit root properties of all the series employed. ADF procedure is conducted by extending all the equations by adding all the lagged terms of the dependent variables, and requires estimation of the following regression;

$$\Delta Y_t = \beta_0 + \gamma 1t + \delta \Delta Yt - 1 + \sum_{j=1}^{s} \pi_j \Delta Y_{t-j} + \varepsilon_t \ldots\ldots\ldots \quad (6)$$

Where, $\delta = \emptyset - 1$ and $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$, and the like. β_0 is the intercept, $\gamma 1$ is the trend coefficient, t is the time/trend variable and where; s, are the lag terms. For this test, the hypothesis would be; Where, H_0: $\delta = 0$; there is unit root (implying the time series is non-stationary). On the other hand, the test regression for the Phillips Perron (1988) approach regresses;

$$\Delta y_t = \beta L_t + \delta y_{t-i} + \varepsilon_i \qquad (7)$$

Under the null of $\delta = 0$ (i.e. unit root exists)

2. The Cointegration Analysis

Procedures with this test detects whether the long run relationship exists among the variables under consideration. Generally, any two variables are said to be cointegrated, whenever they exhibit the long run equilibrium relationships [9], [22] and [19]. The test procedure has adopted the Johnson's Maximum likelihood approach for cointegration. Johnson derived the maximum likelihood estimation using sequential tests to determine the number of cointegrating vectors. His procedure steps from estimation of VAR of orderp of the form;

$$\Delta y_t = \mu + \pi y_{t-1} + \sum_i^p = 1 \emptyset_i \Delta y_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots \qquad (8)$$

$$Where, \pi = \sum_i^p = A_i - I \text{ and } \emptyset_i = - \sum_j^p I + 1^{Aj}$$

If the coefficient matrix (π)has a reduced rank (r<n), then, there exists an (n x m) matrices 'α' and 'β' each with rank (r) such that $\pi = \alpha\beta'$ and $\beta'\gamma_t$ is stationary. Hence, r and α indicate the number of cointegrating vectors and the speed of adjustment parameters in *ECM* respectively. Each column of β indicates the number of cointegrating equations in the model. Hence, the VAR model representation of variables entered the inflation model is as indicated below:

$$\begin{pmatrix} \Delta lnCPI_t \\ \Delta lnM2_t \\ \Delta lnFD_t \\ \Delta lnRER_t \\ \Delta lnRGDP_t \\ \Delta lnOT_t \\ \Delta lnDIR_t \end{pmatrix} = \Gamma_i \begin{vmatrix} \Delta lnCPI_{t-i} \\ \Delta lnM2_{t-i} \\ \Delta lnFD_{t-i} \\ \Delta lnRER_{t-i} \\ \Delta lnRGDP_{t-i} \\ \Delta lnOT_{t-i} \\ \Delta lnDIR_{t-i} \end{vmatrix} + \alpha\beta' \begin{pmatrix} lnCPI_{t-i} \\ lnM2_{t-i} \\ lnFD_{t-i} \\ lnRER_{t-i} \\ lnRGDP_{t-i} \\ lnOT_{t-i} \\ lnDIR_{t-i} \end{pmatrix}$$

The Johnson's approach for cointegration basically uses two test statistics: While the maximum eigenvalue examines the null of *'r'* cointegrating vectors against its alternative of *'r+1'*, the trace test examines the null of *'r'* cointegrating vectors against the alternative of *'k'* cointegrating relations. Where *'k'* represents the number of variables in the model adopted; and (r = 0, 1, 2, 3… k-1); i.e. in a model containing 'k' endogenous variables, possibly the cointegrating rank might assume the value ranging from zero to 'k-1', see [22] and [32]. The max-eigen value and trace test statistics, respectively, are given by the following formulae:

$$\lambda_{max}\,(r/r+1) = -T * log\,(1-\hat{\lambda})$$

$$\lambda_{trace}\,(r/k) = -T * \sum_{i=r+1}^{n} log(1-\hat{\lambda}):$$

where, λ are the maximum eigenvalues and *T* is the sample size in the model.

3. Vector Error Correction Model (VECM)

Once applied the cointegration test, VECM has been estimated to capture both the short and long run dynamics of inflation in a relation to other explanatory variables in the model; and, that is the well-recognized beauty of VEC model over others. After ensuring the existence of cointegration, the ECM has been estimated to also deal with the short run issues. Based on [9], assuming two variables y and x (to be the dependent and independent series respectively), ECM in this study requires estimating the following regression;

$$\Delta y_t = d_1 + \alpha_1 \varepsilon_{t-1} + \sum_{i=0}^{n} \beta_i \Delta yt\text{-}1 + \sum_{i=0}^{n} \delta_i \Delta x_{t-i} + \sum_{i=0}^{n} \emptyset_i \Delta Z_{t-i}$$

$$\Delta x_t = d_2 + \alpha_2 \varepsilon_{t-i} + \sum_{i=0}^{n} \delta_i \Delta y_{t-i} + \sum_{i=0}^{n} \beta_i \Delta x_{t-i} + \sum_{i=0}^{n} \mu_i z_{t-i}$$

The coefficients of the lagged terms, in accordance to their placement in the equations above, reveal the short run impact of regressors on the dependent ones. On the other hand, the significant and negative coefficient of the error correction term (the parameters) measures an economy's convergence to its natural state. Along with the short run estimates, the cointegrating equations (the long run coefficients) are also computed simultaneously from Johnson's cointegration normalization in ECM regressions. Besides, a properly determined cointegrating rank makes the predicted cointegrated equation exhibit a property of joint stationarity in the long-run.

4. The Granger Causality Diagnosis

It is also critical to identify the direction of influence among variables since it helps to easily control variables causing adverse shocks at macro level. Keynes, the Real Bills Doctrine and the monetary economists viewed the direction of causality among money supply and inflation variables differently. Towards validating any of the three cases in the context of Ethiopian economy, the Granger Causality approach has been applied to detect the direction of causality among the three dominant variables in the model. The test needs all the variables be stationary; which of course has been solved in the section for Unit Root Tests above. Moreover, as usual, the error terms in the testing procedure need serially uncorrelated. Following [44], the Granger causality test examines the following two focus paired regressions sequentially from the inflation model;

$$\Delta lnm2_t = \sum_{i=1}^{n} \alpha_i \, \Delta lncpi_{t-i} + \sum_{j=1}^{n} \beta_j \Delta lnm2_{t-j} + \varepsilon_{1t}$$

$$\Delta lncpi_t = \sum_{i=1}^{n} \delta_i \, \Delta lncpi_{t-i} + \sum_{j=1}^{n} \lambda_j \Delta lnm2_{t-j} + \varepsilon_{2t}$$

Where, the lower case letters represent the growth rates of corresponding variables, and Δ are the difference operators. From the first equation, currently money supply is determined by its ith lagged value and the previous level of inflation. Hence, the current value of money supply is regressed on all of its lagged terms and all other variables in question (but with no lagged terms of CPI). Next, the same regression could be applied including the lagged terms of CPI. From the first regression, due to the restricted lagged terms of the inflation variable, we get the Restricted Residual sum of Squares (RSSR), and from the second regression, we do have unrestricted Residual Sum of Squares (RSS_{UR}), see [9]. Finally, using the two residual square terms, the general F-test to be examined can be presented as follows;

$$F = \frac{(RSS_R - RSS_{UR})/h}{RSS_{UR}/(n-k)}$$

Where, 'h' represents the number of M2 lagged terms, & 'k' is the number of parameters estimated in the unrestricted regression, which follows F-distribution with 'n-k' degree of freedom. The test requires estimation of the VAR model discussed earlier in the section for cointegration. The null hypothesis is: H0: $\sum \alpha_i = 0 \rightarrow$ the lagged M2 values do not belong in the regression. If the calculated *F* value exceeds the critical value at chosen level of significance, we reject the null hypothesis; so that the lagged M2 values belong in the regression: which is to mean M2 causes CPI. Exactly the same procedure is followed to test whether the influence runs in reverse.

VI. Estimation Results and Discussion

a) Unit Root Properties of Individual Variables

Initially all the variables were subjected to the stationarity test and both the ADF and PP procedures accepted the null of unit root at level in each case. However, both procedures rejected the null hypothesis with all the variables differenced once. Therefore, test statistics has confirmed the stationarity of all the variables at their first differences.

Table 5.1: ADF and PP Unit Root Tests with all variables differenced once

Augmented Dickey Fuller Unit Root (ADF) Test			Philips-Perron (PP) Unit Root Test		
Variables	Constant	Constant & Trend	Constant	Constant &Trend	Infer/e
D.lnCPI	-5.560**[0.0000]*	-5.516**[0.0000]*	-5.582**[0.0000]*	-5.530**[0.0000]*	*I(1)*
D.lnM2	-3.833**[0.0026]*	-4.709**[0.0007]*	-3.928**[0.0018]*	-4.709**[0.0007]*	*I(1)*
D.lnRGDP	-3.490***[0.0083]*	-4.608***[0.0010]*	-3.537***[0.0071]*	-4.720***[0.0006]*	*I(1)*
D.lnBD	-9.279**[0.0000]*	-9.189**[0.0000]*	-5.855**[0.0000]*	-10.074**[0.0000]*	*I(1)*
D.lnOT	-5.782**[0.0000]*	-6.277**[0.0000]*	-10.164**[0.0000]*	-6.286**[0.0000]*	*I(1)*
D.lnRER	-5.117**[0.0000]*	-5.066**[0.0002]*	-5.041**[0.0000]*	-4.981**[0.0002]*	*I(1)*
D.lnDIR	-6.573**[0.0000]*	-6.433**[0.0000]*	-6.590**[0.0000]*	-6.444**[0.0000]*	*I(1)*

***Note:** * and ** implies rejection of the null hypotheses @1% and @5% critical values respectively in both cases; I(1)- shows order of integration;[ ]are the P-values; and other notations are as defined earlier.*

Source: STATA Model output

Except for the RGDP variable, the unit root test statistics for all other variables are significant @1%. Besides, both the ADF and PP unit root tests have confirmed stationarity in *lnRGDP* @5%. [1] Inclusion of the trend term did not improve efficiency of the unit root estimates. Hence, consideration of either the constant term alone, or inclusion of trend term together with the constant doesn't have differences in the estimation of the general inflation model of this study. So that, only the constant term is considered while regressing ECM model in latter
sections of this paper.

b) Lag Length Determination

It is well understood that, the Johnson's approach for cointegration is highly sensitive to the number of lags included in the VAR model. Perhaps, there is no an easy and sharp rule on what optimum lags size to use; but, given the respective practical limitations of all the criteria, researchers would enjoy some relief to arbitrarily decide on the appropriate lags, conceptually geared to be reasonable. A popular method is where the AIC is minimized, which is at the optimum lag order of three in the present case. Moreover, except SBIC all other criteria have suggested the lag length of three. That is based on the second option of majority; lag size of three is sugges ted also. Hence, in subsequent analysis for cointegration, VECM and VAR model estimations, the lag length of three is used.

Table 5.2: Lag Size Determination

Lag Order	LL	LR	P-Value	FPE	AIC	HQIC	SBIC
0	208.098	-	-	6.0e-14	-10.5841	-10.4768	-10.2824
1	470.968	525.74	0.000	8.1e-19	-21.8404	-20.9818	-19.4271*
2	536.755	131.57	0.000	4.4e-19	-22.7239	-21.114	-18.199
3	614.727	155.94*	0.000	2.2e-19*	-24.2488*	-21.8876*	-17.6123

** reflects the appropriate lag length suggested by each of the criteria; and where, LL: the Log Likelihood; FPE: Final Prediction Error; AIC: Akaike Information Criteria; LR: Sequential Modified Likelihood Ratio Test (LR); HQIC: Hannan-Quinn Information Criteria; and SBIC: Schewarz Information Criteria*

Source: STATA Model output

[1] Consideration of the trend term together with the constants didn't improve the critical values for stationarity. So that, ECM estimation with the trend and constant, does not improve the efficiency of estimates with only constants. Hence, in regressing ECM, only the constant terms are considered.

c) The Cointegration Test Results

As far as the series considered, here, are all integrated of order one (the same order), we make use of the Johnson's Maximum Likelihood procedure for cointegration issues. Accordingly, the trace *(λtrace)* and maximum eigenvalue test *(λmax)* statistics have rejected the null of no-cointegration amongst the series of interest: while confirming the existence of long run relationships among them. The summary statistics of both tests have been reflected in the table below;

Table 5.3: Results of the Johnson's Unrestricted Cointegration Test

Maximum Rank	λ_{max}	Critical @ 5%	λ_{trace}	Critical @ 5%
0	49.2117	48.45	144.3689	136.61
1	35.7802*	42.48	95.1572*	104.94
2	26.7732	36.41	59.3770	77.74
3	14.7638	30.33	32.6038	54.64
4	11.7084	23.78	17.8399	34.55
5	5.0027	16.87	6.1315	18.17
6	1.1288	3.74	1.1288	3.74

*Where *, represents the maximum cointegrating rank determined by both test statistics*

Source: STATA Model Output

The *λtrace* rejected the null of (r = 0) while favoring its alternative hypothesis of (r ≥ 0). At this stage the existence of at least one cointegrating rank within the adopted model of inflation is detected based on the trace test. At (r = 0), the *λtrace* (144.3689) is greater than the 5% critical value, which is 136.61. Hence, we can reject the null hypothesis of no cointegration. Likewise, the max-eigen value, *λmax,* has also confirmed the existence of one cointegrating vector in the inflation model adopted.

d) VEC Model Estimation Results

i. The Long Run Estimates [β Coefficients]

Long run elasticities (the β's) were exactly identified and the Johnson normalization restrictions were imposed too. The table below presents these long run elasticities of all the explanatory variables in the inflation model adopted. The estimates revealed that, all of the variables considered have been important and highly significant in determining the long run dynamics of inflation. Moreover, internal factors were more important than the external factors.

Table 5.4: Estimation Results for β Coefficients

Variables	Coefficients	Standard Errors	t-statistic	P- value
ln*RER*	0.30	0.0422	7.04	0.000
ln*RGDP*	-1.34	0.1581	-8.46	0.000
ln*DIR*	-0.06	0.0267	-2.20	0.028
ln*M2*	1.45	0.1712	8.46	0.000
ln*OT*	0.91	0.084	10.74	0.000
ln*BD*	1.38	0.105	13.13	0.000
CON	-7.88	-	-	-

$R^2 = 0.98$ $\bar{R}^2 = 0.98$ F(6, 34) = 534.61[0.0000] RSS = 0.061071746 DW(7, 41) = 1.83

Diagnostic Test:

- *Heteroskedasticity Test: Chi^2(1) = 2.42[0.1198]*
- *RESET Test: (3, 31)= 2.28[0.0990]*
- *ARCH= 0.745[0.3879]*
- *Model Normality Condition;*
  Jarque-Bera test: Chi^2(14) = 4.493[0.99170]
  Skewness test: Chi^2(7) = 1.571[0.97976]
  Kurtosis test: Chi^2(7) = 2.922[0.89211]
- *Residual Autocorrelation Test at lags;*
  (1). Chi^2 (49) = 53.5123[0.30522]
  (2). Chi^2 (49) = 62.6017[0.09174]
  (3). Chi^2 (49) = 58.0539[0.17617]

Source: STATA Model output

Where: ln = Logarithmic forms of: M2; Broad Money Supply: RGDP; Real Gross Domestic Product: OT; Openness to Trade: BD; Budget Deficit: RER; Real Exchange Rate: DIR; Nominal Rate of Deposit: and CON is the Constant term

Therefore, variables entered the inflation model are related in the long-run via the equation given by:

$$lnCPI = -7.88 + 0.30lnRER - 1.34lnRGDP + 1.45lnM2 + 0.91lnOT - 0.06lnDIR + 1.38lnBD$$
$$(7.04) \quad (-8.46) \quad (8.46) \quad (10.74) \quad (-2.20) \quad (13.13)$$

Where ( ) are the t-values.

As has been clearly displayed in the table above, all of the considered variables were found to impose a considerable long run impact on inflation. The long run elasticity of money supply was estimated to be 1.45, exhibiting a more than unit elastic effect (ep >1). It can be understood as, other things being constant; a percentage change in money supply leads the long run growth of inflation to change by about 1.45%. Concerning the estimated strong inflationary impact of money supply, this finding is consistent with the classical version of *QTM.* Besides, it also supports the works of [10], [35], [38] and [46]. Again, the suggested greater than unit long run elasticity of money supply is strongly in line with the Keynes's version of *QTM.* There, monetary impact being aggravated by expectations could result even in a more than unitary inflationary effect in the long run; and, the elasticity assumes zero value in the short run [36]. Hence that, there is no guarantee for the estimated higher elasticity of money supply here is not because of the same case as with the reformulated version of *QTM.* Yet, the classical's version best explains the short-run matter of the present analysis.

Though is among the monetary policy instruments of National Bank of Ethiopia, deposit rates serve less in controlling the long-run process of inflation, however, positive. The implication follows that, the interest rate channel of monetary policy is found to be less effective in dealing with the long run process of inflation. Any one or more of the justifications below might explain this scenario in Ethiopia:

First: owing to the customary lower bank rates, economic agents may resort to other asset holding decisions. Increased demand for non-financial assets, therefore, induces spending and as a result money goes to the economy not to the banks.

Second: another possible justification may be that, associated with higher surge in money growth and past inflationary experiences, the public's future inflationary expectation may increase.[2] This further reduces the expected real rate of bank and discourages voluntary saving and induces consumption. Once again, other wealth holding methods become preferable, leading to increased spending, aggregate demand and price.

Third: poor habitual tendency to save in Ethiopia may be leading the volume of saving to be interest inelastic. Irrespective of changes in bank deposit rate, agents may engage in other wealth holding decision, or either consumes all what they have. It might further be accredited to the inadequate personal disposable income in Ethiopia and, even inadequate information to the public on periodic levels of these rates by the public together with the potential benefits of keeping wealth at bank.

On other hand, as with prior theoretical expectation, the output sector has been suggested to have negative and significant impact on inflation in the long run. The estimated elasticity suggest that the output variable is nearly equally important with the money supply in explaining the long run dynamism of inflation in Ethiopia. It is straight to argue the negative impact of output on Ethiopian inflation based on economic interpretations. As far as Ethiopian economy is predominantly agrarian; improvements in agricultural productivity and output will have considerably reducing effect on food inflation; which, in turn, has been explaining more than half of the general *CPI* inflation in Ethiopia [42].

Unlike to the claims of 'New Growth Theory', trade openness has been found to vary positively with inflation in the long run. Its long run elasticity was estimated at 0.91; implying that, a percentage improvement in country's exposure to international trade would result in growth of domestic inflation by about 0.91%. It may be justified to one or more of the following cases: *First,* it couldn't be much impressing to estimate such a positive correlation in countries, like ours, where bulks of manufactured and industrial items are imported. Frequent and heavy imports might also increase the probability of welcoming external inflation. *Secondly,* prolonged internal political unrest, frequent conflicts and civil wars, drought and famine complemented with unstable macro economy might have potentially been imposing adverse effect against the inflow of *FDI* in Ethiopia; which is the principal benefit resulting from larger international exposure. Besides, bad history of famine and drought, the discouraging and aggressive economic policies in the past regimes, internal conflicts and that of frequent Ethio-Eritrean Wars and internal civil wars, among others, might have been shadowing the international image of Ethiopia. All these factors might have been working against the suspected benefits of more exposure to international trades. Possibly, another personal justification for the case would be that, the government may resort to increase the domestic tax rate as well as tax base, to compensate for the lost tariff and other trade liberalization related revenues.

[2] Real interest rate is nominal interest rate minus inflation rate. If expected rate of inflation is high, the real rate of return decreases, and as a result agents prefer more consumption to saving hereby further imposing inflationary pressures.

The long run inflationary effect of real exchange rate is expected. Its long run elasticity is 0.30, with strongly significant and expected sign (positive). Real depreciation makes exports cheap and, imports become expensive; so that, higher foreign prices would be reflected in domestic economy in the form of higher inflation. It is consistent with the international trade hypothesis, like [33].

Due to its monetary dimension, the long-run impact of budget deficit on inflation is positive as expected and significant too. Its long run elasticity is estimated to be 1.35, implying that a 1% rise in financing deficits would result in rise of long run inflation rate by 1.35%; while exhibiting also a more than unit effect. From macroeconomic theories (including the traditional *QTM*), any positive effect of budget deficit on inflation reflects seignior ages. Therefore, though made in fiscal aspects the effect of budget deficit could be viewed indirectly as being the effect of money supply. This analysis is highly consistent with the study of [5] and [46]. Therefore, monetization of fiscal deficits has been among the important long run drivers of inflation, and has also been an important source of money growth in Ethiopia.

ii. *VECM Short-Run Estimates*

The long and short run estimates of VECM are related by the error correction term ECt-i. Negative and significant coefficient of the error term reveals the economy's convergence back to its natural state; which is satisfied in the present paper. In the short run, most of the variables were found to be important. Money supply remained still dominant as with the case in the long run, thereby exhibiting a more than full effect. The detail is reflected in the following table:

Table 5.5: VECM Short-Run Estimates

Dependent variable: Dln*CPI* [Proxy to Inflation Variable]			
[D_ln*cpi* _ce1], Speed of Adjustment	-0.40 (-3.44) [0.001]	Speed of adjustment is the α-parameter in ECM	
Independent Variables	Short run elasticities at various lags		
	y_{t-1}	y_{t-2}	y_{t-3}
Dln*CPI*	-0.09 (-0.47) [0.641]	-0.35 (-1.83) [0.068]	-0.10 (-0.58) [0.565]
Dln*M2*	1.07 (2.32) [0.020]	1.01 (2.68) [0.007]	0.34 (1.17) [0.241]
Dln*RGDP*	-0.06 (-0.25) [0.800]	0.06 (0.24) [0.807]	0.81 (2.98) [0.003]
Dln*OT*	0.44 (3.26) [0.001]	-0.24 (-2.31) [0.021]	-0.35 (-2.54) [0.011]
Dln*BD*	0.64 (3.94) [0.000]	0.52 (4.07) [0.000]	0.02 (0.27) [0.786]
Dln*RER*	0.64 (4.28) [0.000]	0.21 (1.30) [0.194]	0.14 (1.17) [0.244]
Dln*DIR*	-0.13 (-1.72) [0.085]	0.04 (0.43) [0.666]	0.15 (1.89) [0.058]
CONS	0.05 (2.15) [0.031]		
$R^2 = 0.98$ $\bar{R}^2 = 0.98$ $F(6, 34) = 534.61[0.0000]$ $RSS = 0.061071746$ $DW(7, 41) = 1.83$			

Diagnostic Test:

- *Heteroskedasticity Test: Chi^2(1) = 2.42[0.1198]*
- *RESET Test: (3, 31)= 2.28[0.0990]*
- *ARCH= 0.745[0.3879]*
- *Model Normality Detection;*
  Jarque-Bera test: Chi^2(14) = 4.493[0.99170]
  Skewness test: Chi^2(7) = 1.571[0.97976]
  Kurtosis test: Chi^2(7) = 2.922[0.8921]
- *Residual Autocorrelation Test at lags:*
  (1). Chi^2 (49) = 53.5123[0.30522]
  (2). Chi^2 (49) = 62.6017[0.09174]
  (3). Chi^2 (49) = 58.0539[0.17617]

Prob>(

Source: STATA Model output

Note: Numbers without brackets are the short run elasticities of corresponding Series; ( ) are t-values and; [ ] are the P-Values; and D, represents the Difference Term: y_{t-i}, represents the lag length.

The most important thing in ECM is the sign and significance status the error term. It measures the speed by which the short term deviations in the inflation model can converge back to, or diverge from its long run equilibrium. In our case, it is negative and highly significant implying that any short term distortions in the inflation model could be corrected; and the short term deviations could converge towards the long run equilibrium at the annual speed rate of 40%. Hence, it takes a model about $2\frac{1}{2}$ years to reach the long run equilibrium point.

The short run elasticity of money supply is 1.07 and 1.01, in the first and second lags respectively; but, it is insignificant at the third lag. Besides, the short run elasticities are strong, being more than unity in the first lag, and equal to unity at the second lag. Therefore, money supply remained dominant even in the short run. It is highly consistent with the hypothesis of the

traditional *QTM*. The short run estimates reveal that, the real output and domestic deposit interest variables are not important in explaining the short dynamism of inflation. The inflationary effect of deficit financing by the government has persisted in the short-run also. It further evidenced the dominancy of money in the dynamics of inflation in Ethiopia. Moreover, the openness to trade variable is also found to be important in the short run.

iii. *Monetary Versus Fiscal Policy: Which is More Important?*

To determine the relative importance of the two big macroeconomic policies in the dynamics of inflation in Ethiopia, the percentages of long-run elasticities have been used for comparison. Accordingly, Consideration of all the major variables of monetary policy (money supply, real exchange rate and deposit interest rate) with the adopted inflation model enables to fully capture the role of monetary policy regarding the process of inflation. On the other hand, the sole candidate to fiscal policy in our model is the budget deficit variable. In comparing these two policies, and to avoid bias and moreover based on the main subject of this study, monetary policy was represented only by money supply variable and that, fiscal policy was examined with consideration of budget variable. Accordingly, the computed long run elasticity of broad money supply is 1.45 and, of that of budget deficit variable is equal to 1.38. For a 1% additional money supply, inflation responds by 1.45% increment; while, a 1% rise in deficit financing results in a growth of inflation by 1.38% in the long run. The coefficients are almost equal revealing the strength in both policies in explaining the long run dynamics of inflation in Ethiopia. The reason may be that, the measures in both policies have resulted in the expansion of money supply within the general economy. Though policies differ, measures in both cases are meant to increase the quantity of money under circulation. But, the inflationary effect of money supply under monetary policy only slightly exceeds its effect through fiscal policy. That means the long run inflationary impact of monetary policy is a little bit greater than the effect of fiscal policy only by 0.07%. For comparison matters however, monetary policy is more important in the long run process of inflation in Ethiopia. This finding is consistent with the works of [2], [25] and [37]. The finding also rejected the government's claim that, inflation in Ethiopia is of neither monetary nor fiscal factors, but rather of a growth factor. Even though, the pressure from production side has been estimated to be strong in the long run, its short run importance is not considerable. The effect of money supply also remained dominant in the short-run. Generally, money supply has found to be the strongest of all, both in short and the long run dynamics of inflation with a more than full effect. The classical *QTM* has, thus, a truth in claiming money as the powerful item in a relation to the dynamics of inflation.

[3] *Table 5.6:* The Relative Importance of Monetary and Fiscal Policies (with all variables changing simultaneously)

Variables	Comparative Ratios	Percentages	Sign
ln*M2*	0.267	26.7	+
ln*DIR*	0.011	1.1	_
ln*RER*	0.055	5.5	+
ln*RGDP*	0.246	24.6	_
ln*OT*	0.167	16.7	+
ln*BD*	0.254	25.4	+
Total	1.00	100.0	

Source: Self Computation based on Model Output

e) Granger Causality Test Results

Knowing the responsiveness of a variable to shocks from other source is help full to easily control the effect of a variable on the other. The bench mark to decide on as to whether accept or reject the null hypothesis was based on the 5% critical value. The causality test result is displayed below. No causal influence has been detected between inflation and budget deficit variables in either direction; but, forward uni-directional causality was suggested from money

[3] *Coefficients in the table are computed by taking the relative ratios of individual elasticities to their sum total. Then, the values were used for comparison matters.*

supply to inflation. I t means money supply Granger causes inflation but no influence runs in reverse. This is in line with the traditional *QTM*. It is also consistent with the works of [1], [7] and [46]. Moreover, the revealed uni-directional causality from budget deficit to money supply is in line with the doctrine of the classical Quantity Theory of Money. This finding strongly supports the macroeconomic treatment of monetization of deficits to cause money growth and hence inflation in LDCs. Generally, the Granger Causality test suggests causal influence running from budget deficit to money supply and from money supply to inflation (BD Ms CPI). It further evidenced the claim in Ethiopia that, monetization of fiscal deficit has been the main reason for the rapid growth of money supply and, hence inflation; see again [7] and [46].

Table 5.7: G ranger Causality Wald Test Results

Null Hypothesis:	***F-Statistic***	***P-value***	***Decision***
Inflation does not Granger cause Money Supply	3.2183	0.0833	*Accept*
Money Supply does not Granger Cause Inflation	4.3417	0.0461	*Reject*
Inflation does not Granger cause Budget Deficit	1.8481	0.1845	*Accept*
Budget Deficit does not Granger Cause Inflation	0.5860	0.4502	*Accept*
Money Supply does not Granger cause Budget Deficit	0.4135	0.5253	*Accept*
Budget Deficit does not Granger Cause Money Supply	24.288	0.0000	*Reject*

Source: STATA VAR Model output

VII. Conclusion

Inspired basically by the competing hypothesis of the classical and Keynes's version of *QTM*, the study has mainly intended to empirically investigate the share of money supply in explaining the dynamics of inflation in Ethiopia by employing the time series data set ranging from 1974/75 to 2014/15. To achieve this objective, ECM has been estimated after confirming all the pre and post statistical qualities in individual variables as well as, their joint behavior in the model. Towards validating the claims in traditional *QTM*, money supply has found to account for the dominant role in the process of inflation in Ethiopia with a more than unit effect. Especially its dominant role is highly considerable in the short run. The long run case puts it only a little over other domestic factors of fiscal deficit and real output. Besides, the Keynes's version of *QTM* might partly explain a more than unit effect inflationary effect of money supply. Moreover, the uni-directional causality from budget deficit to money supply; and from money supply to inflation has been confirmed by VAR Granger causality tests. The implication is that, budget deficit has been an important source of monetary growth and; hence, inflation in Ethiopia. This result is also consistent with hypothesis of traditional macroeconomists in *QTM*; and, with most empirical studies claiming for government budget deficit to cause money supply especially in developing economies as they rely more on monetization of these deficits. Besides; budget deficit, real output, trade openness and real exchange rate variables were estimated to be an important sources of inflation in the long run. Domestic deposit interest rate is also suggested to have only a minor role in the long run dynamics of inflation. Besides, the study has estimated the positive correlation between openness and inflation in contrast to the hypothesis of New Growth Theory. The short run impacts of real *GDP* and domestic deposit interest rate variables have been found to be insignificant. Money supply still remained the dominant one with a more than unit effect, in line with the classical version of *QTM*, but in contrast to Keynes.

VIII. Recommendations

Taking note of the points below would support the process of maintaining stable price; and hence, wellbeing of general macroeconomic environment in Ethiopia;

- Both the monetary and fiscal policy makers should consider the higher sensitivity of inflation to changes in monetary growth. Controlling money supply growth thereby situational tightening of monetary policy can be an important solution. Besides, it is better for the government to rely more on other methods (rather than seigniorages) to finance its deficits. Enhancing domestic capacity and utilizing resources at home could have considerably stabilizing effect in the long run.
- Based on Keynes's version of *QTM,* the estimated higher than unit elasticity of money supply may have been explained by higher inflationary expectations. Hence, the effect of expectations can be tackled by ensuring credibility in targeting and announcement of key economic and general policy variables.
- Price shocks associated with the real production sector necessitate for larger investments in agriculture (as more of output is sourced from agricultural sector) and other food sectors. Therefore, enhanced domestic and foreign

investment undertakings in these sectors could support the process of price stabilization and growth in general; parallel to the government's effort of expanding manufacturing industries in Ethiopia.

- To divert the positive inflationary effect of openness, the inflow of *FDI* should be encouraged and be provided
- with various promotional incentives in order to boost domestic production. Promoting *FDI* in manufacturing industries will reduce the sill of imported inflation in the long run.
- Furthermore, efforts to improve saving habits, moderate upward revision of deposit rates together with the credible policy for expectation issues will improve the effectiveness of monetary policy in controlling inflation via its interest rate channel. Measures related to interest rate should also consider its impact on private investment undertakings.
- Finally, the inflation model of this study suggests that, inflation in Ethiopia has been more of internal factor. As a result, especial consideration should be given to home side factors.

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