

Addis Ababa University

College of Business and Economics

Department of Economics

Financing Ethiopia's Future: Market-Driven Domestic Debt as a Growth Catalyst

A Thesis Submitted to the Graduate Program of Addis Ababa University in Partial Fulfilment of the Requirements for the Degree of Master of Science in Economics (Economic Policy Analysis)

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Declaration

I, Haile Meseret, declare that this study titled "Financing Ethiopia's Future: Market-Driven Domestic Debt as a Growth Catalyst" is my own work and I have carried out the research work independently with the guidance and support of my research advisor. This thesis is submitted to the Department of Economics at Addis Ababa University in partial fulfilment of the requirements for the Degree of Master of Science in Economics (Economic Policy Analysis). It has not been submitted for any Master's Degree program in this university or any other university. All sources of materials used for the study have been duly acknowledged.

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This is to certify that the thesis prepared by Haile Meseret, entitled: Financing Ethiopia's Future: Market-Driven Domestic Debt as a Growth Catalyst and submitted in partial fulfilment of the requirements for the Degree of Master of Science in Economics (Economic Policy Analysis), complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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List of Acronyms

ADF	Augmented Dickey-Fuller
ARDL	Autoregressive Distributed Lag
BIC	Bayesian Information Criteria
CPS	Credit to Private Sector
DD	Domestic Debt
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
HGER	Home Grown Economic Reform
IMF	International Monetary Fund
MoF	Ministry of Finance
NBE	National Bank of Ethiopia
OLS	Ordinary Least Squares
RGDP	Real Gross Domestic Product
TB	Treasury Bill
USD	United States Dollar
VECM	Vector Error Correction Model

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Abstract

In this study, an attempt has been made to find out the influence of market-based domestic debt using the issuance of treasury bills on the economic growth in Ethiopia. In order to conduct the study on the effectiveness of treasury bills issuance on economic growth in the long and short run, this study adopted the Autoregressive Distributed Lag (ARDL) model using the annual time series data from 1993 to 2025. Data have been sourced from The National Bank of Ethiopia, World Bank, and Ministry of Finance. The result obtained in this study indicates that the use of treasury bills as a domestic financing tool has a positive and statistically significant impact on economic growth in the short run and a positive but statistically insignificant impact in the long run. The result aligns with the Ricardian equivalence theory. The government should manage its domestic debt, so that it can serve as an efficient instrument of short-term financing without crowding out private sector credit. In the long term, the development of government bonds should be promoted, where the capital is mainly directed to areas that can enhance sustainable economic growth.

Chapter One

1. Introduction

1.1 Background of the Study

Fiscal deficits remain a fundamental problem in the context of public finance management in many countries especially those in Sub-Saharan Africa. The governments of these countries experience structural deficiencies in the balance between public expenditures and public revenues as a result of inability to generate enough domestic resources, poor tax structure, dependence on primary commodity export revenues, and the rising demand for public goods and infrastructure. This problem has been made worse by the attempts by the governments to solve development problems, transform the economies and supply public goods without having enough domestic resources. Public expenditure is normally higher than public revenues leading to the emergence of fiscal deficits that need to be financed using borrowed funds and other sources of financing.

The usual way that fiscal deficit can be financed by governments is through the use of domestic and external borrowing along with other types of financing sources. The usual form of external borrowing includes taking up loans from bilateral agencies, multilateral agencies like IMF and World Bank or issuance of sovereign bonds through international capital markets. Although the external source provides the extra finances for the country to develop further, the source also carries a lot of risk including that of exchange rate volatility, foreign currency payments and sustainability of debt (IMF, 2002). Domestic borrowing, on the other hand, involves borrowing from within the domestic economy. The process of domestic borrowing usually involves the issuance of government securities like treasury bills and government bonds in the domestic markets. This form of debt financing helps minimize the foreign exchange risk and development of domestic financial markets.

Over the past few years, domestic borrowing through treasury bills auctions has grown significantly in many developing countries as governments search for alternative ways of financing apart from the traditional concessional loans from outside the country (Panizza, 2008; Manger et al., 2025). There are many advantages that result from developing domestic debt markets, such as establishing benchmark interest rates curves, enhancing monetary policy transmission channels, and boosting the capital markets of a country through creating investment opportunities for financial institutions and other investors. Well-developed markets of government bonds may also

contribute to the deepening of the financial sector and give governments the opportunity to become more flexible in their finances. However, domestic borrowing may also have some disadvantages for the macroeconomics of a country if not managed correctly. The overuse of domestic borrowing increases borrowing costs, creates resource problems for a country, reduces credit availability for investments in the private sector, and may cause inflation due to expansionary monetary policies along with borrowing.

Ethiopia has seen its debt composition and structure transform over the last six decades in line with the economic policies and frameworks set out by different governments. In the imperial era, foreign borrowings were limited, and most foreign borrowings were used for infrastructural development and overall modernization. In the Derg period, most deficit financing was done through borrowings from the National Bank of Ethiopia, while most foreign borrowings were done for military operations, hence the build-up of external debts amounting to about USD 8.86 billion by 1991 (Melaku & Cassimon, 2025). Under the EPRDF era, Ethiopia witnessed economic growth coupled with foreign and domestic borrowings. Particularly, the issuing of treasury bills came to play an increasingly important role in financing the government budget.

Upon the implementations of macroeconomic reforms under the Homegrown Economic Reform (HGER) agenda (FDRE, 2020), changes were made in Ethiopia's debt composition. As a result of endeavors to improve debt sustainability and minimize foreign borrowings, internal debt financing gained prominence. By 2024, domestic debt has amounted to almost 58% of Ethiopia's public debt, mainly due to the increased issue of government securities (NBE, 2024). This is an indication of the major structural change in Ethiopia's public debt management system from reliance on foreign finance to a market-based internal finance system. While internal debt financing has a lot of advantages, which can be helpful in the development of local financial markets and utilization of internal resources, its economic growth consequences will depend on many other aspects such as efficient resource distribution, availability of private sector credits, and productive use of loaned money. Hence, the investigation of the economic growth consequences of Ethiopia's shift towards the domestic market-based deficit financing through treasury bills is a topical and relevant research work.

1.2 Statement of the Problem

In developing countries facing fiscal deficits, public debt management has become a focus of macroeconomic policy. Access to concessional external financing and narrow domestic revenue sources from tax and non-tax for financing capital expenditures and the provision of public services is limited. In recent years, Ethiopia has been progressing towards domestic debt to finance budget deficits, reducing reliance on foreign borrowing, targeting currency pressures and debt stress risks of external debt.

In the past, the National Bank of Ethiopia advances and non-market instruments were used to finance fiscal deficits in Ethiopia. Nevertheless, following macroeconomic reform under the HGER Agenda, the country is shifting towards T-bills and bonds to meet the domestic financing needs (IMF, 2026). The growth of treasury bill auctions and the anticipated emergence of longer-term government bond markets represent a structural shift in Ethiopia's fiscal finance architecture.

This transition is part of broader efforts to build a local currency bond market, reduce monetary financing of deficits by the NBE, phase down mandated bank purchases of government assets, and promote fiscal transparency. According to the NBE Annual Report, in 2024, internal borrowing became a primary source of fiscal financing in the absence of significant new external borrowing, with outstanding domestic debt reaching approximately ETB 2,25 trillion and outstanding T-bills totaling 447.8 billion (NBE, 2024).

Despite market-based domestic debt financing often being seen as a more sustainable and transparent method of supporting fiscal deficits, its macroeconomic ramifications in financially shallow and structurally transforming economies remain poorly understood. On one hand, domestic debt markets could improve monetary policy effectiveness, develop benchmark yield curves, and mobilize domestic savings. On the other hand, rapid expansion of domestic borrowing may crowd out private sector credit, increase interest rate volatility, worsen inflationary pressures, or generate fiscal dominance if monetary policy becomes bound by government financing demands (Abbas & Christensen 2010).

The theoretical literature gives competing opinions regarding to the economic effect of domestic debt. Neoclassical frameworks stress intertemporal budget constraints and potential crowding-out impacts through increased real interest rates. Keynesian and heterodox approaches in comparison

underline the demand-stimulating role of deficit financing, especially in economies with underused capacity. Structuralist viewpoints further underscore the quality of governance, the importance of financial deepening and fiscal-monetary coordination in determining outcomes.

Considerable emphasis has been given to studying external debt in existing literatures while studying the public debt in Ethiopia. Some of the empirical findings of studies conducted in other countries focusing on domestic debt by Anyanwu & Erhijakpor (2004), Haffner et al., (2017), Elom-Obed et al., (2017), Lotto (2018), Saungweme & Odhiambo (2021), Ali et al., (2022), and Mah (2025), indicate that economic growth is adversely affected by domestic debt. Studies conducted by Godfrey & Mutuku (2013), Babu et al., (2015), Abu-Karaki et al., (2016), Igbodika et al. (2016), Akhanolu et al., 2018), Asravor et al. (2023), Akanbi & Uwaleke (2023), and Onuoha (2025), in contrast, concluded that domestic borrowing is positively associated with economic growth. A study conducted by Abebe (2019) examining the effect of external debt on economic growth revealed that domestic debt exerts a positive influence on economic growth. On the other hand, Yimer & Geda (2024) found a positive relationship in the short run and a negative long-term impact of domestic debt while studying the impact of public debt on economic growth. Olkamo (2021) also has made an attempt to analyze the impact of domestic debt on economic growth in Ethiopia in his working paper, covering the period of 1981-2020, revealing that domestic debt adversely affects economic growth.

However, existing studies examine aggregate domestic debt but have failed to explicitly analyze treasury-bill financing under the recent market-based debt management framework in Ethiopia. Debt related studies conducted in other countries have conflicting results, which necessitate further empirical research in this area. Therefore, considering the recent development with the growth of domestic debt over external debt, studying its composition and macroeconomic dynamics of Ethiopia's market-based domestic debt financing is timely.

1.3 Research Questions

This study critically investigated the following research questions in relation to the connection between domestic debt, which is measured by issuance of treasury bills, and economic growth in Ethiopia.

1. What is the nature and structure of domestic debts, especially through treasury bills throughout the period of study?
2. What are the short-run and long-run effects of domestic debt through treasury bill issuance on economic growth?
3. How does the influence of selected macroeconomic variables, which include government expenditure, total labor force, and inflation, influence economic growth?
4. What policy recommendations are possible for efficient domestic debt management and sustainable economic growth?

1.4 Objectives of the Study

The primary objective of this study was to empirically investigate the short and long-run link between treasury bill-based domestic debt and economic growth. To achieve this broad objective, the study specifically focused on:

1. Investigating the effect of domestic debt growth through the issuance of treasury bills on economic growth;
2. Analyzing the historical trend, composition, and structure of domestic debt in the country;
3. Assessing the influence of selected macroeconomic control variables on economic growth; and
4. Draw policy implications based on the empirical findings to support sustainable debt management and economic growth.

1.5 Significance of the Study

Domestic debt has become a main source of public debt in recent years in Ethiopia. This calls for further investigation of the channels through which this debt comes from and its large effect on the economic growth of the country. This study followed a novel approach by focusing on the issuance of treasury bills as a major source of the growth of domestic debt through employing a data set covering over thirty-three years, unlike any other previous studies related to domestic debt.

Moreover, this study supports policymakers in formulating sound fiscal policy to bring macroeconomic stability and economic growth, guiding the future debt structure of the country, and it is relevant for other researchers for future studies in this area.

1.6 Scope and Limitations of the Study

The scope of this study is limited to the analysis of market-based domestic debt using the issuance of treasury bills on economic growth in Ethiopia period spanning from 1993 to 2025. Therefore, this study has the limitation of relying mainly on treasury bill-based domestic financing, which excludes instruments like government bonds and non-market-based borrowing mechanisms, such as direct advances from the National Bank of Ethiopia. Because of this, the findings may not capture the broader impact of domestic debt on the economic performance of the country.

1.7 Organization of the Study

This study was organized into five chapters. The first chapter will be an introduction, followed by chapter two containing a theoretical and empirical literature review. The third chapter will be dedicated to research methodology, and the fourth chapter discusses descriptive data analysis and estimation results. Finally, the study concludes with chapter five, with summarizing main research findings and policy recommendations.

Chapter Two

2. Literature Review

2.1 Conceptual Review

Domestic Debt

Domestic debt, which is alternatively called domestic public debt, describes the part of national debt that originates and remains inside the national borders of a particular country. It is often understood as debts owed by the government to its own citizens or economic residents and measured in the domestic currency, which are issued by the domestic sovereign entity (Panizza, 2008; Bua et al., 2014). Domestic public debt, according to the World Bank and IMF approaches, includes various types of government obligations, like treasury bills and bonds, purchased by domestic financial institutions, including commercial banks, pension funds, insurance firms, and individuals (World Bank, 2021). In contrast to foreign or external debt, domestic debt does not include any outflow of resources from the domestic economy and is free of exchange rate risks.

Market-Based Domestic Debt Financing

Market-based financing of domestic debts entails a situation where the government sources its finances from debt instruments such as treasury bills and bonds through auction processes or the open market, whereby interest rates and prices of the debt securities are decided by market forces and not by any form of coercion (Abbas & Christensen, 2007).

This type of domestic debts' financing can be distinguished from other forms of financing such as financial repression, where debt issues are offered directly by the central bank to the government and other cases where they have been acquired at below-market prices by the commercial banks. Main characteristics include transparent auctions, diverse investors' bases, secondary markets trading, and effective price discovery. Market-based domestic debt financing is highly viewed as an instrument for fiscal discipline and financial deepening of developing countries (IMF, 2016; Hooley, 2021).

2.2 Theoretical Literature Review

Classical and neo-classical economists consider the notion of public debts to be a transfer of productive uses of funds by individuals into inefficient uses through government borrowing (Ricardo, 1951). David Ricardo argued that when the government borrows money, it means people will have to pay taxes in the future and thus reduce savings and welfare among individuals. The above view is the basis upon which the theory of loanable funds was developed, whereby high levels of government borrowing led to increases in real interest rates, resulting in lower investment and slower growth (Diamond, 1965). According to Modigliani (1961), low levels of productive capital would adversely affect the productive capacities of the nation.

On the contrary, according to the Keynesian theory, the significance of borrowing is in its ability to stimulate demand. Keynes argued that borrowing by the government will lead to increased aggregate demand, thereby increasing the production level. The debt will be used to finance government expenditures, leading to increased spending that is not inflationary, especially in a semi-closed economy experiencing underutilization of its productive capacity. The extra money created in such a way increases the income, and therefore more investment takes place (Aschauer, 1989).

One of the key theoretical critiques of the Keynesian approach relates to the existence of the Ricardian equivalence proposition where rational and foresighted individuals internalize government's inter-temporal budget constraint completely. This approach was first formalized by Barro (1974). The logic of the argument suggests that people realize that the present-day borrowing on behalf of the government will result in the necessity to pay more taxes in the future to cover the borrowed money. In such conditions, people save more, thus making financing mechanisms neutral from the standpoint of consumption, investments, and interest rates. Within the framework of perfectly competitive markets, infinite horizons, and inter-generational altruism, there are no macroeconomic effects from the financing mechanism choice. Yet, in the case of developing countries, there are many reasons for the violation of the Ricardian equivalence. In developing-country contexts, however, Ricardian equivalence is frequently violated due to liquidity constraints, myopia, distortionary taxation, and finite lifetimes (Haque, 1986). Imperfections in the credit market and uncertainty about future fiscal policy make the equivalence weaker, which means that debt can have non-neutral effects (Gumus, 2003).

The overhang theory of sovereign debt and the non-hypothesis constitute significant advances on previous debt theories by highlighting threshold and disincentive effects linked to high public indebtedness. Specifically, the debt overhang assumption, which originated from the work of Krugman (1988) and Sachs (1989), is based on the observation that when the current level of public indebtedness is very high, this creates a disincentive effect for investments and growth since economic actors expect future incomes to be taxed or expropriated for the purpose of debt servicing. In other words, the presence of high public debt works as an implicit tax system on future income flows, thereby making future investments and innovations less attractive (Krugman, 1988). Consequently, the debt-repayment relationship takes the form of a debt Laffer curve, according to which increased debt above some point reduces the expected value of outstanding debts owing to the risk of defaulting. While the overhang approach was developed with respect to external debt crises, it can be applied to internal debts as well provided that high sovereign debt levels lead to higher domestic interest rates, higher interest expenses, or higher tax burdens (Panizza, 2008).

Nonlinearity hypothesis, which directly draws from overhang, claims that the relationship between public debt and economic growth is nonlinear and threshold dependent. When at low to moderate levels, public debt can have a neutral or positive impact on growth through Keynesian demand management, productive government investments, and financial deepening. However, when public debt reaches above a certain threshold level, it becomes detrimental to economic growth by increasing risk premia, creating crowding out effects, constraining policy space, and damaging investors' confidence (Reinhart & Rogoff, 2010; Égert, 2015).

Empirical research shows that lower debt thresholds apply to emerging and developing nations (60%-80% of GDP) relative to developed countries (approximately 90%) because of their shallow financial markets, high interest rate sensitivity, and higher vulnerability to fiscal dominance (Égert, 2015; Karadam, 2018; Okwoche et al., 2023). In Sub-Saharan Africa studies consistently find that debt has effects. When the debt gets too high it becomes a problem for countries. This happens when countries have much debt and it goes past a certain threshold. The problem is not as bad when countries have institutions that use their money wisely and have good financial development (Nouaili, 2025; Okwoche et al., 2023).

These theories offer unclear and contrasting views regarding the macroeconomic consequences of domestic debt. While classical and neoclassical economics emphasize the crowding out of private

investment and slow growth in the long term, Keynesian economics emphasizes the stimulatory effects of such debt in the short run, the potential of which crowding in can occur through productive government spending. On Ricardian equivalence, market-based debt issues have no effect since consumers anticipate future taxation and offset its benefits. In contrast, in practical situations in developing countries, market-based domestic debt issues have many economic advantages, including reducing inflationary pressure, restoring monetary authority, and fostering financial deepening. Moreover, according to the debt overhang theory and the nonlinearity hypothesis, market-based domestic debt financing helps foster economic growth up to certain threshold levels; however, beyond those levels, excessive domestic debt makes economic growth difficult, and the likelihood of private investment declines.

Ethiopia's underdeveloped financial market and economy, high demand for public investments, and move towards debt auction markets imply the complex interaction of theoretical channels. Consequently, the net economic growth impact remains theoretically ambiguous, and depends on financial depth, fiscal prudence, institutional quality and the position of the economy relative to debt thresholds. These different perspectives reveal the need for empirical investigation.

2.3 Empirical Literature Review

2.3.1 Empirical Literature Review: International Perspective

There is considerable empirical evidence on the effects of domestic debt on economic growth, with mixed findings. Among the studies, findings by Anyanwu & Erhijakpor (2004), Onyeiwu (2012), Haffner et al., (2017), Elom-Obed et al., (2017), Lotto (2018), Saungweme & Odhiambo (2021), Saqib Ali et al., (2022), and Mah (2025), indicate that domestic debts negatively affect economic growth.

Anyanwu and Erhijakpor (2004) used time-series data from 1970 to 2003 to examine the connection between domestic debt and economic growth in Nigeria. An Ordinary Least Squares regression model was used to test the debt-overhang and crowding-out hypotheses. The empirical results of this study reveal that there was an inverse relationship between economic growth and the current domestic debt-to-GDP ratio.

Similarly, Onyeiwu (2012) studied the effect of domestic debt on Nigeria's economic growth, by analyzing the effect of domestic debt in Nigeria during quarters ranging from 1994 to 2008 through

employing OLS and Error Correction and parsimonious models. The researcher revealed that domestic debt had a significant negative effect on economic growth since domestic debt, whose average stood at 114.98% of bank deposits, exceeded the healthy level of 35%. Through VECM model, Elom-Obed et al. (2017) also investigated the effect of public debt on economic growth in Nigeria between 1980 and 2015. The study indicated that external and domestic debts negatively affect economic growth.

Employing an analysis of domestic debt in relation to economic growth through the use of annual times series data from 1971 to 2015, Haffner et al. (2017) carried out a study in Sierra Leone, where the effects of domestic debt, inflation, and investments on GDP were evaluated using the ARDL co-integration method. From the results, it has been revealed that there exists a statistically significant negative relationship between domestic debt and economic growth, indicating the occurrence of debt overhang in Sierra Leone. On the same note, there is another study, where the authors Saungweme and Odhiambo (2021), used the ARDL approach to examine the respective impacts of domestic and foreign public debt on South Africa's economic growth by employing the annual time series data from 1970 to 2017. The findings reveal that both domestic and foreign public debt have significant negative impacts on South Africa's economic growth in the long run. Furthermore, Saqib Ali et al. (2022) carried out the analysis of the Pakistani economy for 1990-2021 and concluded that domestic debt does not foster sustainable economic growth.

Lotto, Josephat, et al. (2018) conducted research into the effect of domestic debt on the economic growth of Tanzania during the period between 1990 to 2015 using the Ordinary Least Square regression method. According to their findings, there is an inverse and insignificant influence of increasing negative domestic debt on the growth rate of GDP. The inverse relationship may stem from crowding-out effects caused by commercial bank dominance in government lending, improper utilization of borrowed funds for deficit financing rather than productive investment, and government expenditure patterns.

Further evidence comes from Gisele Mah et al., (2025) through analyzing 63 years of annual data (1960-2023) using the nonlinear autoregressive distributed lag methodology. The study found that increases in domestic debt significantly reduce GDP, while decreases in domestic debt significantly boost it. Conversely, increases in foreign debt significantly stimulate GDP growth, though decreases in foreign debt show no statistically significant effect.

Abu-Karaki et al. (2016) use annual time-series data from 2000 to 2014 to examine the effect of domestic debt on economic growth in Jordan. The study uses an Ordinary Least Squares regression model to examine the connection between GDP growth, debt servicing, and the overall stock of domestic debt. The results demonstrate the dual nature of debt: domestic debt servicing (interest payments) has a significant negative impact on economic growth, whereas the stock of domestic debt has a positive and significant impact (indicating that some borrowed funds were successfully used for investment-oriented projects). However, the study uses a linear OLS approach, which, like the Nigerian studies, fails to account for non-linear threshold effects, and its short time frame may not fully capture long-term structural changes.

Using cointegration and Granger causality tests on Indian data from 1959 to 1995 to assess whether internal borrowing impeded or accelerated development, Singh (1999) concluded that domestic debt has little impact on economic growth. However, later studies have seriously questioned the strength of this evidence. More recent studies using similar methodologies over long time periods have reached contrary findings: Pratibha Saini et al. (2021) found a significant negative relationship between public debt and growth covering 1984-2019.

On the contrary, studies by Godfrey & Mutuku (2013), Babu et al., (2015), Abu-Karaki et al., (2016), Igbodika et al. (2016), Akhanolu et al. (2018), Asravor et al. (2023), and Onuoha (2025) found that domestic debt affects economic growth positively.

Godfrey & Mutuku (2013), through cointegration analyses done using ten years of quarterly data by applying Engel-Granger and Johansen VAR methods, showed existence of a long-run relationship between domestic debt and growth in Kenya, whereby the authors employed error correction method in measuring short-run dynamics. According to Godfrey & Mutuku, domestic debt was the only type that influenced positively the economic growth from the year 2000 to 2010, while private sector credit and interest rates had no statistically significant impacts on the economic growth. Babu et al. (2015), through application of the panel fixed effect model based on the Solow growth model modified with debt, analyzed data for the period 1990 to 2010 across all East African Community countries, and came up with the same conclusion. It is argued in their study that domestic debt is an effective tool in achieving financial deepening and can be used effectively to finance public projects without crowding out the private sector.

Using OLS regression, Abu-Karaki et al. (2016) conducted an empirical analysis on Jordanian data from 2000-2014. The study's key finding is that the accumulation of domestic borrowing is related to economic growth in a positive way, suggesting that loans were partially used for investment-oriented projects. Likewise, Igbodika et al. (2016) and Akhanolu et al. (2018) examined the empirical relationship between domestic debt and the performance of the Nigerian economy using annual time series data spanning 1987-2014 and 1982 to 2017 respectively, and found a significant negative relationship between domestic debt and economic, owing to the high cost of debt servicing and the inefficient utilization of borrowed funding. Akhanolu et al. (2018) found a link between high domestic debt levels and inflationary trends in Nigeria, further intensifying the macroeconomic instability.

Furthermore, using a time series comprehensive analysis from 1981 to 2020 using structural equation modeling and the Augmented Dickey-Fuller unit root test, Onuoha (2025) found that domestic debt and public spending positively affect economic growth in Nigeria, with public spending partially mediating this relationship. These findings are grounded in established theory, particularly debt overhang and Keynesian perspectives.

The study by Asravor et al. (2023) using data from 1994 to 2018 investigated Ghana's domestic debt sustainability using an ARDL model revealed that Ghana's domestic debt has a positive impact.

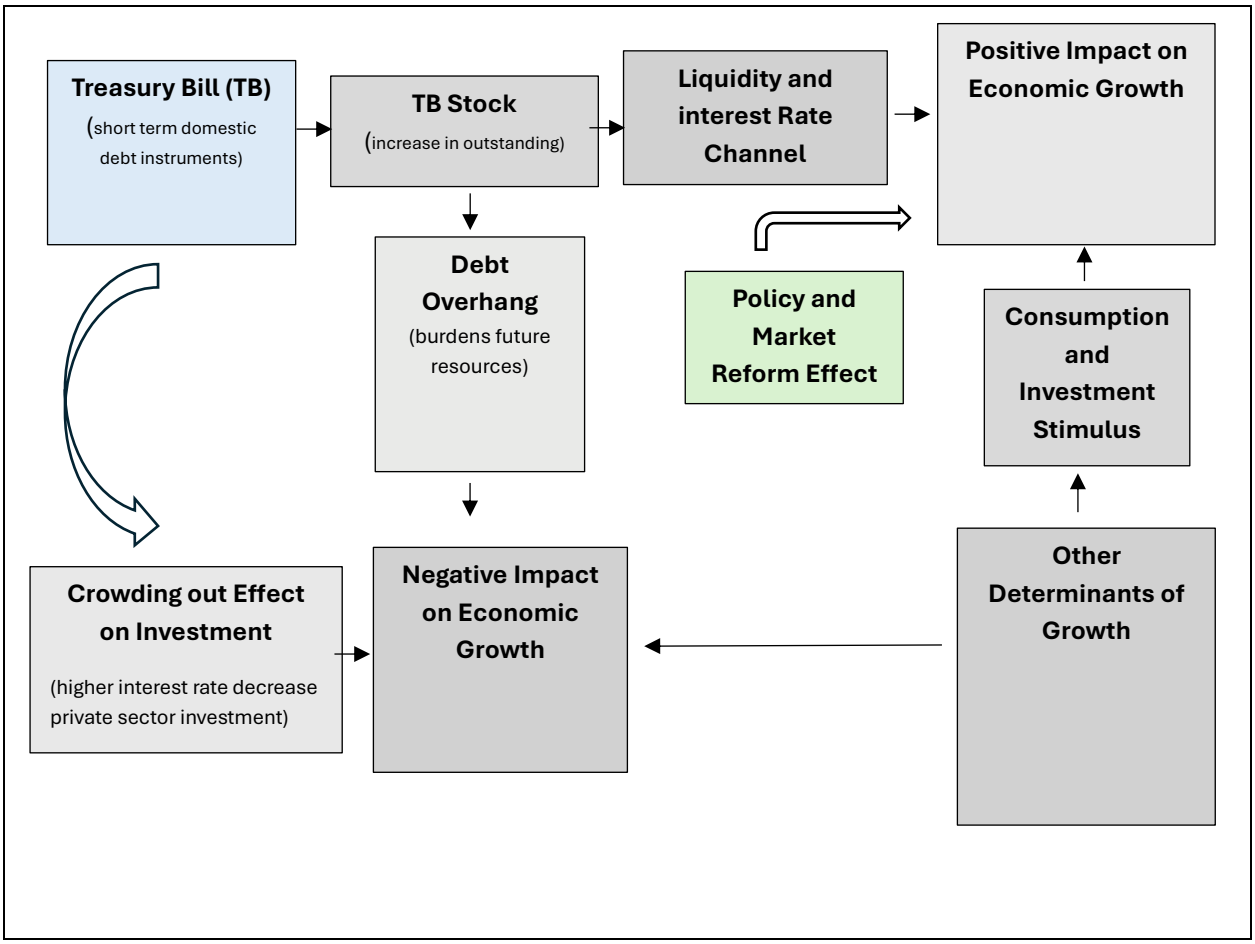
2.3.2 Empirical Review of Studies in Ethiopia

The external debt aspect of Ethiopian public debt is the focus of a large portion of the empirical literature. Abebe (2019) investigated the effect of external debt on economic growth using the VECM model and concluded that domestic debt has a positive and statistically significant influence on economic growth over the 28 years (1991-2018). A recent study by Yimer & Geda (2024) on the effect of public debt on economic growth, using the ARDL model, found that domestic debt has a positive short-term impact on economic growth but a negative long-term impact. Similarly, Olkamo (2021) in the National Bank of Ethiopia working paper that covers the period 1981-2020 also tried to investigate the impact of domestic debt on Ethiopia's economic growth and found similar results with Yimer & Geda (2024).

As seen from the summarized empirical results, the literature provides conflicting evidence with divergent results, different study periods and a variety of econometric models. Some studies find

a positive growth-stimulating effect, and some studies find a significant negative debt overhang or crowding-out effect. Notably, the specific dynamics of domestic debt remain relatively neglected or under-explored in comparison to external debt. A critical research gap is the recent structural shift to market-based treasury bills as a primary financing tool, replacing the previous reliance on direct advances from the National Bank. Therefore, this study seeks to fill this void by using recent data to analyze how this transition to market-based domestic debt affects economic growth dynamics.

2.4 Conceptual Framework of the Study



The volume of treasury bills will affect economic growth either positively or negatively. From a positive point of view, treasury bills promote better liquidity, enhance the interest rate effect, and bring about policy changes, thus leading to higher investments and ultimately economic growth. On the negative side, however, the rise in treasury bills would cause debt overhang and crowding

out due to high interest rates, which can be negative for economic growth. Other factors that will also affect economic growth are those related to the domestic economy, such as government expenditures, inflation rate, credit to the private sector, and labor force were included in the framework because they also influence economic growth alongside domestic debt dynamics.

Chapter Three

3. Research Methodology

This section presents the empirical model and tests to be conducted to establish the model's effectiveness and the validity of the data used to assess the impact of market-based domestic debt financing on Ethiopian economic growth.

3.1 Data Source and Type

This study was conducted based on secondary data, using annual time-series data covering the period 1993-2025, sourced from the National Bank of Ethiopia, the Ministry of Finance, and the World Bank.

3.2 Model Specifications

The effect of external debt on Ethiopian public debt has gained most of the attention in the existing empirical literature. In a study examining the effect of external debt on economic growth by using the VECM model, Abebe (2019) found out that domestic debt had a positive and significant effect on economic growth in the 28 years between 1991 and 2018. Another study published in 2024 on the effect of public debt on economic growth with the ARDL model found that domestic debt positively affected economic growth in the short term but negatively impacted economic growth in the long term. The same applies to the study conducted in the working paper of the National Bank of Ethiopia that analyzed the effect of domestic debt on economic growth within 1981-2020.

$$Y_t = K_t^{\alpha} H_t^{\beta} (A_t L_t)^{1-\alpha-\beta}$$

where Y_t is output, K_t is physical capital, H_t is human capital, A_t represents labour-augmenting technology, L_t is raw labour, and α and β are the output elasticities of physical and human capital, respectively $(\alpha + \beta < 1)$. The model improves its explanatory power regarding international income variation and generates more plausible convergence speeds, consistent with empirical evidence through including human capital (H_t).

Romer (1996) provided further analysis on the concept of augmented human capital, integrating it within the context of endogenous growth models. Romer points out that disparities between

physical and human capital accumulation, along with differences in productivity (which do not occur simply due to exogenous technical progress), are essential when explaining international disparities in per capita income levels. He shows how the introduction of human capital makes the Solow model an effective tool for long-term economic development analysis but also demonstrates how it is possible to bridge Solow's model with the theory of endogenous growth, which regards technology as part of the economy. Thus, the above approach can serve as a basis for studying the relationships between public spending, including public debt, and capital accumulation.

In order to consider the influence of debt on the economic growth process, the study modifies the model by adding the burden of debt to represent yet another determinant that impacts productivity levels. Following the modification made to the neoclassical production function model to capture the effect of debt burden on economic growth among heavily indebted poor countries, as done by Cunningham (1993), debt or debt servicing is included as a determinant that negatively impacts the efficiency of capital and labor. The general production function as presented by Cunningham (1993) takes the form of:

$$Y_t = f(K_t, L_t, H_t, DS_t)$$

where DS_trepresents the debt service burden (or debt stock). She proposed that the weight of debt results in a debt overhang effect, which crowds out investment opportunities and results in inefficient allocation of resources, resulting in negative effects on growth. The modified equation is consistent with the concept of debt overhang (Krugman, 1988) and financial repression theories, whereby high levels of debt service result in lower productivity levels of capital. In the context of the current study, the theoretical framework therefore combines the human capital-augmented Solow model (Mankiw et al., 1992; Romer, 1996) with Cunningham's (1993) debt-burden extension. This integrated approach yields the following conceptual production function for empirical application:

$$Y_t = f(K_t, H_t, DSMB_t, Z_t)$$

where $DSMB_t$denotes market-based domestic debt (or its service burden), and $Z_t$is a vector of control variables (government expenditure, labor force growth, and inflation). The framework

predicts that domestic debt creates short-term positive impacts for the economy through capital formation and financing infrastructure. However, they are expected to cause long-term negative effects on the economy due to increased cost of servicing debt, crowding-out effect of private investments, and debt overhang problem.

On theoretical grounds from the neoclassical growth model and empirical literature on public debt and economic growth, the functional form of real gross domestic product can be defined as follows:

$$\ln RGDP_t = \beta_0 + \beta_1 lntb\_gdp_t + \beta_2 lncps\_gdp_t + \beta_3 lnextd\_gdp_t + \beta_4 lngexp\_gdp_t + \beta_5 tlf_t + \beta_6 infl_t + \varepsilon_t$$

where lnRGDPt (lnrgdp) is real GDP and serves as the dependent variable of the study, lntb_gdp is treasury bills stock/GDP, lncps_gdp is credit to the private sector/GDP, lnextd_gdp is external debt/GDP, lnlfgr islngexp_gdp is government expenditure/GDP, all in natural log, tlf is the total labor force, and infl is the annual inflation rate, and ε_t is the stochastic error term.

3.3 Description of Variables

This study uses real GDP as a dependent variable. The theoretical basis for the use of real GDP as an indicator of economic growth lies in the theory of neoclassical and endogenous economic growth, where capital formation, labor force growth, technology improvement and macroeconomic stability play crucial role in determining long-term economic performance. Abbas & Christensen (2010), Babu et al. (2015), Akhanolu et al. (2018), Olkamo (2021), Abebe (2019), Asravor et al. (2023), and Addis Yimer & Alemayehu Geda (2024) have also used real GDP as the main indicator of economic growth.

Treasury bills as a percentage of GDP. Treasury bills as the main explanatory variable of this study capture the short-term domestic debt component and its implications on economic growth. The evidence on the debt-growth relationship remains mixed. According to Abbas and Christensen (2010), domestic debt can lead to economic growth on the condition that it is at sustainable levels and coupled with developed financial markets. Likewise, Panizza (2008) states that domestic borrowing can decrease external vulnerability and improve macroeconomic stability. However, studies such as Igbodika et al. (2016), Akhanolu et al. (2018), and Onyeiwu (2012) report that excessive reliance on short-term domestic debt instruments may negatively affect growth through

high borrowing costs and reduced private sector investment. Erkan Gumus (2003) explains this ambiguity through the competing crowding-out hypothesis and Ricardian equivalence proposition. On the one hand, Treasury bills can stimulate growth by improving liquidity management and financial market development. On the other hand, Treasury bills can crowd out private investment through rising interest rates. Hence, the expected effect of treasury bills on economic growth in this study is not clear, and it is subject to empirical verification.

Credit to the private sector, measured as domestic credit to the private sector as a percentage of GDP is used to measure how much financial institutions direct financial flows to private economic actors. This variable is frequently used as a proxy for the development of the financial sector and the efficiency of financial intermediation. According to Abbas & Christensen (2010), better-developed domestic financial markets improve the efficiency of domestic credit in spurring economic growth. In line with this thought, empirical literature, such as Babu et al. (2015) and Lotto (2018), demonstrates that private credit contributes positively to economic performance. However, the misuse or excesses of private credit may exacerbate financial instability and inefficiency. The expected effect of private credit on economic growth in this paper is positive.

External debt, measured as external debt as a share of GDP, captures borrowing from other countries and multinational institutions. The connection between external debt and growth is still open to question in scientific works. For example, following the debt overhang hypothesis advanced by Krugman (1988) and Sachs (1989), external debt can adversely affect economic growth due to debt obligations and lack of investments. At the same time, Cunningham (1993), Reinhart and Rogoff (2010), and Nouaili (2025) point out the possibility that the external debt of the state can negatively influence economic growth in case of low fiscal space and macroeconomic instabilities. On the other hand, according to Mankiw et al. (1992), Romer (1996), and Panizza (2008), the external debt can contribute to growth if borrowed money is spent for productive activities. Addis Yimer and Alemayehu Geda (2024) also emphasize the sustainability and usage of debt in their study. The expected effect of external debt on economic growth in this paper is negative.

Government expenditure, measured as government expenditure as a percentage of GDP, includes expenditure by the government on infrastructure, education, health, and other programs targeted at developing and enhancing economic and social welfare. Government expenditure is included in

the model because it directly affects aggregate demand, capital formation, and productivity. Both empirical studies and theoretical literature have found that there exists a positive relationship between productive government expenditure and economic growth. According to Aschauer (1989), public investments, particularly public investment in infrastructure, greatly increase productivity and lead to economic growth. Smilarly, Onuoha (2025) finds out that public expenditure is an important channel through which public debts affect economic growth. Nevertheless, if not properly managed, excessive government expenditure leads to budget deficits, high debts, and misallocation of resources. The expected sign of government expenditure in this study is positive.

Labor force growth is used in this study as a proxy for population. It captures the contribution of labor input to overall economic output. According to the theory of neoclassical growth, growth in labor supply positively influences economic growth as long as there is sufficient capital formation and technological advancement. As noted by Mankiw et al., (1992), labor is one of the most basic factors in economic production and growth. A growing labor force may enhance production capacity and domestic demand in developing countries. But rapid labor force growth, without employment options, may lead to unemployment, low productivity, and consequently poor economic growth. Several empirical works, including those by Godfrey and Mutuku (2013), have confirmed this positive link. Therefore, the expected sign of government expenditure in this study is positive.

Inflation is an increase in the general level of prices, which serves as one of the major indicators of macroeconomic stability. The inclusion of this variable in the model helps in considering the influence of price instability on economic performance. Studies conducted by Barro (2012), Babu et al. (2015), and Ali et al. (2022), confirm that inflation tends to negatively influence economic growth because of its negative implications on the economy by creating uncertainty, distorting relative prices, and discouraging investment. Although moderate inflation may have limited positive effects in the short run, the main expectation is negative. Therefore, the expected effect of inflation in this study is negative.

Table 1: Expected Signs of the Explanatory Variables

Variables	Expected Sign
TB	+/-
CPS	+
EXTD	-
GEXP	+
TLF	+
INF	-

3.4 Estimation Method: The Autoregressive Distributed Lag (ARDL) Approach

In this paper, the empirical analysis is carried out using the Autoregressive Distributed Lag (ARDL) model proposed by Pesaran and Shin (1999) and further extended by Pesaran et al. (2001). The ARDL estimation procedure has emerged to be one of the most popular empirical approaches to the analysis of macroeconomic phenomena since it allows one to estimate both short-run dynamics and long-run equilibrium relationships between variables.

As compared to the traditional OLS estimation technique, the ARDL procedure possesses several advantages. Even though OLS produces an unbiased estimator under the standard linear regression conditions, it does not separate short-run and long-run impacts in dynamic equations and, therefore, may provide a spurious regression when the variables have stochastic trends (Granger & Newbold, 1974). Given that macroeconomic variables like GDP, public debt, government spending, and financial development demonstrate stochastic trends, the use of OLS alone can be misleading.

Similarly, although the Vector Error Correction Model (VECM) is a perfect model for both the long-run and short-run analysis, its use requires the variables to be I(1) and cointegrated based on Johansen cointegration approach (Johansen, 1988, 1991). The condition restricts the applicability of the VECM when there are mixed integrated variables. The ARDL bounds testing approach, on the other hand, can be used when the regressors are a mixture of I(0) and I(1) variables with none being I(2) (Pesaran et al., 2001).

Another crucial advantage of the ARDL bounds testing approach is the fact that it is applicable in small sample sizes. While other multivariate cointegration models such as Johansen require a large sample size in order to have reliable estimations, the ARDL estimator gives consistent and efficient estimations even in small samples (Pesaran & Shin, 1999), as this study uses data from 1993 – 2025.

Moreover, the ARDL technique controls the issue of endogeneity as the model involves the lagged value of the dependent and independent variable in the specification of the model. The use of the right lag structures makes the omission of the dynamic effects and serial correlation problem minimal and at the same time estimates both short-run and long-run coefficients in one reduced form (Nkoro & Uko, 2016).

Following the theoretical framework and empirical literature, the long-run relationship is specified above; the corresponding unrestricted ARDL model, in which differenced variables are used to measure the short-run effect whereas the lagged level variables capture the long-run relation, can be expressed as:

$$\begin{aligned}\Delta \ln RGDP_t = \alpha_0 &+ \sum_{i=1}^{p} \phi_i \Delta \ln RGDP_{t-i} + \sum_{i=0}^{q_1} \theta_{1i} \Delta \ln TBGDP_{t-i} + \sum_{i=0}^{q_2} \theta_{2i} \Delta \ln CPSGDP_{t-i} \\ &+ \sum_{i=0}^{q_3} \theta_{3i} \Delta \ln EXTGDP_{t-i} + \sum_{i=0}^{q_4} \theta_{4i} \Delta \ln GEXPGDP_{t-i} + \sum_{i=0}^{q_5} \theta_{5i} \Delta TLF_{t-i} \\ &+ \sum_{i=0}^{q_6} \theta_{6i} \Delta INFL_{t-i} + \lambda_1 \ln RGDP_{t-1} + \lambda_2 \ln TBGDP_{t-1} + \lambda_3 \ln CPSGDP_{t-1} \\ &+ \lambda_4 \ln EXTGDP_{t-1} + \lambda_5 \ln GEXPGDP_{t-1} + \lambda_6 TLF_{t-1} + \lambda_7 INFL_{t-1} + \varepsilon_t\end{aligned}$$

3.5 Diagnostic Tests

To establish the robustness, validity and reliability of the estimated model, several diagnostics tests were conducted. The diagnostics tests used in this study included stationarity, multicollinearity, autocorrelation, heteroscedasticity, normality, model specification and stability tests.

Chapter Four

4. Results, Discussion and Analysis

The dataset used in this analysis covers 33 years, which is a period spanning from 1993 up to 2025 based on secondary data that was mainly obtained from National Bank of Ethiopia, the World Bank and the Ministry of Finance. This section provides descriptive and econometric analysis.

Table 2: Descriptive Statistics Overview

Variable	Observation	Mean	Standard Dev.	Min	Max
RGDP	33	13.43	0.97	11.84	14.86
TB	33	2.46	0.77	0.93	4.053
CPS	33	2.57	0.30	1.46	3.02
EXTD	33	3.67	0.77	2.34	5.12
GEXP	33	2.90	0.25	2.25	3.28
TLF	33	38.94	10.12	23.57	56.77
INF	33	12.51	13.41	-10.77	55.24

Source: Own computation *2026*

The above table presents summary statistics, which summarizes key features of the dataset that include statistics describing the center and spread of the data. The real GDP averaged 13.43 and varied moderately. Inflation was the most variable with the largest variability, with large variations during the study period. The other explanatory variables, including treasury bills, credit to the private sector, external borrowing, labor force growth and government expenditure are exhibiting more or less stable trends with moderate standard deviations,

4.1 Descriptive Statistics and Trend Analysis

Trends of Variables

The figure below illustrates that real GDP grew significantly from 139.4 billion Birr in 1993 to 2.84 trillion Birr in 2025. High levels of economic expansion have been observed after 2000. In

contrast, treasury bill issuance in the early period was much lower in the early 2000s. However, the numbers significantly increased from less than 30 billion birr before 2004 to 797.8 billion birr in 2024, reaching its highest level since 1993. It is observed that there has been a high growth of domestic borrowing in the last ten years through treasury bill instruments to meet fiscal deficits.

Figure 1: Real GDP and Treasury Bill Growth

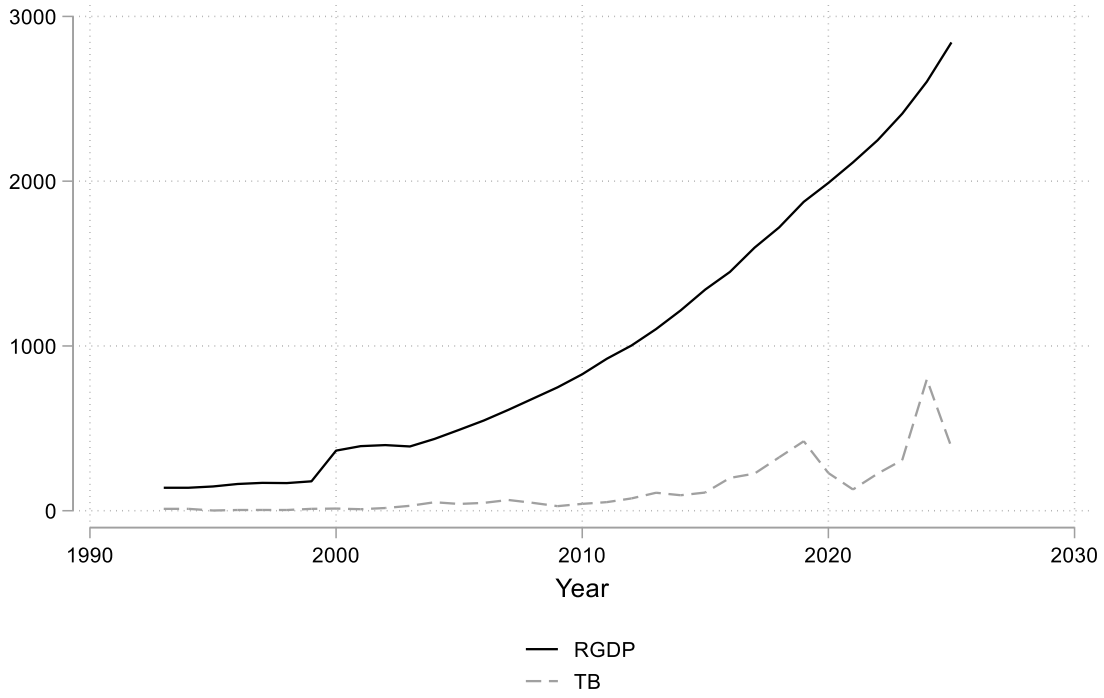
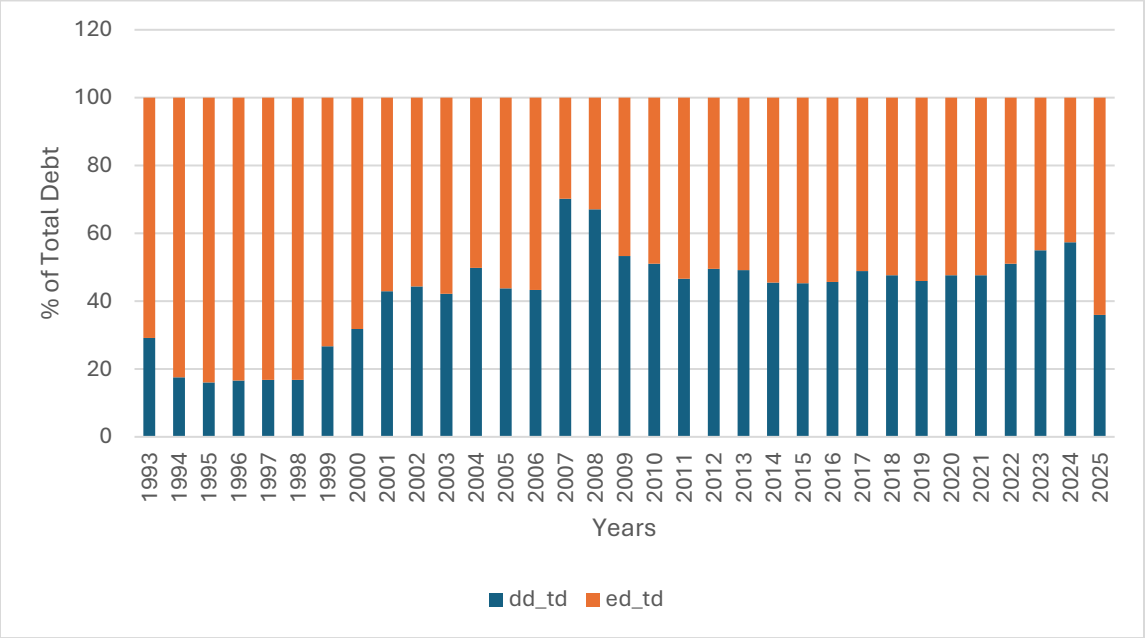


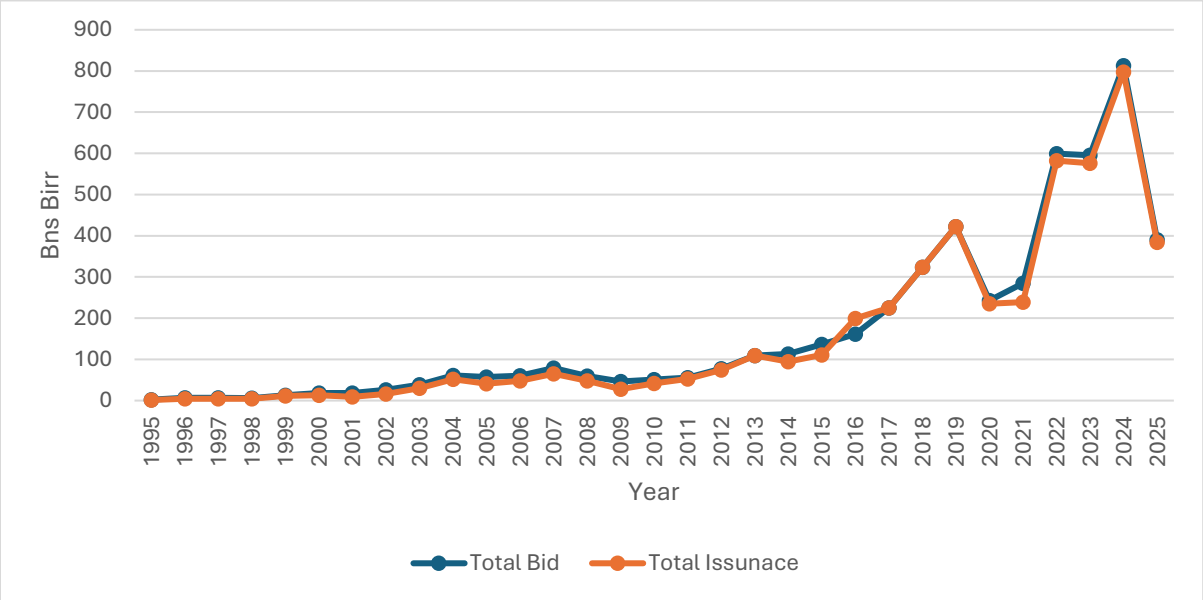
Figure 2: Ethiopia's public debt structure



Source: Own computation *2026*

The figure above indicates that at the early stage, external debt was predominant in the public debt of Ethiopia. External debt represented 70.8% of the total debt in 1993, while the domestic debt was around 29.2%. This trend continued until 2007, suggesting high reliance on external borrowing. A significant shift occurred in the year 2007 with domestic debt reaching 70.2% and continued to surpass external debt in the next years, with some fluctuations. Over the last five years, domestic debt exhibited an upward trend, reaching 57.4% in 2024, before sharply dropping to 35.9% in 2025, mainly associated with Birr devaluation against USD, leading to the growth of the level of outstanding external debt.

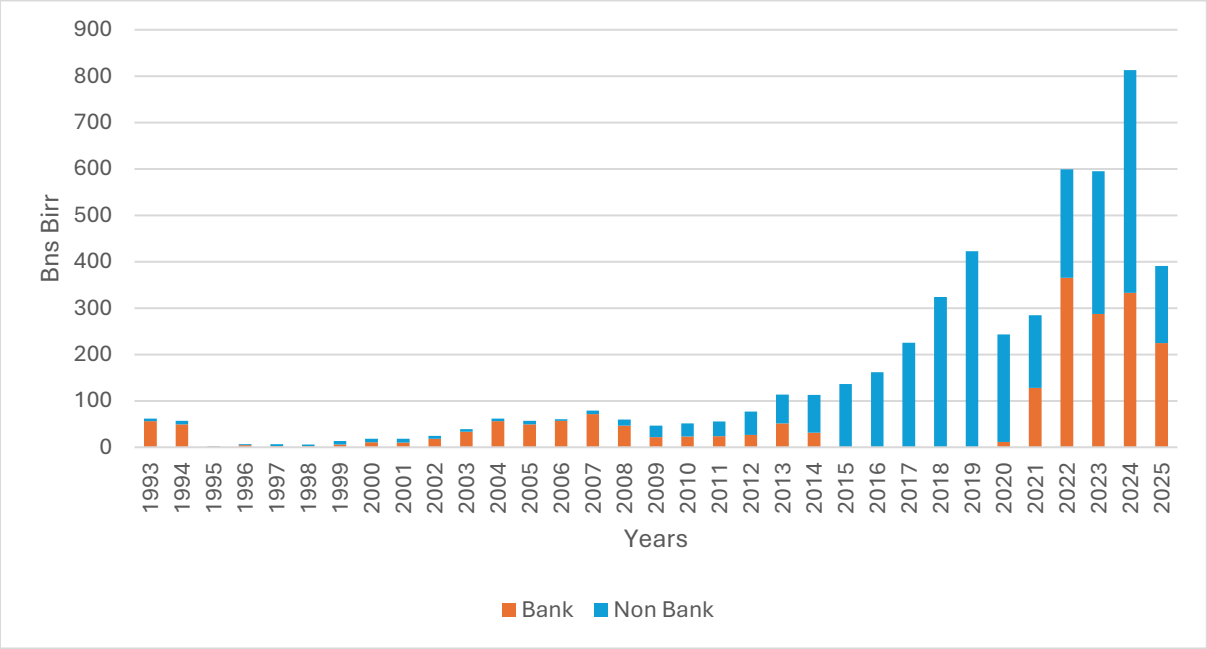
Figure 3: Treasury Bill Auction Results



Source: Own computation *2026*

It is observed from the figure above that the amount demanded exceeded the amount offered from 1995 to 2018, with an average annual yield of 3.34%. The years 2013, 2017, 2018, and 2019 are exceptions where the total offered equals the supply. A significant surge in total issuance volume occurred in the years following the introduction of market-based yields in 2020. The total volumes sold grew from 1.4 billion Birr in 1995 to a peak of 797.8 billion Birr in 2024.

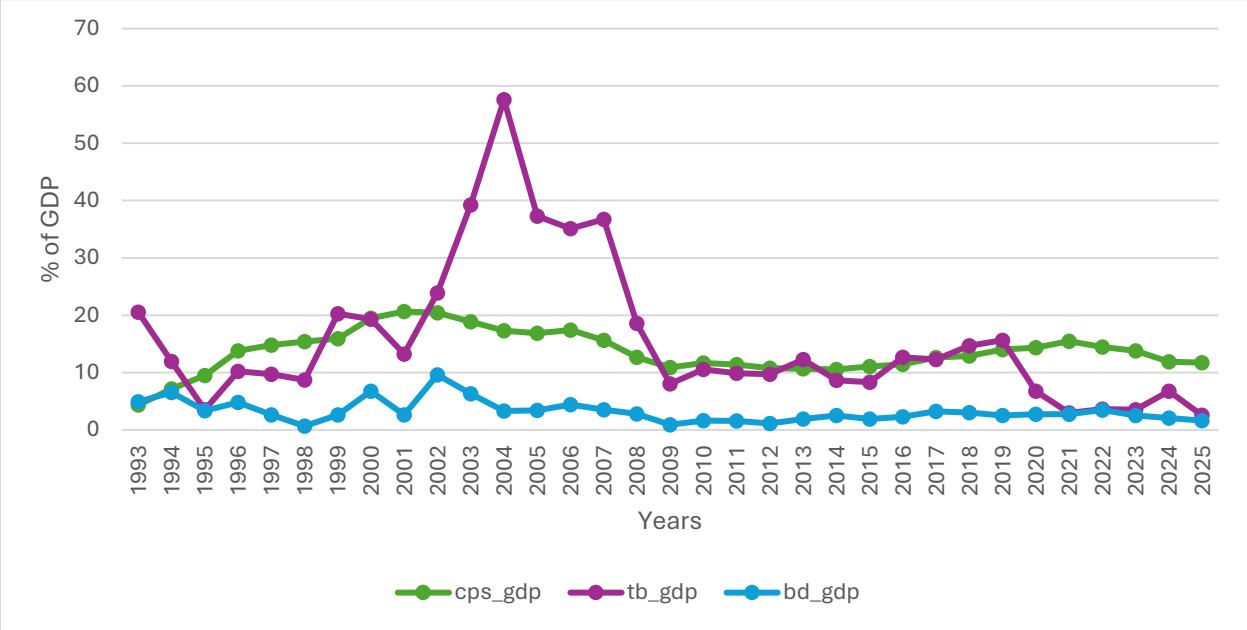
Figure 4: Composition of demand for treasury bills over the years



Source: Own computation *2026*

From this figure, in the early years, the demand for treasury bills was dominated by the banking sector until the mid-2010s. In 1993, the demand for treasury bills by the non-banking participants was minimal, accounting for only 4.9 billion Birr compared to 56.4 billion Birr from the banks. This trend started to change gradually in the year after 2013, as the participation of pension funds grew, mainly the public and private social security agencies, with their demand reaching 479.8 billion Birr in the year 2024, signaling a high level of systemic risk. The participation of banks increased steadily from 2021, and the total demand grew rapidly to 365.4 billion Birr in 2022 after the lifting of the requirement by the NBE for banks to invest 27% of their portfolios in treasury bills. The growing investment demand of banks is mainly driven by higher-yielding treasury bill instruments, reaching more than 10% annual weighted average yield in the last five years.

Figure 5: Private Sector Credit, Treasury Bill Stock and Budget Deficit as a Percentage of GDP Trend



Source: Own computation *2026*

The above figure shows the ratio of CPS, treasury bills stock, and budget deficit to gross domestic product. The TB/GDP showed high fluctuations in the study period. Starting 20.5% in 1993, it increased to 6.76% in 2004 before finally reaching 2.5% in 2025. The significant decline in the ratio is mainly related to the high level of nominal value of GDP growth relative to treasury bill issuance. CPS/GDP exhibited a positive relationship with TB/GDP, except for an inverse association from 1996 to 1998. BD/GDP shows a stable trend with an average ratio of 3.2%. Budget deficit reached its highest point in 2002 at 9.6%, followed by high treasury bill issuance in the year 2004.

4.2 Econometric Analysis

4.2.1 Test for Stationarity

It becomes crucial to test the properties of the data used before drawing a reasonable conclusion from time series regression analysis. This implies that to obtain some sort of inference in relation to the relationship from time series regression, it becomes essential for the variables used to be stationary and cointegrated. This process will help in avoiding the problem of spurious regression (Granger and Newbold, 1974). Granger and Newbold recommended the use of various statistical tests like the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) to test stationarity. In this case, Augmented Dickey-Fuller test was performed to check for the presence of a unit root, based on Bayesian Information Criteria (BIC) for the optimal lag length.

Table 3: Unit root test results at level using ADF test

Variables	Test Statistic	Critical Values		
		1%	5%	10%
RGDP	-0.73	-3.70	-2.98	-2.62
TB	-1.60	-3.70	-2.98	-2.62
CPS	-5.02	-3.70	-2.98	-2.62
EXTD	-1.39	-3.70	-2.98	-2.62
GEXP	-0.59	-3.70	-2.98	-2.62
TLF	1.88	-3.70	-2.98	-2.62
INF	-4.03	-3.70	-2.98	-2.62

Source: Own computation *2026*

The above table demonstrates that all variables except credit to the private sector and inflation are non-stationary at level I(0).

Table 4: Results of the unit root test at first difference using ADF test

Variables	Test Statistic	Critical Values		
		1%	5%	10%
RGDP	-5.54	-3.70	-2.98	-2.62
TB	-5.68	-3.70	-2.98	-2.62
CPS	-4.13	-3.70	-2.98	-2.62
EXTD	-4.53	-3.70	-2.98	-2.62
GEXP	-6.38	-3.70	-2.98	-2.62
TLF	-4.72	-3.70	-2.98	-2.62
INF	-7.87	-3.70	-2.98	-2.62

Source: Own computation *2026*

From the table above, the unit root tests indicate that all the variables are integrated of order I (1), and none are I(2). This meets the pre-requisite for using the ARDL bound testing method suggested by Pesaran et al. (2001), thus it becomes the best suited estimator for this study.

4.2.2 Test for Multicollinearity

VIF is used as the primary diagnostic tool for the multicollinearity test, where values greater than 10 indicate problematic multicollinearity. All independent variables recorded VIF values below 10 in this study, confirming the absence of multicollinearity. This ensures a valid interpretation of the individual effects of independent variables on the dependent variable (Gujarati & Porter, 2009).

Table 5: Results of multicollinearity test

Statistic	GEXP	TLF	EXTD	TB	CPS	INF	Mean VIF
VIF	7.82	6.75	3.36	2.30	1.73	1.65	3.94
1/VIF	0.12	0.14	0.29	0.43	0.57	0.60	

Source: Own computation *2026*

4.2.3 ARDL Bounds Test for Cointegration

In determining the existence of a long-run relationship among the variables, the ARDL Bounds Test for Cointegration by Pesaran, Shin, and Smith (2001) was adopted. According to this method, the relationship between the variables can be determined regardless of whether they are integrated of order I (0) or I (1).

Table 6: Results of the ARDL bounds test

Test Statistic	Estimated Value	10%		5%		2.5%		1%	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
F-statistic	18.476	2.12	3.23	2.45	3.61	2.75	3.99	3.15	4.43
t-statistic	-6.132	-2.57	-4.04	-2.86	-4.38	-3.13	-4.66	-3.43	-4.99

Source: Own computation *2026*

The ARDL bounds test was carried out to investigate the presence of a long-term relationship between the study variables. From the table above, it can be observed that the calculated F-statistics (18.476) exceeds the upper bound critical value of 4.43 at the 1% significance level while the t-statistic (-6.132) is much less than the respective 1% lower bound critical value of -4.99. It implies that the null hypothesis is rejected, indicating the presence of a long-term cointegration relationship among the study variables.

4.2.4 ARDL Model: Short Run Estimation Results

Table 7: Short run ARDL model estimation results

Short-run coefficients				
Variables	Coefficient	Std. Error	t	P>|t|
TB	0.06	0.02	2.14	0.04
CPS	1.02	0.14	6.86	0.00
EXTD	-0.06	0.04	-1.53	0.14
GEXP	0.17	0.15	1.11	0.28
TLF	0.05	0.01	4.81	0.00
INF	-0.00	0.00	-0.22	0.83
cons	4.40	0.75	5.82	0.00

Source: Own computation *2026*

The short run estimation results indicate that treasury bills with a coefficient of 0.06, affect real GDP significantly in the short run. This shows that domestic borrowing contributed to short-term economic expansion through providing immediate liquidity and financing the government budget deficit. The short run result aligns with previous findings of Yimer and Geda, (2024). Abbas and Christensen (2010) argued that well-functioning domestic debt markets can improve growth in low-income countries by mobilizing domestic funds and encouraging financial market development. Credit to the private sector and total labor force affect economic growth significantly. The negative coefficient of external borrowing is largely attributable to rising debt-servicing obligations, in line with the findings of Nega (2021) and Nouaili (2025). Other control variables of external borrowing and inflation were found to have no significant relationship with economic growth in the short run.

4.2.5 ARDL Model: Long Run Estimation Results

Table 8: Long run ARDL model estimation results

Variable	Coef.	Std. err.	t	P>|t|
ADJ - adjustment term				
RGDP	-0.54	0.08	-6.13	0.00
long-run coefficients				
TB	0.11	0.06	1.86	0.07
CPS	0.96	0.17	5.44	0.00
EXTD	-0.37	0.06	-5.46	0.00
GEXP	0.09	0.37	0.25	0.80
TLF	0.09	0.00	13.32	0.00
INF	0.00	0.00	1.99	0.06

Source: Own computation *2026*

The above result shows that 90.2% variation in RGDP is explained by dependent variables. The estimated coefficient of error correction is negative and significant, which confirms the existence of long run relationship between the variables in the model. The coefficient suggests 54% of disequilibrium in short run will be corrected in each year.

The long-run result indicates that credit to the private sector, external borrowing, and total labor force variables have a significant relationship with RDGP, and all other independent variables have an insignificant relationship with real GDP at 5% significance level.

The coefficient of treasury bills stock (a key variable in this study) has a positive and statistically insignificant effect on economic growth in the long run. This result is consistent with the Ricardian equivalence proposition where rational and foresighted individuals internalize government's inter-temporal budget constraint completely, making no macroeconomic effects from the financing mechanism choice, in line with the findings of Barro (1989).

In the long run, credit to the private sector has a positive and highly statistically significant effect on economic growth. The coefficient value of 0.96 indicates that a 1% increase in private sector credit as a share of GDP is associated with a 0.96% increase in real GDP, ceteris paribus. This indicates that the development of the financial sector and improved access to credit, through channelling resources into productive investments, are important for promoting investment, business growth, and overall economic performance (Abbas & Christensen, 2010; Mankiw et al., 1992). This supports the view that market-based domestic debt financing does not appear to crowd out private credit.

The long run coefficient of external borrowing is a negative value and statistically significant. The result indicates a 1% increase in the external debt is associated with a 0.37% decline in real GDP. The negative relationship is due to persistent rising debt-servicing obligations associated with exchange rate volatility and proceeds from the borrowing directed towards less efficient public investments. This result is consistent with studies in developing countries where the decline or inefficient investment was unable to support growth (Nega (2021) and Nouaili (2025).

In the study period, total labor force has positive contributions to long-run economic growth. The outcome on the growth of labor force might reflect high labor productivity and the enormous capacity of the economy to absorb the growing labor force into productive sectors in the future. In contrast, government expenditure and inflation have positive but insignificant contributions to long-run economic growth. The weak contribution of government expenditure could be a signal of inefficiencies in the composition and efficiency of public spending, rather than its growing size. In contrast to conventional economic theory, which generally predicts a negative impact of inflation on long-run growth due to uncertainty and resource misallocation (Barro, 2012), in this study, inflation has a statistically insignificant and positive impact on economic growth. This may indicate that moderate increases in the general price level were associated with expansionary economic activities.

4.2.6 Post Estimation Diagnostic Tests

4.2.6.1 Autocorrelation Test

Autocorrelation implies the association between the error terms or residuals. The test for the existence of serial correlation in the residuals of the regression equation is known as the Breusch-Godfrey Lagrange Multiplier test. The test is much broader and general compared to the Durbin-Watson test as it can identify higher-order serial correlations and is valid even when lagged values of the independent variables are included. The null hypothesis states that there is no serial correlation in the error terms up to the order specified, and the alternative hypothesis states the existence of autocorrelation.

Table 9: Results of the autocorrelation test

lags (p)	Chi^2	df	Prob > chi^2
1	1.789	1	0.1810

Source: Own computation *2026*

The test was done using one lag, where the chi-square statistic was 1.789, and the p-value was 0.1810. The value of the p-value is greater than the conventional value used for testing at 5%, and hence we accept the null hypothesis. Therefore, it means that there is no autocorrelation at the first order.

4.2.6.2 Heteroscedasticity Test

Breusch-Pagan test was undertaken to investigate the existence of heteroskedasticity in the data. There is heteroskedasticity in the case where the variability of the residual or error terms in a regression model varies across the levels of the independent variables. The variance of the error terms is constant in the null hypothesis; conversely, in the alternative hypothesis, the variance is heteroskedastic in that it varies systematically with respect to the independent variable.

H0: Constant variance

chi2(1) = 0.36

Prob > chi2 = 0.5463

The value of the p-value is greater than 0.05, and therefore it means that there is no problem of heteroskedasticity.

4.2.6.3 Model Specification

The Ramsey RESET test was applied in the investigation of the appropriate functional form and specification of the model. Null hypothesis holds that there is appropriate functional form with no omitted variables, and alternative hypothesis assumes that the model is misspecified with omitted variables.

H0: Model has no omitted variables

F(3, 14) = 0.68

Prob > F = 0.5779

In view of the above results, the rejection of the null hypothesis does not occur since the probability value is greater than the 5 percent level of significance.

4.2.6.4 Normality Test

Normality Test is one of the tests that are frequently performed to check whether a particular variable has a normal distribution. One of the tests used for this purpose is the Jarque-Bera normality test.

Jarque-Bera normality test: 1.26 Chi (2) .5327

Jarque-Bera test for Ho: normality:

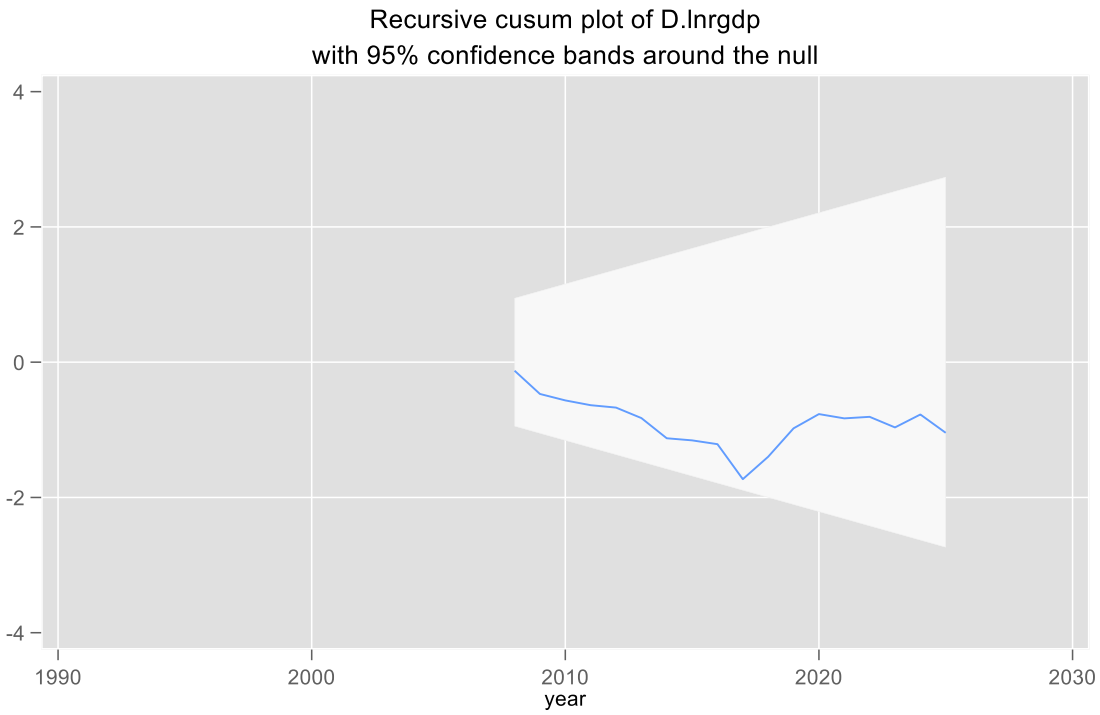
According to the above result, the p-value is greater than 0.05. Therefore, the variables have a normal distribution.

4.2.6.5 Recursive CUSUM Test

In this study, in order to ascertain the stability of the model throughout the research period, recursive cumulative sum test. For a model to be stable, the cumulative sum should remain in confidence bands. Crossing of the threshold line shows the structural break or changing of parameters of the model. From the chart below, we can see that the cumulative sum line remains within the 95% confidence band. There is a little decline in the cumulative sum after 2018, but it

never crosses the critical lines. Therefore, we cannot reject the null hypothesis and find real GDP and other parameters stable.

Figure 6: Recursive cusum plot



Chapter Five

5. Conclusion and Policy Implications

5.1 Summary of the Findings and Conclusion

This paper has tried to demonstrate the impact of domestic debt through treasury bills issuance on the growth of the Ethiopian economy. With respect to the impact of domestic debt on economic growth, several studies in developing countries came to differing conclusions. While certain studies found that the domestic debt had a negative impact on economic growth, others found that it had a positive impact. Nevertheless, no formal research has been conducted so far in terms of assessing the domestic debt with special consideration of treasury bills in Ethiopia and its impact on economic growth.

The data for the time series from 1993 to 2025 was employed during the estimation. The dependent variable in the study considered natural logarithm of real GDP while explanatory variables were natural logarithm of treasury bills, credit to the private sector, gross capital formation, labor force growth rate, government expenditure, and annual inflation rate. Except for the total labor force and annual inflation rate, all the explanatory variables were in terms of the ratio of the natural log of GDP. The estimation was done using Autoregressive Distributed Lag (ARDL) Model. Prior to estimating the model, the stationarity was tested using Augmented Dickey Fuller test. Variables such as treasury bills, gross capital formation, labor force growth rate, and government expenditure, except credit to the private sector and annual inflation rate, were found non-stationary at level I(0). In contrast, the unit root tests indicate that all variables used in this study are integrated of order at first difference, and none are I(2).

The short run regression result shows that treasury bills, credit to the private sector, and total labor force affect economic growth significantly at a 5% significance level. The coefficient of treasury bills, which is a key variable in this study, has a positive relationship with the growth of the economy, this suggests that it provides immediate liquidity and financing the government budget deficit, aligning with the Ricardian equivalence theory. Furthermore, the long-run regression result indicates that treasury bills and government expenditure have an insignificant relationship with economic growth, and credit to the private sector, external debt, and total labor force have a significant relationship with economic growth. The long-run coefficient of external borrowing is a negative value and statistically significant, indicating persistent rising debt-servicing obligations

associated with exchange rate volatility and proceeds from the borrowing directed towards less efficient public investments.

5.2 Policy Relevance and Implications

In assessing the relationship between domestic debt financing through the issuance of treasury bills and economic growth, the following policy recommendations are made in light of the empirical findings of this study.

These results show that the use of treasury bills as a financing tool has a positive and statistically significant impact on economic growth in the short run and a positive but statistically insignificant impact in the long run. Therefore, treasury bills as a financing mechanism of domestic borrowing can serve as an efficient instrument of short-term financing without causing sustained long-term economic growth by itself. Hence, it would be wise for policy makers to continue using treasury bills as a means of domestic financing while keeping the level of borrowing sustainable and incorporated into a strategy of economic development in the long run.

Furthermore, it has been discovered that the use of credit to the private sector positively and statistically significantly influences economic growth, especially in the long run. Hence, it is essential to make sure that access to finance is not restricted, and businesses have enough money for their investments. In case if domestic borrowing increases because of the rising demand for treasury bills by the government, the level of borrowing should be carefully managed in order not to limit access to credit for businesses.

The insignificant long-run relationship between government expenditure and economic growth implies that the effect of the growth of public expenditure does not depend only on its size but also on its efficiency and allocation. Hence, more effort is needed in ensuring that the domestic resources used by the country are channeled into productive investment areas such as infrastructural projects, industry, agriculture, education, and energy sector development to ensure their positive contribution to the productive capability of the economy and generate economic benefits over a long period of time rather than current expenditure.

Finally, the study underscores the necessity of developing the domestic debt market of the country to make it more effective in terms of domestic borrowing. Creating an efficient secondary market for Treasury bills, enlarging the number of participants from commercial banks and social security

organizations to pension funds, insurance companies, investment firms, and individuals, and gradually developing the government bonds market will help to develop liquidity of the market, diversify the participants, facilitate price discovery, and increase the ability of the government to attract long-term domestic sources for productive investment.

5.3 Directions for Future Research

This study investigated the implications of treasury bill issuance as a tool for financing the government budget deficit from a fiscal policy perspective. This is a very crucial study area to explore, especially for developing countries like Ethiopia highly reliant on external borrowing, providing alternative domestic resources with less foreign exchange fluctuation risk associated with external borrowing. However, the researcher recommends that further investigation is needed from the monetary policy side, assessing how different treasury bill instruments affect interest rate and money supply dynamics to capture their comprehensive role in the economy.

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Appendix

```
  ___  ____  ____  ____  ____ ©
 /__    /   ____/   /   ____/      17.0
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 Statistics and Data Science       Copyright 1985-2021 StataCorp LLC
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Notes:
      1. Unicode is supported; see help unicode_advice.
      2. More than 2 billion observations are allowed; see help obs_advice.
      3. Maximum number of variables is set to 5,000; see help set_maxvar.

. do "C:\Users\haile\AppData\Local\Temp\STD7134_000000.tmp"

. import excel "C:\Users\haile\Downloads\MSc Research\Market Based Debt\Data\Research Data.xlsx", sheet("Sheet1") firstrow
(16 vars, 33 obs)



. tsset year

Time variable: year, 1993 to 2025
        Delta: 1 unit


. gen lnrgdp=ln(rgdp)

. dfuller lnrgdp

Dickey-Fuller test for unit root           Number of obs  = 32
Variable: lnrgdp                           Number of lags =  0

H0: Random walk without drift, d = 0

                                      Dickey-Fuller
                   Test      -------- critical value --------
              statistic           1%           5%          10%
------------------------------------------------------------------
 Z(t)            -0.736       -3.702       -2.980       -2.622
------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.8373.


. gen lntb_gdp =ln(tb_gdp)

. dfuller lntb_gdp

Dickey-Fuller test for unit root           Number of obs  = 32
Variable: lntb_gdp                         Number of lags =  0

H0: Random walk without drift, d = 0

                                      Dickey-Fuller
                   Test      -------- critical value --------
              statistic           1%           5%          10%
------------------------------------------------------------------
 Z(t)            -1.609       -3.702       -2.980       -2.622
------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.4791.
```

```
. gen lncps_gdp =ln( cps_gdp )

. dfuller lncps_gdp

Dickey-Fuller test for unit root           Number of obs  = 32
Variable: lncps_gdp                        Number of lags =  0

H0: Random walk without drift, d = 0

                                      Dickey-Fuller
                  Test      ──────── critical value ────────
              statistic           1%           5%          10%
──────────────────────────────────────────────────────────────
 Z(t)            -5.020       -3.702       -2.980       -2.622
──────────────────────────────────────────────────────────────
MacKinnon approximate p-value for Z(t) = 0.0000.


. gen lnextd_gdp =ln( extd_gdp )

. dfuller lnextd_gdp

Dickey-Fuller test for unit root           Number of obs  = 32
Variable: lnextd_gdp                       Number of lags =  0

H0: Random walk without drift, d = 0

                                      Dickey-Fuller
                  Test      ──────── critical value ────────
              statistic           1%           5%          10%
──────────────────────────────────────────────────────────────
 Z(t)            -1.396       -3.702       -2.980       -2.622
──────────────────────────────────────────────────────────────
MacKinnon approximate p-value for Z(t) = 0.5840.


. gen lngexp_gdp =ln( gexp_gdp )

. dfuller lngexp_gdp

Dickey-Fuller test for unit root           Number of obs  = 32
Variable: lngexp_gdp                       Number of lags =  0

H0: Random walk without drift, d = 0

                                      Dickey-Fuller
                  Test      ──────── critical value ────────
              statistic           1%           5%          10%
──────────────────────────────────────────────────────────────
 Z(t)            -0.590       -3.702       -2.980       -2.622
──────────────────────────────────────────────────────────────
MacKinnon approximate p-value for Z(t) = 0.8732.


. dfuller tlf

Dickey-Fuller test for unit root           Number of obs  = 32
Variable: tlf                              Number of lags =  0

H0: Random walk without drift, d = 0

                                      Dickey-Fuller
                  Test      ──────── critical value ────────
              statistic           1%           5%          10%
──────────────────────────────────────────────────────────────
 Z(t)             1.883       -3.702       -2.980       -2.622
──────────────────────────────────────────────────────────────
MacKinnon approximate p-value for Z(t) = 0.9985.
```

```
. dfuller infl

Dickey-Fuller test for unit root           Number of obs  = 32
Variable: infl                             Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test      -------- critical value ---------
              statistic           1%           5%          10%
------------------------------------------------------------------
 Z(t)            -4.039       -3.702       -2.980       -2.622
------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0012.


. gen diff_lnrgdp=D.lnrgdp
(1 missing value generated)

. dfuller diff_lnrgdp

Dickey-Fuller test for unit root           Number of obs  = 31
Variable: diff_lnrgdp                      Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test      -------- critical value ---------
              statistic           1%           5%          10%
------------------------------------------------------------------
 Z(t)            -5.549       -3.709       -2.983       -2.623
------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.


. gen diff_lncps_gdp =D.lncps_gdp
(1 missing value generated)

. dfuller diff_lncps_gdp

Dickey-Fuller test for unit root           Number of obs  = 31
Variable: diff_lncps_gdp                   Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test      -------- critical value ---------
              statistic           1%           5%          10%
------------------------------------------------------------------
 Z(t)            -4.132       -3.709       -2.983       -2.623
------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0009.


. gen diff_lnextd_gdp =D.lnextd_gdp
(1 missing value generated)

. dfuller diff_lnextd_gdp

Dickey-Fuller test for unit root           Number of obs  = 31
Variable: diff_lnextd_gdp                  Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test      -------- critical value ---------
              statistic           1%           5%          10%
------------------------------------------------------------------
 Z(t)            -4.534       -3.709       -2.983       -2.623
------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0002.
```

```
. gen diff_lngexp_gdp =D.lngexp_gdp
(1 missing value generated)

. dfuller diff_lngexp_gdp

Dickey-Fuller test for unit root           Number of obs  = 31
Variable: diff_lngexp_gdp                  Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test      -------- critical value ---------
              statistic           1%           5%          10%
------------------------------------------------------------------
 Z(t)            -6.384       -3.709       -2.983       -2.623
------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.
```

```
. gen diff_infl =D.infl
(1 missing value generated)

. dfuller diff_infl

Dickey-Fuller test for unit root           Number of obs  = 31
Variable: diff_infl                        Number of lags =  0

H0: Random walk without drift, d = 0

                                       Dickey-Fuller
                   Test      -------- critical value ---------
              statistic           1%           5%          10%
------------------------------------------------------------------
 Z(t)            -7.877       -3.709       -2.983       -2.623
------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.
```

```
. label var lnrgdp "natural logarithm of real gdp"

. label var lntb_gdp "natural logarithm of treasury bills/gdp"

. label var lncps_gdp "natural logarithm of credit to private sector/gdp"

. label var lnextd_gdp "natural logarithm of external debt/gdp"

. label var lngexp_gdp "natural logarithm of government expenditure/gdp"

. label var tlf "total labor force"

. label var infl "inflation"
```

```
. reg lnrgdp lntb_gdp lncps_gdp lnextd_gdp lngexp_gdp tlf infl
```

Source	SS	df	MS	Number of obs	=	33
				F(6, 26)	=	283.69
Model	30.1093314	6	5.0182219	Prob > F	=	0.0000
Residual	.459923643	26	.017689371	R-squared	=	0.9850
				Adj R-squared	=	0.9815
Total	30.569255	32	.95528922	Root MSE	=	.133

lnrgdp	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
lntb_gdp	.051508	.0460194	1.12	0.273	-.0430861	.1461022
lncps_gdp	.1697723	.1003967	1.69	0.103	-.036596	.3761406
lnextd_gdp	-.1293782	.0558154	-2.32	0.029	-.2441084	-.014648
lngexp_gdp	.2424212	.2550125	0.95	0.351	-.2817645	.7666069
tlf	.0949358	.0060297	15.74	0.000	.0825416	.1073301
infl	-.0003124	.0022522	-0.14	0.891	-.0049419	.004317
_cons	8.947188	.8042038	11.13	0.000	7.294124	10.60025

```
. vif
```

Variable	VIF	1/VIF
lngexp_gdp	7.82	0.127823
tlf	6.75	0.148217
lnextd_gdp	3.36	0.297655
lntb_gdp	2.30	0.434656
lncps_gdp	1.73	0.578351
infl	1.65	0.605516
Mean VIF	3.94	

```
. ardl lnrgdp lntb_gdp lncps_gdp lnextd_gdp lngexp_gdp tlf infl, maxlags(2) bic

ARDL(1,0,1,1,2,0,1) regression

Sample:       1995 thru       2025                    Number of obs =     31
                                                      F(12, 18)     = 899.97
                                                      Prob > F      = 0.0000
                                                      R-squared     = 0.9983
                                                      Adj R-squared = 0.9972
Log likelihood = 58.40076                             Root MSE      = 0.0483
```

lnrgdp	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
lnrgdp						
L1.	.4593792	.088171	5.21	0.000	.2741387	.6446196
lntb_gdp	.0610857	.0285781	2.14	0.047	.0010453	.1211261
lncps_gdp						
--.	1.02021	.1486196	6.86	0.000	.7079715	1.332448
L1.	-.498362	.1270973	-3.92	0.001	-.7653836	-.2313405
lnextd_gdp						
--.	-.0626611	.0408558	-1.53	0.142	-.1484959	.0231738
L1.	-.1403501	.0391902	-3.58	0.002	-.2226858	-.0580144
lngexp_gdp						
--.	.1714879	.1540249	1.11	0.280	-.1521065	.4950823
L1.	.7245143	.1424899	5.08	0.000	.4251542	1.023874
L2.	-.8466072	.1881326	-4.50	0.000	-1.241859	-.4513552
tlf	.0500029	.0103948	4.81	0.000	.0281642	.0718415
infl						
--.	-.000205	.0009404	-0.22	0.830	-.0021807	.0017707
L1.	.003494	.001035	3.38	0.003	.0013195	.0056686
_cons	4.409002	.7571102	5.82	0.000	2.818372	5.999632

```
. ardl lnrgdp lntb_gdp lncps_gdp lnextd_gdp lngexp_gdp tlf infl, lags(1,0,1,1,2,0,1)

ARDL(1,0,1,1,2,0,1) regression

Sample:       1995 thru       2025                    Number of obs =     31
                                                      F(12, 18)     = 899.97
                                                      Prob > F      = 0.0000
                                                      R-squared     = 0.9983
                                                      Adj R-squared = 0.9972
Log likelihood = 58.40076                             Root MSE      = 0.0483
```

lnrgdp	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
lnrgdp						
L1.	.4593792	.088171	5.21	0.000	.2741387	.6446196
lntb_gdp	.0610857	.0285781	2.14	0.047	.0010453	.1211261
lncps_gdp						
--.	1.02021	.1486196	6.86	0.000	.7079715	1.332448
L1.	-.498362	.1270973	-3.92	0.001	-.7653836	-.2313405
lnextd_gdp						
--.	-.0626611	.0408558	-1.53	0.142	-.1484959	.0231738
L1.	-.1403501	.0391902	-3.58	0.002	-.2226858	-.0580144
lngexp_gdp						
--.	.1714879	.1540249	1.11	0.280	-.1521065	.4950823
L1.	.7245143	.1424899	5.08	0.000	.4251542	1.023874
L2.	-.8466072	.1881326	-4.50	0.000	-1.241859	-.4513552
tlf	.0500029	.0103948	4.81	0.000	.0281642	.0718415
infl						
--.	-.000205	.0009404	-0.22	0.830	-.0021807	.0017707
L1.	.003494	.001035	3.38	0.003	.0013195	.0056686
_cons	4.409002	.7571102	5.82	0.000	2.818372	5.999632

```
. estat bgodfrey

Breusch–Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	1.789	1	0.1810

H0: no serial correlation

```
. estat hettest

Breusch–Pagan/Cook–Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of lnrgdp

H0: Constant variance

    chi2(1) =   0.36
Prob > chi2 = 0.5463
```

```
. estat ovtest

Ramsey RESET test for omitted variables
Omitted: Powers of fitted values of lnrgdp

H0: Model has no omitted variables

F(3, 15) =   0.68
Prob > F = 0.5779



. predict residuals, residuals
(2 missing values generated)

. jb residuals
Jarque-Bera normality test:   1.26 Chi(2)  .5327
Jarque-Bera test for Ho: normality:


. ardl lnrgdp lntb_gdp lncps_gdp lnextd_gdp lngexp_gdp tlf infl, maxlags(1,0,1,1,2,0,1) ec

ARDL(1,0,1,1,2,0,1) regression

Sample:       1995 thru       2025                    Number of obs =     31
                                                      R-squared     = 0.9020
                                                      Adj R-squared = 0.8367
Log likelihood = 58.40076                             Root MSE      = 0.0483

------------------------------------------------------------------------------
    D.lnrgdp | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
ADJ          |
      lnrgdp |
         L1. |  -.5406208    .088171    -6.13   0.000    -.7258613   -.3553804
-------------+----------------------------------------------------------------
LR           |
    lntb_gdp |   .1129917   .0606506     1.86   0.079    -.0144304    .2404138
   lncps_gdp |   .9652746   .1773467     5.44   0.000     .5926831    1.337866
  lnextd_gdp |  -.3755149   .0687607    -5.46   0.000    -.5199758    -.231054
  lngexp_gdp |   .0913671   .3727538     0.25   0.809    -.6917595    .8744938
         tlf |   .0924916   .0069437    13.32   0.000     .0779034    .1070797
        infl |   .0060838   .0030529     1.99   0.062    -.0003301    .0124977
-------------+----------------------------------------------------------------
SR           |
   lncps_gdp |
         D1. |    .498362   .1270973     3.92   0.001     .2313405    .7653836
             |
  lnextd_gdp |
         D1. |   .1403501   .0391902     3.58   0.002     .0580144    .2226858
             |
  lngexp_gdp |
         D1. |   .1220929   .2045663     0.60   0.558     -.307685    .5518708
         LD. |   .8466072   .1881326     4.50   0.000     .4513552    1.241859
             |
        infl |
         D1. |   -.003494    .001035    -3.38   0.003    -.0056686   -.0013195
             |
       _cons |   4.409002   .7571102     5.82   0.000     2.818372    5.999632
------------------------------------------------------------------------------
```

Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship F = 18.476
t = -6.132

Critical Values (0.1-0.01), **F-statistic**, Case 3

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_6	2.12	3.23	2.45	3.61	2.75	3.99	3.15	4.43

accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), **t-statistic**, Case 3

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_6	-2.57	-4.04	-2.86	-4.38	-3.13	-4.66	-3.43	-4.99

accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

k: # of non-deterministic regressors in long-run relationship
Critical values from Pesaran/Shin/Smith (2001)

. estat sbcusum

Cumulative sum test for parameter stability

Sample: 1995 thru 2025 Number of obs = 31
H0: No structural break

Type	Test statistic	Critical value 1%	5%	10%
Recursive	0.8194	1.1430	0.9479	0.8499

. sum lnrgdp lntb_gdp lncps_gdp lnextd_gdp lngexp_gdp tlf infl

Variable	Obs	Mean	Std. dev.	Min	Max
lnrgdp	33	13.43336	.977389	11.84519	14.86011
lntb_gdp	33	2.465724	.7749391	.9347475	4.053792
lncps_gdp	33	2.571974	.3079401	1.468644	3.027949
lnextd_gdp	33	3.670213	.7720942	2.347347	5.120343
lngexp_gdp	33	2.903651	.2578788	2.251778	3.284268
tlf	33	38.94595	10.1283	23.57633	56.77906
infl	33	12.51999	13.41581	-10.77339	55.24131

.
end of do-file

year	rgdp	infl	cps	tb	gexp	tlf	extd	gdp
1993	139411.5	4.714	1374.172	6494.85	5219.435	23.57633	26086.86	31638.58
1994	139480.2	6.293	2368.475	3945.18	7093.8	24.3442	55339.46	33059.646
1995	147454.5	14.835	3774.134	1395.5	8371.975	25.11574	61192.12	39671.548
1996	162373.1	-8.999	6090.332	4526	10194	25.874	60004.06	44214.734
1997	169246.9	-2.653	7119.042	4690.15	11647.39	26.6117	61355.37	48124.289
1998	167917.5	0.104	8083.27	4555.45	10905.07	27.34515	66252.86	52388.404
1999	178512.7	10.394	9098.473	11594.19	14673.95	28.10877	40370.74	57187.81
2000	364984.3	1.894	13419.43	13311.15	17340.56	28.90859	43472.05	68920.051
2001	392058.8	-10.773	14529.74	9322.94	17395.24	29.76342	46407.69	70345.512
2002	398464.8	-1.222	14052.05	16453.19	18369.07	30.69368	54134.17	68825.24
2003	390102.9	17.773	14318.65	29818	18454.47	31.68062	60442.51	75935.169
2004	435859.5	2.383	15522.87	51632	21750.63	32.71251	54259.47	89614.803
2005	490970.4	10.747	18573.78	41065	24350.19	33.78714	51790.49	110101.89
2006	547625.4	10.820	23733.78	47793.5	29293.34	34.89045	52677.12	136128.47
2007	612217.2	15.103	27839.5	65315	35607.34	36.07562	21107.97	177851.42
2008	680706.9	55.241	32607.14	47716.51	46915.01	37.33306	26852.06	256766.11
2009	749058.8	2.707	37833.92	27839.8	57774.27	38.65881	49660.3	346823.93
2010	828212.7	7.321	46249.34	41736.49	72597.93	40.07685	76991.87	395991.17
2011	922512.8	38.044	60283.52	52316.03	93943.1	41.58593	133331.8	528579.82
2012	1002767	20.812	82505.68	74694.81	124416.8	43.1627	159176.2	766915.48
2013	1102468	7.390	94941.28	109184.5	154008.7	44.76959	209254.9	889644.89
2014	1216015	8.464	114651.4	94233.34	185471.8	45.54079	274179.3	1088631.8
2015	1342556	10.446	147526.6	110593.3	224881.4	46.28989	383270.9	1331983.7
2016	1449397	7.504	179226.1	199200	280892.8	47.02406	465273.9	1568097.5
2017	1596482	8.362	231235.8	225321.2	329658.1	47.73984	541215.9	1832553.7
2018	1719491	16.774	284463.1	323991.2	354205.3	48.39231	703692.2	2202372.7
2019	1874689	15.280	377632.4	421983.5	413105.7	48.98901	782909.6	2696222.7
2020	1989588	21.552	484586.4	228859.1	488243.2	49.13894	1008444	3374746.9
2021	2114238	24.629	670509.5	129143.7	599006.7	49.96394	1292053	4341024.2
2022	2248663	34.035	889630.3	225236.3	779099	51.76446	1468147	6157015.2
2023	2409921	29.352	1203349	307826.2	938771.6	53.41951	1569125	8723116.8
2024	2603953	19.930	1402329	797797.1	1120077	55.09961	1702323	11784561
2025	2842252	13.900	1766639	384390	1818329	56.77906	4611524	15094419