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The Effect of Monetary Policy on Economic Growth in Ethiopia

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Abstract: There is an ambiguous relationship between monetary policy and economic growth both in theoretically and empirically. Hence, this study was examined the link among monetary policy and economic growth in Ethiopia by using time series data from 1980-2019. Zivot and Andrews (ZA hereafter) and Clemente (CMR hereafter) unit root test revealed that real interest rate was stationary at level. while log of real gross domestic product, log of gross capital formation, log of money supply, exchange rate, reserve requirement and consumer price index were stationary after first differencing in both tests. The results of ARDL bounds test for co-integration showed the present of long run relationship among the series during the study period. Long run estimation indicated that the existence of positive statistical significant effect of money supply, real interest rate, reserve requirement and gross capital formation on economic growth in Ethiopia during the study period. While, exchange rate has negative effect on economic growth. The study also revealed that, inflation has no significant effect on economic growth in the long run. The short run estimation showed that except inflation index, other variables (money supply, gross capital formation, reserve requirement and real interest rate) has positive significant effect on economic growth in Ethiopia in the study period. However, exchange rate has no significant effect in the short run. The Error correction model (ECM) test showed that about 29% of short run disequilibrium was be adjusted every year. The test of causality showed that a causation between real gross domestic product with inflation, exchange rate and money supply at 5% level of significant and a causality with gross capital formation at 10% level of significant. In conclusion, there were positive relationship most of the monetary policy instrument variables with economic growth except inflation and exchange rate for this study. As a recommendation, national banks of Ethiopia should be committed to the mission of price stability.

Keywords: Monetary Policy, Economic Growth, ARDL, Error Correction Model, Ethiopia

1. Introduction

Monetary policy refers to a bundle of actions and regulatory stances taken by the central bank. It plays an important role in the performance of an economy. However, the efficiency of the policy in attaining the required goal mainly depends on the institutional factors that retard or enhance the implementation process of the policy [1]. It is important to control the supply of money, usually target the inflation rates or interest rates to stabilize the price and other macro variables [2]. In open economies, monetary policy is a strategic element of macroeconomic management which encourages stability and stimulates sustainable growth and development through its impact on macroeconomic indicators. Monetary policy is typically concerned with the way in which monetary authorities use the instruments at their disposal to influence the decision of economic agents with the intention of achieving overall macroeconomic stability [3].

In most countries today, the central bankers are the only governmental authorities engaged in stabilization policy. Central banks have been made independent and accountable for meeting specific objectives, which lead to the removal of inflation partiality that comes from political intrusion in the monetary policy process [4].

Theories of monetary policy and economic growth have evolved quickly over time, and are dominated by dissimilarities, obscurities and indecisiveness [5]. Of those, classical monetary theory is the first and well-known theory of monetary policy. This theory is preserved under the Irving

Fisher quantity theory of money. Irving Fisher quantity theory of money put the basis of relationship between monetary policy (money) and economic variables. The theory believes both velocity of money and out (economic growth) to be constant. Consequently, whichever increase in the amount of money will only ultimately increase prices proportionally in accordance with the quantity theory. Only real factors influence long run growth, while, money supply played as neutral in both short and long run [6].

Keynesians theorist thought that money supply, via its transmission mechanism, follow indirect result on the real gross domestic product. Monetarists agree with Keynes, therefore, for the short run period the economy does not work at full employment, hence, in the long run, the expansionary monetary policy might work positively. The monetarists also support classists' theory viewer in which the increase in money supply leads to an increase in inflation only. Therefore, they proposed/recommend that the policy necessity accommodate increase in real gross domestic product without altering the price level [7]. According to the recent economists, the long-run economy growth relied on the improvement of production efficiency or increasing of productivity. There is sustainable economic growth in the long run when a suitable monetary policy is complemented by external factors of suitable liquidity, interest rate, robust demand, soft assistance from the world bank of the financial institutions and debt postponement [8].

The history of monetary policy of Ethiopia dates back to 1943 when the state bank of Ethiopia was established. In Ethiopia, practicing of monetary policy was supposed to set in 1963, during the monarchical regime, during which the national bank of Ethiopia was formed by proclamation 206 of 1963, and the bank was officially entitled "administrative autonomy and juridical personality". After the imperial regime replaced by the rule of communist regime (1974-1991) the monetary variables were under the strict command of the central bank, where interest rates was fixed to restrict the private sector participation in the economy. After the change communist of government, the country has experienced radical shift in the sphere of political economy. Monetary and Banking Proclamation of 1994 established the Monetary Authority as a judicial entity, separated from the governments and allowed private banks and insurance companies and other financial institutions to operate in the industry [9].

The main objective of the national bank of Ethiopia is keeping price and exchange rate steadiness and provides support for sustainable economic growth. Price stability is a proxy for macroeconomic stability, which is very important in private sector economic decision on investment, consumption, international trade and saving. Finally, macroeconomic steadiness nurtures employment and economic growth. National bank of Ethiopia; the monetary policy authority in Ethiopia has the right to limit and setting minimum interest rates on deposits or rediscount rate charged to commercial banks, changing commercial bank reserve holding through open market purchases or sales of government securities, setting reserve requirements on deposits, regulatory actions to set minimum capital requirements, and intervene in foreign exchange markets to buy and sell local currency for foreign exchange [1].

There is a fluctuation in reserved requirements in Ethiopia. In 1996, the national bank of Ethiopia set the reserve requirement at 10% of all birr and foreign currency deposit liabilities are held in the form of demand (current) deposits, saving deposits and time deposits by directive no sbb/14/96 [10]. The first reserve requirement was later on amended in 2004 by directive no sbb/37/04 to be reduced to 5% [11]. Then in 2007, it changes to 10% [12]. The fourth amendment was done in 2008. It was 15% [13]. The fifth amendment, that is directive no sbb /46/12 was introduced after four years in 2012 reducing reserve requirement back to 10% [14]. After only a year the NBE comes up with directive no sbb/55/13 to decrease reserve requirement yet again to 5% [15]. The higher reserve requirement contracts the liquidity as well as credit expansion power of commercial banks and the opposite will increase liquidity and credit expansion power of bank [16].

Issues concerning the impact of money policy on real economy have always been an area of great interest for economists and policymakers. This is because monetary policy is one of the most powerful instruments for monetary authorities to influence important macroeconomic variables.

Most studies conducted in Ethiopia are done in separate way i.e. monetary policy with specific variables but not linked with general Ethiopian economy. Studies such as monetary policy effect on the private sector investment by [17], relationship between inflation and money supply with other researcher [18, 19] showed money supply and price in Ethiopia.

Taking in to consideration of the above justification, it is a fact that there is a literature gap and understanding with regard to monetary policy effect on economic growth in Ethiopia which require further studies in order to fill these gaps. Therefore, unlike the previous studies conducted in Ethiopia, this research was carried out to show and justify the long run and short run effect of monetary policy on Ethiopian economy.

The general objective of the study was to investigate the effect of monetary policy on economic growth in Ethiopia.

Specific objectives:

1. To examine the short run effect monetary policy on economic growth in Ethiopia.
2. To investigate the long run effect of monetary policy on economic growth in Ethiopia.
3. To test the causal relationship between monetary policy and economic growth in Ethiopia.

2. Research Methodology

In this part research design, source of data, method of data analysis and model specification were included.

2.1. Data Source

The study was used secondary data which covered from

the years 1980 to 2019 in order to understand the effect of monetary policy on economic growth in Ethiopia.

2.2. Model Specification

In order to examine the effect of money supply on economic growth, The Keynesian IS-LM function was served as a platform on which the empirical model was formulated below. Following McCallum (1991), there are different scholars that use this model. According to [20, 7] the variables used for such research were real gross domestic product, money supply, interest rate, inflation rate, exchange rate and external reserve. Nevertheless, investment proxied by gross capital formation was used in addition to that mentioned in the above. This was due to that investment has theoretically and empirically direct influence on the economic growth. Then the following equation was derived.

$$logRGDP_t = f(INF_t, ER_t, RIR_t, RR_t, logGCF_t, logMS_t) \quad (1)$$

$$logRGDP_t = \beta_0 + \beta_1 INF_t + \beta_2 ER_t + \beta_3 RIR_t + \beta_4 RR_t + \beta_5 logGCF_t + \beta_6 logMS_t + \mu_t \quad (2)$$

Where;

$RGDP_t$=real gross domestic product, INF_t=inflation rate, ER_t=exchange rate, RIR_t=real interest rate, RR_t=reserved requirement, GCF_t =gross capital formation, MS_t =money supply which is broad money, μt=random disturbance, B_0=intercept, βi=slopes and t refers time.

2.3. Estimation Strategies

2.3.1. Unit Root Test

There are different conventional unit root tests like ADF, DF-GLS and PP to test the stationarity of variables with common problem which provide biased and spurious results because they ignore structural break in the series [21, 22]. Zivot and Andrews [23] and Clemente (CMR hereafter) [24] unit root tests were employed to avoid the aforementioned problems. One obvious weakness of the Zivot–Andrews strategy, as well to similar tests proposed by Perron and Vogelsang, is its inability to deal with more than one break in a time series. This problem could address by [24] proposed tests that would allow for two events within the observed history of a time series, either additive outliers (the AO model, which captures a sudden change in a series) or innovational outliers (the IO model, allowing for a gradual shift in the mean of the series).

Zivot and Andrews used to test the stationarity of the variables in the presence of single structural break point in the series with three models. (1) model A, which permits a one-time change in the level of the series; (2) model B, which allows for a one-time change in the slope of the trend function, and (3) model C, which combines one-time changes in the level and the slope of the trend function of the series. Hence, to test for a unit root against the alternative of a one-time structural break, Zivot and Andrews use the following regression equations.

Model A

$$\Delta Y_t = c + \alpha Y_{t-1} + \beta_t + \gamma DU_t + \sum_{j=1}^{k} dj\, \Delta Y_{t-j} + \varepsilon_t$$

Model B

$$\Delta Y_t = c + \alpha Y_{t-1} + \beta_t + \theta DT_t + \sum_{j=1}^{k} dj\, \Delta Y_{t-j} + \varepsilon_t$$

Model C

$$\Delta Y_t = c + \alpha Y_{t-1} + \beta_t + \theta DU_t + \gamma DT_t + \sum_{j=1}^{k} dj\, \Delta Y_{t-j} + \varepsilon_t$$

Where;

DUt is an indicator dummy variable for a mean shift occurring at each possible break-date (TB) while DTt is corresponding trend shift variable.

The mathematical presentations of CMR unit root test for the two models are presented below.

Additive outlier model

The test procedure is as follows. First, the deterministic part of the series was removed by estimating the following model:

$$Y_t = \mu + \delta_1 DU_{1t} + \delta_2 DU_{2t} + \tilde{y}_t, t = 1,2, \ldots . T \quad (3)$$

Second, the test was carried out by searching for the minimal t statistic for hypothesis in the following regression:

$$\tilde{y}_t = \sum_{i=0}^{k} \omega 1i D(TB)_{1t-i} + \sum_{i=0}^{k} \omega 2i D(TB)_{2t-i} + \rho \tilde{y}_{t-1} + \sum_{i=1}^{k} ci\, \Delta \tilde{y}_{t-1} + \epsilon_t, t = k+2, \ldots \ldots \ldots, T \quad (4)$$

Where; DUit=1 if t > Tbi and 0 other wise, Tbi are the break dates, D (TB) it=1 if t=Tbi+ 1 and 0 otherwise.

The equivalent model for the innovational outlier (gradual change) model is expressed as

$$Y_t = \mu + \delta_1 DU_{1t} + \delta_2 DU_{2t} + \theta_1 D(TB)_{1t} + \theta_2 D(TB)_{2t} + \rho Y_{t-1} + \sum_{i=1}^{k} ci \Delta Y_{t-i} + \epsilon_t \quad (5)$$

In each of these models, the breakpoints Tb1, Tb2 and the appropriate lag order k are unknown. The breakpoints are located by a two-dimensional grid search for the maximal (most negative) t-statistic for the unit-root hypothesis (α=1), while k is determined by a set of sequential F -tests.

2.3.2. Co-integration Analysis

In this study, the short run and long run dynamic relationship between monetary policy and economic growth in Ethiopia was estimated by the newly proposed ARDL bound test approach which was initially introduced by [25]. The ARDL approach does not involved in pre testing variables, which means that the test on the existence of the relationship between variables in levels is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1) or mixture of both. This futures alone, gave

the characteristics of the cyclical components of the data, makes the standard of co integration technique unsuitable and even the existence of unit root test to identify the order of integration were still highly questionable. Furthermore, the ARDL method avoids large number of specifications to be made in the standard co integration test. These include decision regarding the number of endogenous and exogenous variables (if any) to be included, the treatment of deterministic element, as well as the optimal number of lag to be specified [26]. It also avoids the uncertainties created by pre-testing for unit root [27, 28]. ARDL approach is also possible for those variables that had different optimal lag length, which could impossible for the standard co integration test. It is also important for small sample data (30 up to 80 observations) in which the set of critical value were developed by [29]. The bounds testing approach is convenient for small sample data, unlike the other co integration approach [26].

The decision was depend on F- statistics. If the F test statistics exceeds the upper critical value, it is concluded that there is evidence for the long run relationship between variables regardless of order of integration of variables. If F test statistics is less than the upper critical value, we cannot reject the null hypothesis of no co integration and if it lies between the upper and lower critical value conclusive inference cannot made without knowing the order of integration of regressors.

The ARDL approach encompasses two steps for estimating the long-run relationship. The first step is to examine the existence of long-run relationship among all variables in an equation and the second step is to estimate the long run and short run coefficients of the model. We run the second step only if there is a co- integration relationship in the first step [26].

The generalized equation of ARDL (m, n) was as follows:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \cdots + \beta_p Y_{t-m} + \alpha_0 X_t + \alpha_1 X_{t-1} + \alpha_2 X_{t-2} + \cdots + \alpha_q X_{t-n} + \varepsilon_t \quad (6)$$

Here, m and n are the number of years for lag, εt is the disturbance terms and βi's are coefficient for short run and αi's are coefficients for long run relationship. For further illustration of co integration test, long term and error correction model was developed based on the following procedures, taking ARDL (1, 1) for simplicity.

$$\mathrm{Y_t} = \beta_0 X_t + \beta_1 X_{t-1} + \varepsilon_t \quad (7)$$

By subtracting Yt-1 from both sides of we get the following equation;

$$\mathrm{Y_t} - \mathrm{Y_{t-1}} = \beta_0 X_t + \beta_1 X_{t-1} - \mathrm{Y_{t-1}} - \beta_2 Y_{t-1} + \varepsilon_t \quad (8)$$

$$\Delta Y_t = \beta_0 X_t + \beta_1 X_{t-1} + (\beta_2 - 1) Y_{t-1} + \varepsilon_t \quad (9)$$

Let (β_2-1)=α, then we will get the following equation:

$$\Delta Y_t = \beta_0 X_t + \beta_1 X_{t-1} + \alpha Y_{t-1} + \varepsilon_t \quad (10)$$

$\Delta X_t = X_t - X_{t-1}$; Hence, $X_t = \Delta X_t - X_{t-1}$, then equation (10) can be rewrite as follow:

$$\Delta Y_t = \beta_0 \Delta X_t + (\beta_0 + \beta_1) X_{t-1} + \alpha Y_{t-1} + \varepsilon_t \quad (11)$$

Let $\beta_0 + \beta_1 = \Phi$, then equation (11) can be rewrite as

$$\Delta Y_t = \beta_0 \Delta X_t + \Phi X_{t-1} + \alpha Y_{t-1} + \varepsilon_t$$

$$\Delta Y_t = \beta_0 \Delta X_t + [\Phi X_{t-1} + \alpha Y_{t-1}] + \varepsilon_t \quad (12)$$

Then we multiply $[\Phi X_{t-1} + \alpha Y_{t-1}]$ by $\frac{\alpha}{\alpha}$, and we will get equation 13

$$\Delta Y_t = \beta_0 \Delta X_t + [\Phi/\alpha X_{t-1} + \alpha Y_{t-1}] + \varepsilon_t \quad (13)$$

Thus, the error correction model can be written as:

$$\Delta Y_t = \beta_0 \Delta X_t + \alpha[\gamma X_{t-1} + Y_{t-1}] + \varepsilon_t \quad (14)$$

Let $\gamma = -\Phi/\alpha = -(\beta_0 + \beta_1)/\alpha$, then equation 15 can be rewrite as

$$\Delta Y_t = \beta_0 \Delta X_t + ((\beta_2 - 1)[-\beta_0 + \beta_1)/(\beta_2 - 1 X_{t-1} + Y_{t-1}] + \varepsilon_t \quad (15)$$

From this equation we got

$$\Delta Y_t = \beta_0 \Delta X_t + \alpha ECT_{t-1} + \varepsilon_t \quad (16)$$

Where α=β_2-1 is the error correction parameter that measures the speed of adjustment; and

$$[-\beta_0 + \beta_1)/(\beta_2 - 1 X_{t-1} + Y_{t-1}] = ECT_{t-1}$$

Is error correction term lagged by one period.

The above equations were used to know how to get the error correction term (ECT_{t-1}).

Then by adding an intercept, time trend and dummy variables (if any), we can rewrite our ECM model in the following general form:

$$\Delta Y_t = c + \theta + \beta_0 \Delta X_t + \alpha ECT_{t-1} + \lambda \mathrm{D}_n + \varepsilon_t \quad (17)$$

Hence, to test for co-integration among the variables of this study, following the ARDL approach proposed [26]. the ARDL was expressed as unrestricted error correction model (UECM) as follow:

$$\Delta RGDPt = \beta 0 + \sum_{i=1}^{n} \beta 1\, \Delta RGDPt - i + \sum_{i=1}^{n} \beta 2\, \Delta INF\ t - i + \sum_{i=1}^{n} \beta 3\, \Delta \mathrm{RR\,t} - i + \sum_{i=1}^{n} \beta 4\, \Delta MS\ t - i + \sum_{i=1}^{n} \beta 5\, \Delta GCF\ t - i + \sum_{i=1}^{n} \beta 6\, \Delta RIR\ t - i + \sum_{i=1}^{n} \beta 7 \Delta ER\ t - i + \theta_0\, RGDPt - 1 + \theta_1\, INFt - 1 + \theta_2\, RRt - 1 + \theta_3\, MSt - 1 + \theta_4\, GCFt - 1 + \theta_5\, ERt - 1 + \theta 6\, RIRt - 1 + \mu t \quad (18)$$

Where RGDP is real gross domestic product, INF is inflation rate, RR is reserved requirement, MS is money supply, GCF is gross capital formation, ER is exchange rate and RIR stands to real interest rate. The residual term is denoted by μt which is assumed to be white noise, n is the optimal lag length. The parameters θi (i=0, 1, 2, 3, 4 5, and 6)

are the long run model coefficients and βi are the coefficients for the short run model. To test whether there is a long run equilibrium relationship between the variables; bounds test for co- integration was carried out as proposed by [26]. The hypotheses are: Ho:=means there is no long run relationship among the variables (Ho=$\theta_0=\theta_1=\theta_2=\theta_3=\theta_4=\theta_5=\theta_6=0$); and Ha=$\theta_0$. It means there is a long run relationship among the variables. After confirming the existence of long-run relationship among the variables, the following stable long-run model was estimated:

$$\text{RGDPt}=\beta 0+\sum_{i=1}^{n}\beta 1\ RGDPt-i+\sum_{i=1}^{n}\beta 2\ INF\ t-i+\sum_{i=1}^{n}\beta 3\ \text{RR t}-\ i+\sum_{i=1}^{n}\beta 4\ MS\ t-i+\sum_{i=1}^{n}\beta 5\ \Delta GCF\ t-i+\sum_{i=1}^{n}\beta 6\ ER\ t-i+\ \sum_{i=1}^{n}+\sum_{i=1}^{n}\beta 8\ RIRt-i+\mu t \quad (19)$$

On the other hand, the short run dynamic relationship was estimated by error correction model (ECM) specified as:

$$\Delta\text{RGDPt}=\beta 0+\sum_{i=1}^{n}\beta 1\ \Delta RGDPt-i+\sum_{i=1}^{n}\beta 2\ \Delta INF\ t-i+\sum_{i=1}^{n}\beta 3\ \Delta\text{RR t}-\ i+\sum_{i=1}^{n}\beta 4\ \Delta MS\ t-i+\sum_{i=1}^{n}\beta 5\ \Delta GCF\ t-i+\sum_{i=1}^{n}\beta 6\ \Delta ER\ t-i+\ \sum_{i=1}^{n}+\sum_{i=1}^{n}\beta 8\ \Delta RIRt-i+\alpha\ ECTt-1+\mu t \quad (20)$$

After estimating the long run and short run model, normality test, serial correlation test, heteroscedasticity test and cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) test for stability of the model were undertaken to check the robustness of the model. The optimal lag periods of the model were determined according to the Akaike Information Criterion (AIC).

2.3.3. Granger Causality Test

In granger causality test, the attempt was to test in which direction goes the influence of one variable to another, i.e. whether x variable influences on the movement of y variable. Using Granger test we go from the assumption that if variables do not influence each other, we reject the null hypothesis when the calculated value of F statistics is bigger than theoretical value. It is said that one variable influences the other if coefficients that stand with the variable are statistically significant.

The null hypothesis was, Ho=monetary policy does not Granger cause economic growth and economic growth does not cause monetary policy; then the alternative hypothesis became H_1=monetary policy does Granger cause economic growth and economic growth does Granger cause monetary policy. Pairwise granger causality test was employed to see the causal relationship between the variables.

3. Results and Discussion

3.1. Unit Root

To check the stationarity property, unit root tests [23, 24] was employed. This is necessary in order to avoid the use of spurious regression, which occurred when non-stationary series are estimate. Results for these tests are present as follows.

Table 1. *Results of Zivot–Andrews unit root test.*

Variable	t-statistics at level	Break time at level	t-statistics at first difference	Break time at first difference
LOGRGDP	-2.876	2002	-5.524**	2007
LOGM2	-3.708	2003	5.165**	2006
LOGGCF	-3.500	2002	-8.85***	1993
RIR	-6.167***	2007	-6.468***	1992
RR	2.582	2007	-7.242***	2012
CPI	-3.218	2007	-5.140**	2007
ER	-3.729	2006	-5.093**	2006

Where *** and ** indicated statistically significant at 1% and 5% level of significant respectively.

The unit root test estimation was conducted by including both trend and intercept. The result showed that except real interest rate (RIR) all the series showed unit root problem at their level. The calculated test statistic had a value of -6.167 (Table 1) which was greater than the critical values of 1%, 5% and 10%, which were -5.57, -5.08 and -4.82, respectively. However, the series were stationary at first difference I (1) at 5% level of significance. Since all the variables were stationary, further estimation of the possible relationship that might exist among the variables was possible.

Table 2. *Results of the Clemente-Montanes-Reyes Unit-Root Test with Double Mean Shifts.*

Variables	Innovative outliers			Additive outliers		
	t-statistics	TB1	TB2	t-statistics	TB1	TB2
	At level					
LOGRGDP	-1.142	1991	2003	-2.829	1997	2009
LOGM2	-1.848	2003	2009	-2.674	1997	2012
LOGGCF	-3.391	1991	2006	-3.218	1996	2009

Variables	Innovative outliers			Additive outliers		
	t-statistics	TB1	TB2	t-statistics	TB1	TB2
	At level					
RIR	-8.560**	1990	2007	-7.849**	1989	2006
RR	3.424	2006	2015	-1.056	2007	2016
CPI	0.603	2006	2010	-1.656	2008	2013
ER	-2.029	1992	2008	-1.354	1995	2012
At first difference						
LOGRDGP	-6.304**	1991	2003	-6.119**	2006	2012
LOGM2	-5.950**	2003	2009	-5.539**	1995	2010
LOGGCF	-5.566**	1991	2007	-5.674**	1990	2008
RIR	-8.560**	1990	2007	-7.849**	1989	2006
RR	-5.619**	2006	2013	-7.836**	2005	2009
CPI	-6.403**	2006	2010	-5.627**	2008	2013
ER	-6.148**	1993	2007	-5.535**	1996	2012

Where ** indicated statistically significant at 5% critical value.

The result of the unit-root [24] test showed that except real interest rate all other series were stationary at first difference (Table 2). Their statistical values were greater than the critical values of the test (-5.49) which it is possible to test the existence of a long-run relationship between real gross domestic product, gross capital formation, money supply, real interest rate, consumer price index, reserve requirement and exchange rate in the presence of double structural break in the series over the period of 1980–2019. To perform the ARDL bound test approach of co-integration; it needs selection of appropriate lag length. So Akakie Information Criterion (AIC) was employed to determine the optimal number of lag of the variables. Therefore, according to Akaike Information Criterion, the selected lag of the model was (4, 4, 4, 4, 4, 4, 4).

Then, F-test was used to investigate the long-run relationship among real gross domestic product, gross capital formation, money supply, consumer price index, real interest rate, reserve requirement and exchange rate in Ethiopia in the study period.

3.2. Long Run ARDL Bounds Tests for Co-integration

Based on the stationarity test result, ARDL bound test for co integration test was done.

Table 3. *Results of ARDL bounds test.*

Test statistics	Value	Significance	I(0)	I(1)
F-statics	54.84666	10%	1.75	2.87
		5%	2.04	3.24
K	6	2.5%	2.32	3.59
		1%	2.66	4.05

Source: Author's computation

The Long Run ARDL bounds tests for co-integration result showed that the calculated F statistics (54.84666) was greater than the upper bounds of critical values (4.05) at 1% significance levels (Table 3). Hence, the null hypothesis of non-existence of a long-run relationship would be rejected. The result verified that there was significant long run relationship between real gross domestic product and gross capital formation, money supply, consumer price index, real interest rate, reserve requirement and exchange rate.

3.3. Long Run Estimation Model

The stable long-run relationship between the variables was estimated in accordance with ARDL model specified in equation, 19 after the long-run co- integration relationship among the variables had been confirmed. The long run coefficients are put in the table below that was computed using the Autoregressive Distributed Lag Approach:

Table 4. *Long run estimation.*

Variables	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-0.006348	0.003910	-1.623499	0.2460
ER	-0.345779	0.013147	-26.30148	0.0014
LOGGCF	0.926181	0.113049	8.192712	0.0146
LOGM2	0.476934	0.106609	4.473652	0.0465
RIR	0.060167	0.006883	8.741081	0.0128
RR	0.000174	2.04E-05	8.556661	0.0134
Constant	-2.353804	19.86246	-0.118505	0.0249

Source; Author's computation, Dependent variable=LOGRGDP

In the long run, consumer price index had no statistical significant effect on economic growth (Table 4). Because it may be the monetary authority (national bank), play a great degree of autonomy for managing price stability in Ethiopia. The result was in line with the findings of [20] who reported that economic growth was not significantly influenced by domestic level of inflation.

Exchange rate resulted in a negative statistical effect on economic growth at 1% level of significance in Ethiopia. Likewise [30, 31] reported that exchange rate had not a power in promoting economic growth in the long- run period. In addition, the result showed that a 1% increase in exchange rate would leads to a decline of economic growth by 0.34, keeping other things constant.

The result showed that gross capital formation resulted in positive effect for economic growth in Ethiopia (Table 4). The increase in gross capital formation by 1%, would lead to 0.93 increases in economic growth. gross fixed capital

formation had positive and significant impact on economic growth for the long run [32].

Money supply was influenced economic growth positively and the increase in money supply by 1% would leads to 0.48 increases in economic growth, other things remain constant. This is due to that an increase in money supply could lower local interest rate compared to global interest rate. As a result, firms could increase their production through available loan with low interest rate [33]. In addition, money played as important instrument in all economic transactions [34]. Similar to this finding, money supply has a positive effect and a strong impact on economic growth [35-37, 32].

Real interest rate had positive and statistical significant effect on economic growth in Ethiopia while the increase in 1% the real interest rate would leads to 0.06 increases on economic growth. This is due to the fact that, real interest rate is a tool that can be used to motivate investors, having control over them makes national bank, to some extent, have influence over economic decisions, which in turn affect economic output of a country (Lut and Moolio, 2015). [32] Reported that real interest rate had positive effect on the economic growth in the long run. [31] Also showed that economic growth and interest rates had positive linkage and positive relation was existed among economic growth and money supply.

Reserve requirement showed positive and statistical significant effect on economic growth in the long run in Ethiopia. An increase in reserve requirement by 1% would leads to 0.000174 increases in economic growth. This might be due to that reserve requirements typically had fiscal motives and have long been viewed as a source of "financial repression" in developing economies (McKinnon. 1973; Fry. 1995). In addition, reserve requirements can help to accelerate economic growth through public spending, when public investment might depend on sources of government revenue and the domestic credit [38, 39]. In similar to this result [20, 40] reported that external reserve was a key monetary policy instruments that had positive effect and high impact for economic growth. From the above table the long run model was written as follows.

$$LOGRGDP=-2.353804 - 0.345779ER + 0.926181LOGGCF +0.476934LOGM2 + 0.060167RIR + 0.000174RR$$

3.4. Short Run Error Correction Estimates

In this subsection, the short run Error Correction was estimated to balance in the long term and to clarify the speed of adjustment of any deviation towards in the long-run equilibrium. The short run error correction model was estimated based on the model specified in Equation 20.

Table 5. *ARDL Error Correction Regression Result.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGRGDP(-1))	0.186113	0.028794	6.463537	0.0231
D(LOGRGDP(-2))	0.246311	0.027726	8.883894	0.0124
D(LOGRGDP(-3))	0.207738	0.028441	7.304133	0.0182
D(CPI)	-0.011950	0.000791	-15.11541	0.0043
D(CPI(-1))	-0.015218	0.000829	-18.34719	0.0030
D(CPI(-2))	-0.022099	0.000965	-22.89719	0.0019
D(CPI(-3))	-0.018709	0.001005	-18.62350	0.0029
D(ER)	0.006277	0.002376	2.641521	0.1184
D(ER(-1))	0.093813	0.003374	27.80470	0.0013
D(ER(-2))	-0.054132	0.002874	-18.83739	0.0028
D(ER(-3))	-0.024570	0.002740	-8.968508	0.0122
D(LOGGCF)	0.170112	0.006499	26.17653	0.0015
D(LOGGCF(-1))	-0.095444	0.010170	-9.384982	0.0112
D(LOGGCF(-2))	-0.033770	0.009138	-3.695566	0.0660
D(LOGGCF(-3))	0.095739	0.010180	9.404897	0.0111
D(LOGM2)	0.394423	0.030670	12.86025	0.0060
D(LOGM2(-1))	1.728087	0.051571	33.50885	0.0009
D(LOGM2(-2))	1.276303	0.047119	27.08665	0.0014
D(LOGM2(-3))	0.109670	0.029781	3.682603	0.0665
D(RIR)	0.003472	0.000120	28.81752	0.0012
D(RIR(-1))	-0.011103	0.000333	-33.34986	0.0009
D(RIR(-2))	-0.008799	0.000274	-32.10410	0.0010
D(RIR(-3))	-0.004399	0.000173	-25.42032	0.0015
D(RR)	6.37E-06	5.98E-07	10.66585	0.0087
D(RR(-1))	-5.23E-05	1.60E-06	-32.68917	0.0009
D(RR(-2))	-4.75E-05	1.62E-06	-29.31959	0.0012
D(RR(-3))	-1.45E-05	8.64E-07	-16.83089	0.0035
Constant	2.399850	1.121867	2.139158	0.0407
ECT(-1)***	-0.291860	0.007448	-39.18809	0.0007
R-squared	0.998745	Mean dependent var	0.058624	
Adjusted R-squared	0.994510	S. D. dependent var	0.057888	
S. E. of regression	0.068796	Akaike info criterion	-8.013868	
Sum squared resid	0.000147	Schwarz criterion	-6.782242	

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Log likelihood	172.2496	Hannan-Quinn criter.	-7.583998	
Durbin-Watson stat	3.172091			

Where; '***' indicate statistically significance at 1% level of significance
Source; Author's computation

The coefficient of determination (R-squared) was 0.99874 (Table 5); which implied that about 99.8% of variation in the economic growth rate was attributed to variations in the explanatory variables (gross capital formation, money supply, real interest rate, reserve requirement, exchange rate and inflation). This result of the coefficient of determination (R squared) showed, the regression equation was good enough to be used, and the independent variable to determine the dependent variable were chosen properly i.e. monetary policy could be effectively used to control the Ethiopian economy. The coefficient of estimated lagged ECT was negative and statistically significant at 1% level of significance (Table 5). The result indicated that about 29.2% of variation (the disequilibrium) from the previous period's shock was corrected (converges back) to the long-run equilibrium in every year.

The result showed that the lag value of the real gross domestic product was positive and statistically significant effect on economic growth. Keeping other things constant, an increase by 1% of a one-lag value of real gross domestic product leads to 0.19 increases in the value of current economic growth.

In the short run consumer price index has statistically negative significant effect on economic growth and 1% increase in consumer price index would leads to 0.12 decreases in economic growth, keeping other things remains constant. However, the effect of exchange rate, in the short run it was insignificant for economic growth.

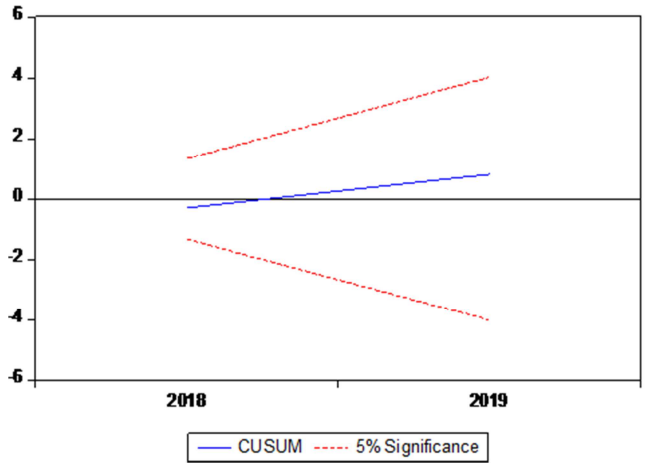
The gross capital formation has statistically positive effect on economic growth (Table 5) and keeping other things constant, a 1% increase in gross capital formation leads to 0.17 increases in economic growth in the study period. Gross fixed capital formation had positive impact on economic growth [32]. In this study, money supply showed positive and statistically significant effect on economic growth in Ethiopia in the study time. The result indicated that when money supply increased by 1%, economic growth also increased by 0.39 keeping other things remains constant. The result was in with [41] that reported positive and statistically significant effect of money supply, exchange rate, inflation and interest rate on economic growth in short run. In addition, Sang (2019) noted money supply has a positive effect and a strong impact on economic growth in the short run.

In addition, the result showed positive and statistically significant effect of real interest rate with economic growth in the short run. Accordingly, when there is a 1% increase in real interest rate, 0.003472 increased in economic growth would be achieved keeping other things remains constant. In support of this result, [41] reported statistically positive significant effect of interest rate on economic growth in short run.

There was also statistically positive significant effect reserve requirement on economic growth in Ethiopia. By keeping other things constant, when there is a 1% increase in reserve requirement, 6.37E-06 increase in economy would be achieved. External reserve served as monetary policy instruments that had positive effect for economic growth [34, 40].

3.5. Diagnostic Test

Diagnostic test was carried out to check the verifiability of the estimated model. There was no error autocorrelation and heteroscedasticity (Table 6) since the value of p-value was greater at 5% level of significant. Therefore, the null hypothesis was not rejected, as there was no serial correlation and heteroscedasticity.



Source: Author's computation using E Views 10

Figure 1. *Cumulative sum of recursive residuals test for stability.*

Table 6. *Test for serial correlation and Heteroscedasticity.*

Breusch-Godfrey	LM	test	for autocorrelation
lags(p)	chi2	df	Prob > chi2
1	2.155	1	0.1421

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	
chi2(1)	2.95
Prob > chi2	0.0858

Source: Author's computation

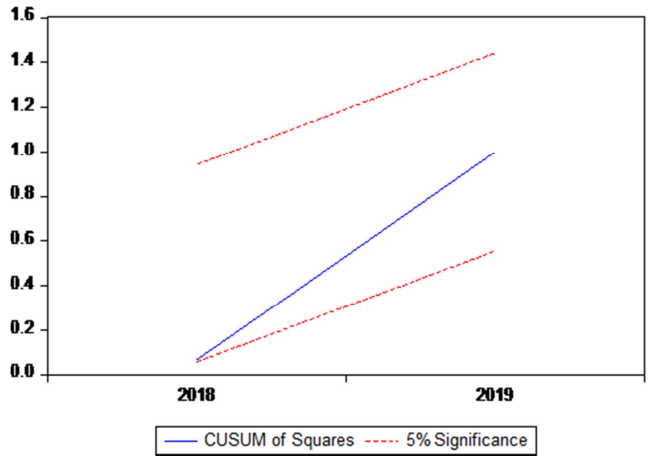
To test for structural stability of the estimated coefficients, cumulative sum (CUSUM) and cumulative sum squares (CUSUMSQ) of the recursive residuals were used. Figures 1 and 2 revealed plots of CUSUM and CUSUMSQ, and statistics were strictly within the 5% critical bounds indicating that all the estimated coefficients of the model

were stable.

Table 7. *Pair wise granger causality test.*

Null Hypothesis:	Obs	F-Statistic	Prob.
LOGRGDP does not Granger Cause CPI	39	5.72593	0.0221
CPI does not Granger Cause LOGRGDP	39	2.00763	0.1651
LOGRGDP does not Granger Cause ER	39	4.18334	0.0482
ER does not Granger Cause LOGRGDP	39	0.19172	0.6641
LOGRGDP does not Granger Cause LOGGCF	39	1.95297	0.1708
LOGGCF does not Granger Cause LOGRGDP	39	3.82931	0.0582
LOGRGDP does not Granger Cause LOGM2	39	10.1913	0.0029
LOGM2 does not Granger Cause LOGRGDP	39	3.52837	0.0684
RIR does not Granger Cause LOGRGDP	39	0.03411	0.8545
LOGRGDP does not Granger Cause RIR	39	1.08613	0.3043
RR does not Granger Cause LOGRGDP	39	1.75318	0.1938
LOGRGDP does not Granger Cause RR	39	1.07925	0.3058

Source; Author s computation using EViews 10



Source: Author's computation using E Views 10

Figure 2. *Cumulative sum of squares of recursive residuals test for stability.*

3.6. Granger Causality Test

Granger causality test is the most famous test to identify the direction of causality. There was causality between real gross domestic product with inflation, exchange rate and money supply at 5% level of significant and causality with gross capital formation at 10% level of significant (Table 7). The direction of causality was, from real gross domestic product to inflation, exchange rate and money supply. Therefore, real gross domestic product causes for inflation, exchange rate and money supply. However, the causality between real gross domestic product and gross capital formation was in inverse direction i.e. gross capital formation causes for real gross domestic product.

4. Conclusions and Recommendations

4.1. Conclusion

The paper examined the impact of monetary policy on economic growth in Ethiopia using time series data from 1980 to 2019. The unit root test result revealed that one variable 9real interest rate) was stationary in both tests at level. However, other variables were stationary at first difference. For the reason, ARDL bound test approach to co integration was applied to establish the long run relationship among the variables and to estimate for both long run and short run effect. In addition, pairwise granger causality approach to granger causality was used to investigate the causal relationship between the series.

The long run estimation result indicated that, most of the monetary policy instruments (real interest rate, money supply and reserve requirement) had positive effect on economic growth in the long term. However, exchange rate has negative statistically significant effect on Ethiopian economy. But, inflation has not significant effect on economic growth. Therefore, the policy needs a revision regarding to this variable.

The short run estimation result indicated that except inflation (consumer price index), other variables had positive significant effect on economic growth in Ethiopia in the study period. However, exchange rate had no significant effect in the short run with positive sign. This indicates that the national bank of Ethiopia does not meet the mission of price stability.

There were causation between real gross domestic product with inflation, exchange rate and money supply at 5% level of significant and causality with gross capital formation at 10% level of significant. The direction of causality was from real gross domestic product to inflation, exchange rate and money supply. However, the causality direction between real gross domestic product and gross capital formation was from gross capital formation to real gross domestic product.

In general, most of the monetary policy instrument (interest rate, reserve requirement and money supply) promotes economic growth. However, exchange rate does not promote Ethiopian economy which requires further revision.

4.2. Recommendation

The main objective of the monetary policy of the National Bank of Ethiopia is to keep price and exchange rate stability and support sustainable economic growth of Ethiopia. Price

stability is a proxy for macroeconomic stability, which is vital in private sector economic decision on investment, consumption, international trade and saving finally, macroeconomic stability promotes employment and economic growth. However, inflation and exchange rate contributes negative effect for Ethiopian economy in the study period.

Therefore, national bank of Ethiopia must preserve the purchasing power of the national currency by ensuring that the level of money supply is generally consistent with developments in the macroeconomic and intervening in the foreign exchange rate market for stabilizing the exchange rate and then to promote economic growth. In addition, to promote economic growth, national banks of Ethiopia should be committed to the mission of price stability.

List of Abbreviations

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
ARDL	Autoregressive Distributed Lag
CUSUM	Cumulative Sum Of Recursive Residuals
ECM	Error Correction Model
ECT_{t-1}	Error Correction Term at Lag One
GDP	Growth Domestic Product
OLS	Ordinary Least Square
MS	Money suuply
UECM	Unrestricted Error Correction Model
VAR	Vector Auto Regression

References

[1] NBE 2009. National bank of Ethiopians Monetary Policy Framework. Ethiopia.

[2] Mengesha M. (2016). MA thesis. The Impact of Monetary Policy on Output and Price in Ethiopia. Addis Ababa University. Addis Ababa, Ethiopia.

[3] Michael C. (2012). Monetary Policy in Developing Countries: The Case of Nigeria. University of Leeds. Nigeria.

[4] Cecchetti G. S. (2000). Making Monetary Policy: Objectives and Rules. Oxford Review of Economic Policy, Ohio State University and Research Associate.

[5] Brunner and Meltzer (1972). Money, Debt, and Economic Activity, *the Journal of Political Economy*.

[6] Mankiw, G. N. and Taylor, M. P (2007). Macroeconomics. (European Edition ed.) Basingstoke: Palgrave Macmillan.

[7] Ufoeze, L. O., Odimgbe, S. O., Ezeabalisi, V. N., & Alajekwu, U. B. (2018). Effect of monetary policy on economic growth in Nigeria: An empirical investigation. Annals of Spiru Haret University, Economic Series, 9 (1), 123-140.

[8] Russell,M. (2010). Monetary policy and interest rates, Ezine articles, What is the monetary policy effect on GDP. Unemployment, inflation and interest rates.

[9] Alemayehu G. (2006). The Structure and Performance of Ethiopia's Financial Sector in the Pre- and Post-Reform Period with a Special Focus on Banking. World institute for development economic research. United Nation University, No. 2006/112.

[10] National Bank of Ethiopia, (1996). Directive No sbb/14/96on amendment on reserve requirement.

[11] National Bank of Ethiopia, (2004). Directive No sbb/37/04on amendment of reserve requirement.

[12] National Bank of Ethiopia, (2007). Directive No sbb/42/07on amendment of reserve requirement.

[13] National Bank of Ethiopia, (2008). Directive No sbb/45/08, amendment of reserve requirement.

[14] National Bank of Ethiopia (2012). Directive No sbb/46/12, on amendment of reserve requirement.

[15] National Bank of Ethiopia (2013). directive No sbb/55/13, on amendment ofreserve requirement.

[16] Gazena E. (2001). Monetary Policy Instruments in Ethiopia.

[17] Demilie Basha Hailu, Fikru Debele (2015). The Effect of Monetary Policy on the Private Sector Investment in Ethiopia: ARDL Co-Integration Approach. Economics, 4 (2), 22-33.

[18] Denbel, F. S., Ayen, Y. W., & Regasa, T. A. (2016). The relationship between inflation, money supply and economic growth in Ethiopia: Co integration and Causality Analysis. International Journal of Scientific and Research Publications, 6 (1), 556-565.

[19] Eyesight, A., and Rao, N. (2015). A co-integration analysis of money supply and price in Ethiopia. nternational Journal of Recent Scientific Research, 3972-3979.

[20] Fasanya, I. O., Onakoya, A. B., & Agboluaje, M. A. (2013). Does monetary policy influence economic growth in Nigeria? Asian Economic and Financial Review, 3 (5), 635-646.

[21] Baum, C. F. (2005). Stata: The language of choice for time-series analysis?. *The Stata Journal*, *5* (1), 46-63.

[22] Waheed, M., Alam, T., & Ghauri, S. P. (2006). Structural breaks and unit root: evidence from Pakistani macroeconomic time series. Available at SSRN 963958.

[23] Zivot E, Andrews DWK (1992) Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. J Bus Econ Stat 10 (3): 251–270.

[24] Clemente, J., Montañés, A., & Reyes, M. (1998). Testing for a unit root in variables with a double change in the mean. *Economics letters*, *59* (2), 175-182.

[25] Pesaran, M. H., Shin, Y., & Smith, R. J. (1996). Testing for the'Existence of a Long-run Relationship' (No. 9622). Faculty of Economics, University of Cambridge.

[26] Pesaran, M. H., Shin, Y. and Smith, R. J. (2001). Bound Testing Approach to the Analysis of Level Relationships, Journal of Applied Econometrics Vol. 16: 289-326.

[27] Hundie, S. K. (2014). Savings, investment and economic growth in Ethiopia: Evidence from ARDL approach to co-integration and TYDL Granger-causality tests. *Journal of Economics and international financ*e, 6 (10), 232-248.

[28] Jalil, A., & Mahmud, S. F. (2009). Environment Kuznets curve for CO_2 emissions: a cointegration analysis for China. Energy policy, 37 (12), 5167-5172.

[29] Narayan, P. (2004). Reformulating critical values for the bounds F-statistics approach to cointegration: an application to the tourism demand model for Fiji (Vol. 2, No. 04). Australia: Monash University.

[30] Agbonlahor O. (2014). The Impact of Monetary Policy on the Economy of the United Kingdom: A Vector Error Correction Model (VECM). European Scientific Journal 10 (16): 1857 -881.

[31] Akalpler E. (2017). Does monetary policy affect economic growth: evidence from Malaysia. Journal of Economic and Administrative Sciences 34 (1): 03-0013.

[32] Gnahe, F. E., & Huang, F. M. (2020). The Effect of Monetary Policy on Economy Growth of WAEMU Countries. Open Journal of Business and Management, 8 (6), 2504-2523.

[33] Mankiw, N. G. (2010). Macroeconomics, 7th Ed. Worth Publishers.

[34] Lut M. and Moolio P. (2015). The Impact of Monetary Policy on Economic Growth in Cambodia. *Journal of Management for Global Sustainable Development* 1: 2415-5799.

[35] Samimi J. and Nouri M. (2011). the Impact of Monetary Policy on Economic Growth in Iran. *Middle East Journal of Scientific Research* 9 (6): 1990-9233.

[36] Onyeiwu, C. (2012). Monetary policy and economic growth of Nigeria. Journal of Economics and Sustainable development, 3 (7), 62-70.

[37] Sang, T. M. (2019). Impact of Monetary Policy on Economic Growth: Empirical Evidence in Vietnam. International Journal of Social Science and Economics Invention, 5 (10).

[38] Basu, P. (2001). 'Reserve Ratio, Seigniorage and Growth', Journal of Macroeconomics, Vol. 23, pp. 397-416.

[39] Eun Y. O. (n.d). Reserve Requirements and Economic Growth: the Case of South Korea.

[40] Vinayagathasan, T. (2013). Monetary policy and the real economy: A Structural VAR Approach for Sri Lanka. National Graduate Institute for Policy Studies, 13 (13), 1-31.

[41] Ahmad D., Afzal M. and Ghani U. (2016). Impact of Monetary Policy on Economic Growth Empirical Evidence of Pakistan. *International Journal of Applied Economic Studies* 4 (6): 2345-5721.