DOES INFLATION HAMPER DOMESTIC CREDIT TO PRIVATE SECTOR IN ETHIOPIA?

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ABSTRACT

The study examines the effect of inflation on domestic credit to private sector in Ethiopia using inflation and Gross National Savings as regressors. From the Autoregressive Distributed Lag model, we confirmed presence of a unique co-integrating equation among the variables. Our long run results show a significant negative effect of inflation (proxied by consumer price index) on domestic credit to private sector, whereas gross national saving has strong positive impact. The dynamic results from Error Correction Model suggest that inflation substantially depresses availability of domestic credit to private sector in the short run too. Given the usually high and volatile inflation in Ethiopia, this result is highly anticipated. On the other hand, from the short run dynamic results, a strong positive causation is evidenced between domestic credit to private sector and its lagged values. Our findings imply that maintaining reasonable level of inflation and boosting national savings are requisite in expanding and sustaining domestic credit to private sector in Ethiopia.

Keywords*: Effect of Inflation, Availability, Domestic Credit, Private Sector, Ethiopia*

JEL CLASSIFICATION: E51. G21. O16

INTRODUCTION

The vitality of services by financial institutions (like banks, insurance companies and financial markets) in promoting economic growth has long been advocated by

many scholars like Danthine & Donaldson (2005), Hubbard(1995), Levine (1997), McKinnon (1973), Shaw (1973) and Schumpeter (1911) cited in King & Levine (1993). Likewise, researchers such as Ahiawodzi & Adade (2012), Aliero et al.(2013) and Sutton & Jenkins (2007) underscored the instrumental role of private credit in boosting business activities and in driving economic growth of a country at large. Put in a nutshell, the available stock of evidence generally suggest that, in modern economic scene, businesses from Micro and Small Enterprise (SMEs) to big conglomerates highly depend on financial services like loan services, equity financing, trade credit etc., in performing their daily exchanges and production activities and in undertaking their long run investments. It is also verified by various theoretical and empirical studies that excessive inflation could sabotage the efficiency of financial intermediaries in providing these services, which is likely to be the case in Ethiopia too.

Though Ethiopia registered a decade long remarkable economic growth (starting from 2004), the performance of financial sector remained low, which is due to a number of interplaying factors. While problems like restrictive policy framework and closed nature of the sector, lack of good governance, weak institutional setting, rampant corruption and other rent seeking practices are predominantly sited as explanations for the poor performance of financial intermediaries like banks and insurance companies, the effect of inflation is usually underemphasized by researchers and policy makers alike. Despite the usually high and volatile inflation in the Country, the specific connection between inflation and private credit remained blurry due lack of adequate and conclusive evidence.

Hence, our study examined the effect of inflation on domestic credit to private sector in Ethiopia based on 36 years' time series data(i.e. from 1980-2015). The data is

obtained from World Bank (WB) and IMF databases. The dependent variable of the study is Domestic Credit to Private Sector (DCPS), while the regressor variables are Gross National Saving (GNS) and Inflation. To check for the consistency of effect of inflation on DCPS, the Consumer Price Index (CPI) and Gross Domestic Product (GDP) deflator are used as a proxy for inflation one after the other. All variables are transformed to natural logarithm form to reduce the skewness of the data series and denoted as LNDCPS, LNGNS, LNCPI and LNGDPDFL respectively; and necessary diagnostic tests are applied accordingly. Auto Regressive Distributed Lag (ARDL) model or bound testing approach is employed to verify long-run relationship between the variables under consideration. Restricted Error Correction Model (UECM) is also generated through simple linear transformation to test for short run dynamics.

Our ARDL bound testing result shows the presence of a unique long run co-integrating equation among the variables, where inflation (proxied by CPI) has a significant negative effect on domestic credit to private sector, whereas gross national saving has strong positive long run effect. In the short run, domestic credit to private sector is affected positively and strongly by its own lagged values, while the effect of inflation is strongly negative. The short run deviations adjust to long run equilibrium at the rate of 61.85% per year when log CPI is used as proxy for inflation, though it slow down to 40.86% when GDP deflator is used in lieu of CPI. Given, the usually explosive and high inflation rate in Ethiopia, the strong adverse effect of inflation on DCPS is in line with our prior expectation.

The rest of the paper is organized as follows: section 2 contains some stylized facts about inflation, GDP, GNS, and DCPS in Ethiopia. Review of related literature is presented under section 3, while Model specification is covered under section 4. Estimation results are presented and

discussed under section 5. Section 6 presents conclusion & policy implications.

SOME STYLIZED FACTS ABOUT GDP, GNS, DCPS AND INFLATION IN ETHIOPIA

It is evident from figure-1 that the GDP of the country has been rising since 2004. This is mainly because of rapid growth of the service sector and the construction industry. The expansion of light manufacturing industries (such as textile, garment, leather etc.), growth in horticulture and floriculture investment, and improved agricultural production also contributed to this GDP upsurge. Both Gross National Savings (GNS) and Domestic Credit to Private Sector (DCPS) started ascending somehow after 1995/1996, mainly due to the opening/expansion of private as well as state-owned banks, insurance companies, and microfinance institutions following the socio-economic and political reforms introduced during the aftermath of the demise of military regime in 1991.The implementation of savings for condominium housing and introduction of some mandatory savings like private pension contribution and others might also contributed to the further increase in GNS during recent years (see figure-1).

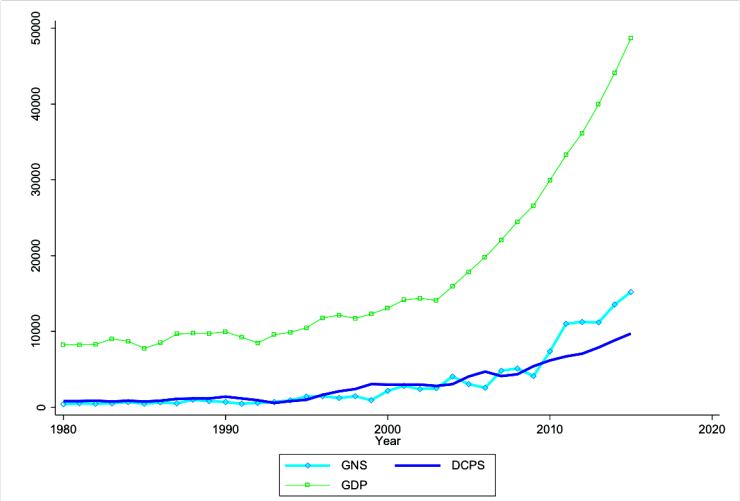


Figure-1: The Trend of GDP GNS and DCPS in Ethiopia (1980-2015)

It is also noted that the CPI of the country continuously increased over the entire study period, exhibiting a positive correlation with the fast economic growth that has been registered since 2004. This could be due to a number of interplaying factors like inadequate growth in aggregate supply as compared to aggregate demand, inflation expectation, persistent budget deficit and excessive supply of broad money (at times by printing money), successive currency devaluation and rising imported inflation, market inefficiencies and other institutional and structural problems.

As portrayed in figure-2, both GNS and DCPS growth rates had been so erratic over the study period. Similarly, growth in GDPC was swinging somehow up until 2004, but became steady at relatively higher level afterwards. Inflation rate is no exception as it also remained so volatile. It appears that both GNS & DCPS growth rates and inflation rate tends to swing around GDPC growth rate. The relationship between the trend of DCPS growth rate and inflation rate

also looks markedly negative. Somehow, both rates also exhibit an upward trend over the period under consideration.

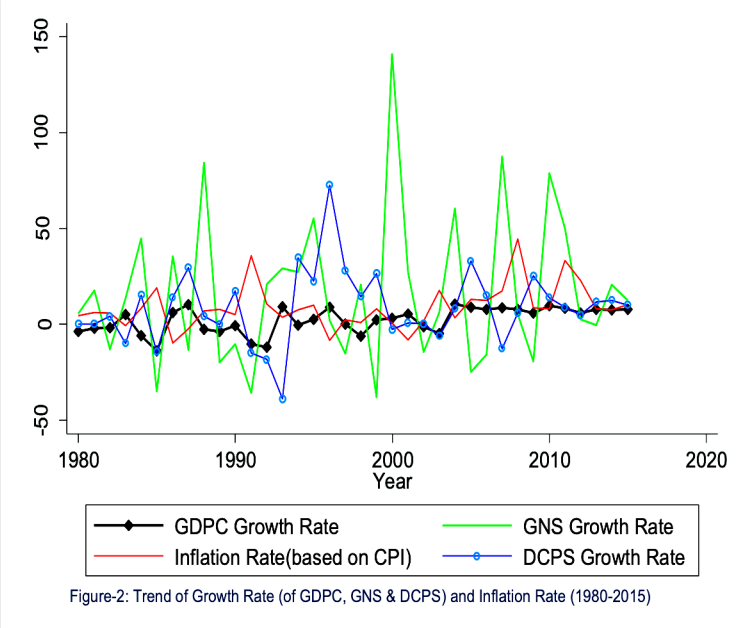


Figure-2: Trend of Growth Rate (of GDPC, GNS & DCPS) and Inflation Rate (1980-2015)

Despite the long run upward trend of DCPS growth rate, availability of domestic credit to private sector has remained a serious constraint in Ethiopia, partly due to the slow and shaky growth in GNS, and also because of the stiff competition from state run enterprise and projects over the limited loanable fund. Likewise, the prolonged high inflation in Ethiopia might have weakened the overall macroeconomic performance and the availability DCPS as well.

Though the graphical depictions presented above are useful in grasping the apparent relationships between the variables under study, it is not possible to establish the specific link between inflation and DCPS from the graphs. Hence, an ARDL model (presented under section 4) is used to verify the effect of inflation on DCPS, and the regression results are reported under results and discussion section.

THEORETICAL AND EMPIRICAL LITERATURE

Most theoretical literatures on inflation-growth nexus suggest that, beyond certain threshold, inflation negatively affects credit market performance in general and availability of private credit in particular. For instance, Choi et al. (1996) argued that, excessive inflation creates credit market frictions and weaken the real saving and borrowing interest rates, which may encourage borrowers, but discourage savers. Consequently, the gap between demand for and supply of investment finance become exacerbated, which gives rise to credit rationing and constrain long run real economic activities. In line with this, Azariadis & Smith (1996) noted that high rate of inflation squeezes returns on financial assets like currency and deposit via inflation tax. This may induce illegitimate (risky borrowers) to divert loan to unproductive investments like holding consumption inventories so as to conceal their risky actions from lenders using their private information advantage. And, high and rising inflation rate excites such illegitimate borrowers to divert and invest more and more resources in such unproductive assets. To control such precarious behaviour, lenders impose stringent credit rationing, which in turn dwindles availability of loanable fund for productive physical investments (Ibid).

Similarly, Bose (2002) indicated that, besides its tax effect, inflation rate exceeding certain critical level could trigger lenders to adopt more restrictive lending procedures. Using endogenous growth model, Bose explained that lenders facing information asymmetry could classify risky borrowers using costly information acquisition like screening (at the time of high inflation) and credit rationing (at the time of low inflation). And, the high cost of screening lessens availability of loanable fund/credit and weakens the growth rate of output, while rationing reduces the fraction of financial resources that can be invested in productive

activities. Hung (2003) also elucidated that, both the level of financial development and inflation rate could sabotage the functioning of credit market and economic growth in countries with high level of initial inflation rate. And, according to Huybens and Smith (1999), under high-steady-state-capital stock, excessive inflation diminishes returns on assets, shrinks the level of [bank] loan/credit services, and thereby constrains long run economic growth.

Generally, most theoretical studies suggest a non-linear relationship between inflation and the allocative efficiency of financial markets. That is, inflation rate surpassing certain critical level is likely to have negative effect on the availability of financial services like credit/loan for investment, and thereby undermine long run economic growth.

Empirical evidence seems to substantiate the aforesaid theoretical explanations. For instance, Boyd et al. (2001) analysed the effect of inflation on financial sector performance using a longitudinal panel data of 100 countries and found that a sustained inflation rate exceeding 15% upsets the efficiency of financial intermediaries like banks. According to them, low to moderate level of inflation is associated with lower credit to private sector and weaker financial sector performance at large. However, such relationship is non-linear, and beyond certain threshold, rising inflation has diminishing marginal effect on financial sector performance (Ibid). Rousseau and Wachtel(2002) also analysed a panel data(1960 to 1995) of 84 countries, and suggested that high inflation increases uncertainty of future prices and returns on investment, limit the depth and breadth of services by financial intermediaries, and constrain the progress of real economic activities.

Zermeno et al.(2014), in their study on the nexus between economic growth, bank credit and inflation in the case of Mexico, used ARDL bound testing approach (based on 1969-2011 data), and confirmed that higher inflation

squeezes availability of bank credit to private sector and reduces the level of liquid liability in an economy. They noted that banks' lending appetite diminishes with rising level of inflation. Similarly, Caglayan and Xu (2016) analysed the effect of inflation volatility on bank loan allocation using longitudinal data (1999-2013) of fifteen (15) European Union (EU) & Non-EU Countries by employing Instrumental Variable(IV) using a Generalized Method of Moment(IV-GMM).As their results suggest, price instability exacerbates uncertainty of expected returns on financial loan and consequently erode the lending confidence of bank managers; which in turn reduces the amount of loan available to businesses. The non-linear and negative effect of excessive inflation on financial sector performance is also reported by other researchers like Bittencourt (2011) in the case Brazil, Phiri(2018) in the case of South Africa, and Zermeno et al.(2018) using a panel data (1980-2010) of 84 countries, among others.

Generally, empirical evidence also indicates the threshold effect of inflation on financial sector performance. However, there is no consistency of evidence on the critical value of inflation, beyond which its negative effect could reveals. While a threshold rate as high as 40% is reported by Bruno & Easterly (1998), others suggested a relatively lower, but different figures i.e. 1-3% for industrial countries and 7-11% for developing countries by Khan and Senhadji(2000); 15% by Boyd et al.(2001); 13-25% by Rousseau and Wachtel(2002); 12% by Baglan & Yoldas(2014); 5.6-15.9% by Baharumshah et al.(2016) and 5.3% by Phiri(2018). Such mixed results suggest the need for context specific studies to understand the effect of inflation on financial market performance in general and on the availability of private credit in particular.

MODEL SPECIFICATION

Macroeconomic variables are commonly affected by their historical patterns. In such cases, a Vector Autoregressive (VAR) model could be a good option when all the variables under consideration have same order of integration i.e. all are either I(0) or I(d), and have no long run co-integration. The VAR model has advantage over the conventional Ordinary Least Square (OLS) techniques in estimating the current values of a given variable based on its own lagged values and the lagged values of other variables in the model (Ang & McKibbin, 2007; Verbeek, 2004). If all the variables under consideration are I(1) with one or more long run co-integrating vectors, then, Vector Error Correction Model (VECM), which is a restricted form of VAR, efficiently captures both the short run dynamics and the long run tendencies of the co-integrated data series at a time, by reintroducing information lost in the differencing process. VECM is also a useful toolkit in addressing endogeneity problems through systems of simultaneous equations (Ang and McKibbin, 2007; Engle and Granger, 1987).

However, as in the case of the conventional Engle and Granger (1987) Co-integration and Johansen (1988) co-integration, both VAR and VECM techniques require a pure order of integration (i.e. absence of mixed integration) among the variables; and are not efficient in the case of small number of observation (Ibid). In such cases, the Autoregressive Distributed Lag (ARDL) model also known as '*Bound Testing'* is the best candidate in estimating level relationships between series with unique long run co-integrating equation, regardless of the order of integration between variables. It relies on a bound testing mechanism which allows for mixed order of integration i.e. I(0), I(1) or both, but none with I(2) or higher(Pesaran et al., 2001; Pesaran and Shin,1999; Ramakrishan et al., 2017). And, the

ARDL is more efficient and consistent than other standard tests of long run relationships in the case of small sample size (Bentzen & Engsted, 2001; Narayan, 2005; Ramakrishan et al., 2017). As Narayan (2005) cited in Ramakrishan et al., (2017) and Tiwari et al.,(2013) noted, ARDL is also efficient in simultaneously estimating short run dynamics and long run equilibrium. It has a reparameterization mechanism, which allows generating a dynamic Unrestricted Error Correction Model (UECM) through simple linear transformation, and thereby avoids loss of information needed for long run estimation due to differencing (Engle & Granger, 1987; Hassler & Wolters, 2006). Besides, it delivers unbiased long run estimate even in the presence of endogeneity problem (Narayan, 2005). Hence, taking the nature of the data and the small sample size under consideration in to account, an ARDL model is used in this study. The general ARDL (p, q,… q) model can be formulated as:

$$y_t = \alpha_{ij} + \delta_{ij}T + \sum_{i=1}^{p} \phi_{ij} y_{t-i} + \sum_{i=0}^{q} \beta_{ij} x_{t-i} + u_{it} \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where, t = max (p, q)….,T and u_t is serially uncorrelated error term such that $u_t \sim$ NIID $(0, \delta^2)$; $\alpha, \delta, \phi, \beta,$ are unknown parameters, while *p* and *q* represent the number of lagged values of the dependent and explanatory variables respectively. Following the general framework presented in equation (1) and using the study variables mentioned under section 2, the long run ARDL (p, q,.., q) framework is set in equation (2) below by taking LNDCPS as dependent variable and LNCPI as a proxy for inflation rate.

$$LNDCPS_t = \alpha_{1j} + \delta_{1j}T + \sum_{i=1}^{p} \phi_{1j} LNDCPS_{t-i} + \sum_{i=0}^{q} \beta_{11} LNGNS_{t-i} + \sum_{i=0}^{q} \beta_{12} LNCPI_{t-i} + u_{1t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

From equation (1), the Error Correction can be reparameterized as follows:

$$\Delta y_t = \alpha_{ij} + \delta_{ij}T - \varphi(y_{t-i} - \theta x_{t-1}) + \psi' x_t + \sum_{i=1}^{p-1} \phi_{ij} y_i \Delta y_{t-i} + \sum_{i=1}^{q-1} \beta_{ij} x_i \Delta x_{t-i} + u_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The speed of adjustment coefficient, which measures the rate at which short term deviations converge to long run equilibrium can be derived from equation(3) and expressed as φ = 1- $\sum_{i=1}^{p} \phi_{ij}$; while the long run coefficients $\theta = \frac{\sum_{i=0}^{q} \beta_{ij}}{\varphi}$; where θ,φ, and $\psi'$are unknown parameters to be estimated.

Combining the short run Unrestricted Error Correction Model (UECM) with the ARDL (p,q…,q) framework given in equation (2), the empirical bound testing models for co-integration is presented in equations (4) to (6).

$$\Delta LNDCPS_t = \alpha_{11} + \delta_{11}T + \phi_{11} LNDCPS_{t-1} + \beta_{11} LNGNS_{t-1} + \beta_{21} LNCPI_{t-1} + \sum_{i=1}^{p} \gamma_{11} \Delta LNDCPS_{t-i} + \sum_{j=0}^{q} \gamma_{21} \Delta LNGNS_{t-j} + \sum_{k=0}^{r} \gamma_{31} \Delta LNCPI_{t-k} + u_{t1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$$\Delta LNDGNS_t = \alpha_{12} + \delta_{12}T + \phi_{12} LNGNS_{t-1} + \beta_{12} LNDCPS_{t-1} + \beta_{22} LNCPI_{t-1} + \sum_{i=1}^{p} \gamma_{12} \Delta LNGNS_{t-i} + \sum_{j=0}^{q} \gamma_{22} \Delta LNDCPS_{t-j} + \sum_{k=0}^{r} \gamma_{32} \Delta LNCPI_{t-k} + u_{t2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

$$\Delta LNCPI_t = \alpha_{13} + \delta_{13}T + \phi_{13}LNCPI_{t-1} + \beta_{13}LNGNS_{t-1} + \beta_{23}LNDCPS_{t-1} + \sum_{i=1}^{p}\gamma_{13}\Delta LNCPI_{t-i} + \sum_{j=0}^{q}\gamma_{23}\Delta LNGNS_{t-j} + \sum_{k=0}^{r}\gamma_{33}\Delta LNDCPS_{t-k} + u_{t3} \ldots\ldots\ldots\ldots (6)$$

where, Δ is difference operator, γ *is* unknown parameters, while all other parameters are as described under preceding sections. If LNGDPDFL is used as a proxy for inflation, then, equations (3) to (6) need to be modified by inserting LNGDPDFL instead of LNCPI.

According to Narayan (2005), Pesaran and Pesaran (1997), and Pesaran et al. (2001), the long run co-integration (or the joint significance of coefficients on one period lagged level variables) can be tested by Wald test or F statistic. The null hypothesis to be tested (H_o) suggests absence of any level effect (or non-existence of long-run co-integration between the variables under consideration), while the alternative hypothesis (H_1) claims the opposite. Hence, based on the equations (4) to (6), the null and alternative hypotheses of the study are set as follows.

$$Ho: \phi_{1i} = \beta_{1i} = \beta_{2i} = \beta_{3i} = 0;$$
$$H1: \phi_{1i} \neq \beta_{1i} \neq \beta_{2i} \neq \beta_{3i} \neq 0.$$

In testing these hypotheses, the F-statistic is compared against the lower and upper bound Critical Values (CVs) corresponding to a chosen level of confidence such as 95% or 90% .The null hypothesis (H_o) of no level effect is rejected (or H_1 accepted) for F-statistic higher than the upper bound CVs, but H_o is accepted (or H_1 rejected) when F-statistic falls below the lower bound CVs at a chosen level of significance. Evidence regarding presence of long run relationship is considered inconclusive for F-statistic falling between the upper and lower CVs.

However, the two sets of Critical Values (CVs) reported by Pesaran and Pesaran(1997) and Pesaran et al.(2001) for I(0) and I(1) variables in the case of large sample size do not fit well to small sample case(Narayan, 2005). To address this problem, Narayan (2005) calculated and reported CVs for relatively small sample size ranging from 30 to 80 observations. Hence, in this study, considering the number of variables included and the small sample size of 36 observations, the F-statistic is compared with the upper and lower bound Critical Values (CVs) reported by Narayan (2005) at 95% and 90% confidence levels. The CVs taken corresponds to sample size of 35, number of regressor (K) =2, where both the constant and trend terms are unrestricted.

EMPIRICAL RESULTS AND DISCUSSION

Prior to result estimation, optimal lag length is selected (based on different information criteria), stationarity test is performed (using ADF technique); and long run co-integration checked (following the ARDL bound testing framework). Besides, diagnostic tests of serial correlation and homoscedasticity are carried out, and model stability is confirmed from plot of CUSUM and CUSUMSQ. Subsequently, long run and short run coefficients are estimated and analyzed. The summary results are presented under the following sub-sections.

Lag Length Selection and Unit Root Test

Selecting optimal lag length is so crucial in ARDL bound testing for long run co-integration between data series. Different information criteria such as Akaiki Information Criteria (AIC), Schwarz Bayesian Criterion (BIC), Likelihood Ratio and others could be used in determining the appropriate lag length for a variable. A varsoc commend is used in stata to identify the lag length suggested by most criteria. Accordingly, the optimal lag

length suggested by most criteria is (1, 3, 1) for the variables LNDCPS, LNGNS and LNCPI (or LNGDPDFL) respectively.

Though ARDL model is compatible regardless of whether the variables are I(0), I(1) or both, it, however, collapse if there is any I(d) variable in the model such that $d \geq 2$ (Tiwari et al., 2013). Thus, Augmented Ducky Fuller (ADF) technique is employed to verify that no variable in the model is of I (2) or higher. The stationarity test results suggest that all the three variables i.e. LNDCPS, LNGNS and LNCPI (or LNGDPFFL) are I (1) i.e. non stationary at level, but are stationary at their first difference (see table 1).

Table-1

Augmented Dickey-Fuller (ADF) Unit Root Test Results at Different Lag Length

	Level		First Difference	
Variables	Intercept	Intercept and Trend	Intercept	Intercept and Trend
LNDCPS	0.194	-2.174	-4.505*	-4.514*
LNDCPS-1	-0.207	-2.795	-3.388***	-3.416***
LNDCPS-2	-0.240	-3.184	-3.814 **	-3.808 **
LNDCPS-3	-0.042	-2.427	-3.262***	- 3.353***
LNDCPS-4	0.202	-2.610	-3.416***	-3.417***
LNGNS	-0.188	-3.149	-7.692*	-7.768 *
LNGNS-1	0.328	-2.597	-5.900*	-6.044*
LNGNS-2	0.641	-1.905	-4.535 *	-4.813*
LNGNS-3	0.931	-1.631	-3.367***	-3.921**
LNGNS-4	1.225	-1.913	-3.919**	-4.721*
LNCPI	1.645	-0.627	-4.509*	-4.876*
LNCPI-1	1.173	-0.966	-3.613**	-4.110 **
LNGDPDFL	2.063	-0.717	-2.961	-4.553*
LNGDPDFL-1	1.468	-0.716	-1.893	-3.477***

Note: - ADF Critical Values for Sample size of 25 with constant and trend: 1% = -4.38; 5% = -3.6, and 10%= -3.24.

Significance level: *Stationary at 1% ; **Stationary at 5%; ***Stationary at 10%

Co-integration Test

The co-integration test is performed using ARDL (p,q,…,q) bound testing approach at 5% and 10% level of significance. Accordingly, to check for presence of multiple

co-integrating vectors, equations (4), (5) and (6) are regressed independently by including LNDCPS, LNGNS and LNCPI as dependent variable respectively. Our F-test suggests the presence of a unique long run co-integrating relationship, which is evident in equation (4) where LNDCPS is considered as endogenous, while LNGNS and LNCPI (or LNGDPDFL) are all considered as exogenous regressors. The summary of the F-test results is presented in table 2.

Table-2: Bound Test for Co-integration

	Panel-A: Inflation Proxied by LNCPI			*Panel-B: Inflation Proxied by LNGDPDFL*		
Dependent Variable	*LNDCPS*	*LNGNS*	*LNCPI*	*LNDCPS*	*LNGNS*	*NGDPDFL*
F-Statistic	*7.3685***	*4.7053*	*0.46160*	*6.2108****	*4.9009*	*0.82169*
Critical Values(CVs)	*5% level*	*10% level*		5% Level	10% Level	
Lower Bound	**5.457**	*4.577*		5.457	4.577	
Upper Bound	**6.570**	**5.600**		6.570	5.600	
Diagnostic Tests						
R^2	*.97926*	*.93723*	*.98843*	*.98038*	*.94262*	*.98843*
R-Bar-Squared	*.97235*	*.92827*	*.98576*	*.97488*	*.93200*	*.98845*
D -W test	*1.9943*	*1.5493*	*1.6890*	*2.2389*	*2.0116*	*1.7370*
Ho: Homoscedasticity	*2.7376*	*1.8417*	*.0066702*	*1.4232*	*.65532*	*0.38659*
χ^2 **[Prob > chi2]**	*[.098]*	*[.398]*	*[.93]*	*[.233]*	*[.418]*	*[.534]*
Ho: No Serial Correlation	*.72403*	*.11642*	*.92433*	*1.1347*	*1.3632*	*.6605*
χ^2 **[Prob > chi2]**	*[.979]*	*[.733]*	*[.336]*	*[.287]*	*[.243]*	*[.416]*

Note: -The Critical values are taken from table reported by Narayan(2005) for n=35, k=2 where k is number of regressor variables, with unrestricted intercept and unrestricted trend

** Significance at 1% ** Significance at 5% *** Significance at 10%*

Long Run Relationship and Short Run Dynamics

The long run and short run results are estimated using Microfit 5.50 software. The constant and deterministic trend terms are included in the model as incorporating these variables is found to be important. The best fit estimation is obtained after making ranges of estimation with different lag lengths. Subsequently, the long run and short run regression results are presented in tables 3 and 4. In the long run, LNCPI (proxy for inflation) has a strong negative effect on domestic credit to private sector (LNDCPS) at 5% significance level. That is, a 0.39% fall in domestic credit to private sector is associated with a 1% increase in inflation rate in Ethiopia. However, this long run effect turns to be marginal (though still negative) when log GDP deflator (LNGDPDFL) is used instead of LNCPI. One plausible reason for this could be the effect of lingering imported inflation, which is likely to be stronger in the case of CPI than in GDP deflator, as it affects some consumer baskets directly. Recurrent shortage (actual or artificial) of some basic consumption items might have also contributed to such lasting effect of inflation on DCPS in the case of CPI.

Table 3
Estimated Long Run Coefficients-ARDL Approach: Dependent Variable: LNDCPS

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
Panel A: Inflation is proxied by Consumer Price Index (LNCPI)			
LNGNS	.73350 *	.18288	4.0109[.001]
LNCPI	-.39047**	.18931	-2.0626[.050]
C	6.6667**	3.3371	1.9977[.057]
T	.036207***	.018301	1.9785[.059]
Panel -B: Inflation is proxied by GDP Deflator (LNGDPDFL)			
LNGNS	.60194**	.24018	2.5062[.019]
LNGDPDFL	-.17914	.31478	-.56908[.574]
C	8.7726***	4.3598	2.0122[.055]
T	.041653	.025755	1.6172[.118]

** Significant at 1%* *** Significant at 5%* **** Significant at 10%*

Although the long run effect of inflation appears low, the inflationary trend in Ethiopia could have a formidable effect on domestic credit availability to private sector. In the context of Ethiopia, one important transmission channel could be via reduced savings and weaken mobilization of deposit. It could also dampen the real saving and lending interest rates over time, and thereby undermine mobilization of loanable resources. The other effect of inflation on domestic credit to private sector could work through the ever diminishing purchasing power of people. In other words, high inflation undercuts the real disposal income of people, and thereby dwindle their consumption and saving abilities. Since inflation rate in Ethiopia has been so volatile and generally high, the strong adverse effect of inflation on DCPS was anticipated. It is also in line with most theoretical and empirical findings.

On the other hand, log Gross National Saving (LNGNS) has strong positive long run impact on Domestic Credit to Private Sector (LNDCPS) at 5% level of significance. Our results show that, a 1% increase in LNGNS causes a 0.73% increase in LNDCPS, when LNCPI is used in the regression as proxy for inflation. However, this effect decreases to 0.6% when LNCPI is replaced by LNGDPDFL. Saving is believed to directly raise the level of loanable deposit. It also promotes investment in various income generating activities that may augment the saving capacity of people and improve the availability of credit in an economy. The positive effect of LNGNS also corroborates with underlying theories and the researcher's prior expectation. The significant positive coefficient of the trend (T) variable (in table-3, panel A) indicates an apparent upward tendency of DCPS over the study period. Subsequently, the long run model is presented in equation (7).

$$LNDCPS = 6.6667 + 0.73350LNGNS - 0.39047LNCPI + 0.036207T \quad (7)$$

Table-4

Error Correction Representation for ARDL (3,2 ,0) selected based on Schwarz Bayesian Criterion: Dependent Variable-dLNDCPS

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
Panel A: When dLNCPI is used as a proxy for rate of change in inflation rate			
dLNDCPS1	.28270***	.14464	1.9545[.062]
dLNDCPS2	.30257***	.15455	1.9577[.062]
dLNGNS	.048130	.089518	.53765[.596]
dLNGNS1	-.16902	.10123	-1.6697[.107]
dLNCPI	-.24150**	.11732	-2.0585[.050]
dT	.022393***	.012344	1.8141[.082]
ecm(-1)	-.61847*	.12486	-4.9532[.000]
Panel A: When dLNGDPDFL is used as a proxy for rate of change in inflation rate			
dLNDCPS1	.32890 **	.13551	2.4271[.022]
dLNGNS	-.018779	.090649	-.20716[.837]
dLNGDPDFL	-.91385*	.26815	-3.4080[.002]
dT	.017020	.011853	1.4359[.163]
ecm(-1)	-.40863 *	.098979	-4.1284[.000]
R-Squared	*.57553*	*R-Bar-Squared*	*43404*
DW-statistic	*1.9943*	*F-Stat. F(7,25)*	*4.6488[.002]*

** Significant at 1%* *** Significant at 5%* **** Significant at 10%*

From the short run dynamic results shown in table 4, it is apparent that inflation affects domestic credit to private sector negatively and significantly regardless of whether CPI or GDP deflator is used as a proxy. As the growth rate of CPI increases by one (1) unit, the growth rate of domestic credit to private sector (DCPS) falls by about 0.24 units, which is significant at 5% level. This short run effect even increases to 0.914 units when GDP deflator is included in the model instead of CPI, suggesting an even more pronounced short run effect of changes in inflation rate as measured by GDP deflator.

On the other hand, the rate of DCPS growth is significantly and positively affected by its own lagged values. That is, a one (1) unit increase in the current growth rate of DCPS causes a 0.28 unit and 0.3 unit increases in DCPS growth after one lag and two lags respectively, which

is significant at 10%. The effect of first lagged value of DCPS slightly increases to 0.33 units (significant at 5% level) when inflation is proxied by GDP deflator. Yet, changes in the growth rate of Gross National Saving (dLNGNS) have no short run effect on the rate of growth of DCPS. Greater portions of the available savings have been channeled towards government mega projects in Ethiopia, which might have dwindled [domestic] credit to private sectors.

The coefficient of error correction term is -0.61847 (when LNCPI is included in the model), but becomes -0.40863 (when LNGDPDFL is used instead), both of which are significant at 1% level. This confirms the presence of long run relationship among the variables under consideration. It also implies that the short run deviations converges fairly quickly to long run equilibrium, i.e. at the rate of 61.85% per year (when LNCPI is included), though this adjustment speed slow down to 40.86% when CPI is replaced by GDP deflator. The corresponding error correction models are presented in equations (8) and (9) below.

$$ECM_1 = LNDCPS - .73350*LNGNS + .39047*LNCPI - 6.6667*C - .036207*T \quad \ldots(8)$$

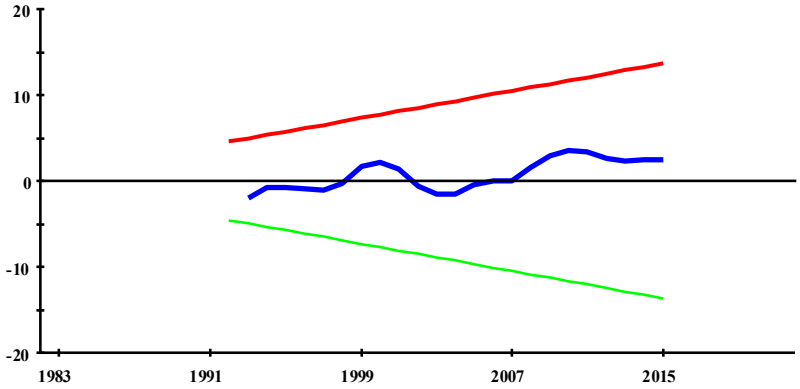
$$ECM_2 = LNDCPS - .60194*LNGNS + .17914*LNGDPDFL - 8.7726*C - .041653*T \quad \ldots(9)$$

Model Stability Test

The stability of our model is confirmed using CUSUM and CUSUMSQ tests, which were suggested by Brown et al.(1975). As Turner (2010) noted, '*CUSUM is a powerful test of parameter stability if the structure change occur in the intercept of regression equation, while CUSUMSQ is more powerful for changes involving slope coefficient or variance of error terms*'. Hence, these tests are used to check for the stability of our parameter. And, regardless of whether inflation is represented by CPI or GDP

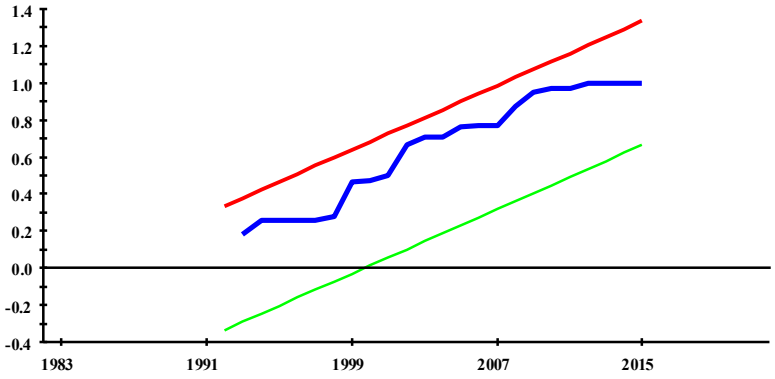
deflator, our CUSUM and CUSUMSQ plots are pretty much similar, which falls within the critical bound of 5% significance level, confirming the stability of our models.

Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

CONCLUSION AND POLICY IMPLICATIONS

Ranges of studies suggest that inflation rate exceeding certain threshold level has detrimental effect on the performance of financial sector in general and on the allocative efficiency of financial intermediaries in particular. To verify this, we analyzed a 36 years data (1980 to 2015) from Ethiopia using ARDL bound testing technique. Our results show that, the generally high and volatile inflation in Ethiopia impedes the growth of Domestic Credit to Private Sector (DCPS) both in the short run and in the long run. This finding is in line with the researcher's prior expectation, and also corroborates with the theoretical and empirical findings presented under review of literature section. In the case of Ethiopia, high inflation might obstruct the growth of domestic credit to private sector by dwindling the saving and lending real interest rates and weakening the purchasing power of people, which in turn could dampens the mobilization of savings and deposit among others.

On the other hand, the results of the study indicate that higher Gross National Savings (GNS) is associated with higher DCPS growth, which is plausible. Yet, given the generally low level of GNS in Ethiopia, the positive impact of GNS on the availability and growth of demotic credit to private sector is likely to be limited. Our results also suggest a strong positive link between DCPS and its lagged values. Thus, to ensure adequate and sustainable growth of DCPS in Ethiopia, measures such as controlling the level and volatility of inflation, and promoting financial services like saving and credit are highly recommendable.

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