

# Impacts and Determinants of External Debt Service in Ethiopia

Shimelis Fikre Chala\*

Department of Economic Modeling and Statistical Analysis, National Bank of Ethiopia, Addis Ababa, Ethiopia

## Abstract

The main purpose of this study is to identify the determinants of the external debt service and decisive impacts in Ethiopia. The annual time series data span from 1987/88 to 2021/22 EFY is used. Based on criteria of pre-estimation and ability to capture dynamism among the variables the study used Auto Regressive and Distributed Lag model (ARDL). The finding shows that; the nature of external debt service of Ethiopia is fluctuate overtime due to varies factors. Incorporated variables in the model are RGDP, consumer price index, current account balance, trade openness, total export of goods and service, real effective exchange rate, government effectiveness and external debt. The result of ARDL estimation model reveals that consumer price index and external debt have negative impacts on external debt service of Ethiopia. While, real gross domestic product and trade openness has positive impacts on debt repayment of Ethiopia. Implication of positive trade openness and economic growth indicate that having out and in ward with international trading partner also having improved infrastructural development are important to make easy external debt service of Ethiopia. It makes easy to attract foreign direct investment and sustainable economic growth. Contrary, higher inflation and higher external debt has leads discourage the inflow of FDI or business activity. The findings suggest that; the need to curb inflation and having not much external debt as well promoting investment on production of exportable goods and service sectors that generate foreign currency is making easy to repay external debt of Ethiopia.

**Keywords:** External debt service • Autoregressive distributed lag estimation model • ARDL • LMICs

## Introduction

### Background of the study

One of the major macroeconomic challenges in developing countries is burden of external debt, which is unresolved problems, particularly in Low and Middle Income Countries (LMICs) [1]. Rising of external debt burdens, along with increased risk profiles, change into higher servicing costs. Most of these countries borrow money from international lending organizations such as International Monetary Fund (IMF), World Bank's International Development Association (IDA), Official Development Assistance (ODA) and Africa Development Bank (ADB). Also, they borrow money from foreign commercial banks, foreign governments. According to the World Bank report on December 2022, poorest countries spend over a tenth of their export revenues to service their long-term public and publicly guaranteed external debt. As report shows at the end of 2021, external debt of these economies totaled \$9 trillion, more than double the amount a decade ago. In the same period, the total external debt of IDA countries

is nearly tripled to \$1 trillion. Rising interest rates and slowing global growth risk tipping a large number of countries into debt crises. About 60% of the poorest countries are already at high risk of debt distress or already in distress.

These countries borrow to finance their expenditures, to build infrastructure, finance or recovery from unexpected difficulty, either natural disasters or pandemic or crisis or others, even to repay its previous external debt. Even though, external debt leads to a debt cycle, continuous borrowing and accumulating payment burden. Sub-Saharan African (SSA) countries face a serious and growing external debt problem. For instance, during COVID-19 economic activities are collapsed in these countries are crowding out healthy spending, unstable of exchange rate and rising of inflation [2]. Literature reviewed that in 2019, most LMICs more spend on servicing their debt rather financing healthy and other problems. The debt burden in SSA is increased to 702 billion USD in 2020 from 305 billion USD in 2010 as World Bank report on October 2021. They highly spend on different infrastructure development, while still do not much collect income or generate an income and end heavily borrowing. Rising debt

\*Address for Correspondence: Shimelis Fikre Chala, Department of Economic Modeling and Statistical Analysis, National Bank of Ethiopia, Addis Ababa, Ethiopia, Tel: 251988113544; E-mail: shimelisfik26@gmail.com

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service levels severely limit the ability of these countries to finance critical imports and new development.

Low-income developing countries face highest and worsening debt servicing ratios. The ratio of external debt to GNI implicates that capacity or ability to repay their debts and a rising in ratio indicate the region's debt is much higher than its income. For instance, in 2020 in four SSA (Mozambique, Zambia, Cabo Verde and Angola) countries the debt to GNI ratio was above 100% [3]. Debt servicing in low income countries are extremely influencing their fiscal budget compositions [4]. Also as IMF measures a country's debt service ratio is the ratio of its debt service payments (principal+interest) to its export earnings. And optimal recommendations country's international finances are healthier when this ratio is low and the ratio is between 0 and 20%.

According to Fitch report, the risk of debt service liquidity stress into severe macroeconomic instability, such as Sri Lanka in 2022. As IMF had published in April 2022 unsustainability of Sri Lanka's debt problems were aggravated by a balance-of-payments crisis. According to the report, government debt reached US\$81.7 billion, representing 101% of 2020 gross domestic product, with 53.1% of GDP in domestic currency and 48.2% of GDP in foreign currencies. Out of 48.2%, 11% were held by multilateral creditors and 13.8% by bilateral creditors (4.4% Japan and 6.9% China has highest debt amounts representing of Sri Lankan GDP) and that held by private creditors to 16.5% of GDP. Also, as report shows Angola, Republic of Congo, Ethiopia, Kenya and Mozambique are face external debt service payments in 2023 equivalent to more than one to quarter of their latest reported reserves. For instance, Ethiopia reserves are 1.5 USD billion at the end of June 2022, which is only a month import values. These makes difficulties in financing budget, import of goods of raw materials and other prioritize goods for development, these leads to seeking new borrowing which increase external debt burden as well repayments.

Ethiopia experienced significant growth in the past decade and recording an average growth rate of 8.4 percent between 2015 and 2020 [5]. However, the growth is mainly driven by government investment that obtained from external debt and total debt accumulation doubled from US\$25 billion in 2013 to US\$56 billion in 2020. External debt as a share of total debt stood at 55% in 2013 and reduced marginally to 53% in 2020. On the composition of the external debt, between 2011 and 2020, Ethiopia's debt is dominated by multilateral debt (41%) followed by bilateral debt (31%) and private creditors (28%) [6]. According to the China Africa Research Initiative (CARI), Chinese loans to the Ethiopian government between 2000 and 2019 amounted to US\$14 billion, making Ethiopia the second highest recipient of Chinese loans after Angola. Even though, loans are substantial for economic growth, some of these loans are offered relatively higher interest rate. Some commercial lenders do not participate in debt relief initiatives (DSSI), rather than provide blanket debt relief, historical precedence shows that China is more likely to options including debt restructuring, postponement of loan payments, refinancing and debt reduction [7].

According to IMF working paper series in 2023 Ethiopia is buffeted by major external and internal shocks compressed within last five years which made difficulty on macroeconomic instability. Such as; widening of fiscal deficit, domestic inflationary pressures, imbalance of the current account, which resulted from a combination of growing import demand, shrinking of exports and increase in global commodity prices. Foreign exchange reserves have continued to dwindle significantly. In February 2023, the reserves lowered to less than a month of import coverage, creating pressure in the foreign exchange market and widening the gap between the official and parallel market rate. Total public debt to GDP ratio is currently over 53%, while the debt service to export ratio is above optimal recommendations IMF of 20%. Even, the Ethiopia's debt stock ratio is not high compared to many emerging economies; it still represents a challenge when we look at it in terms of its fiscal costs. In 2022, the country made a total of USD 2.1 billion in external debt service payments, while spending on poverty-focused social spending was about USD 1.9 billion.

In spite of external financing of Ethiopia is declining in recent years and government undertaking reform measures to better manage State owned enterprises debt, domestic debt has been rising due to fiscal pressure to overcome the multiple macroeconomic shocks suffered by the country in the past three years [8]. Debt service has a resource drain effect which retards economic growth and can lead to debt overhang. A drawback concerning external borrowing is the currency risk, because external debt service raises the demand for often scarce foreign exchange [9]. High external debt-service can deplete foreign exchange that could have been used in the provision of social services [10]. Depreciation in the local currency will amplify the external debt service which results to macroeconomic instability. Also the context of highly indebted countries, debt servicing depletes the revenue to level in which achieving economic growth is slim even when these countries undertake economic reforms. If not viewable economic output external borrowing and debt services can lead countries exposed to macroeconomic crises.

The study by Alani found that external debt and external debt servicing in Ethiopia has impact on economic growth and limit capacity of the country debt servicing. Large debt repayments impose constraints on economic growth by draining away the limit of resources that could have been spent on domestic development needs. Many studies investigate on external debt servicing using OLS, VAR and cross-sectional of panel data used, while no other studies apply ARDL model. Also have time gap being studied on external debt servicing of Ethiopia. Application of this model very important; to capture dynamism of the variables as well as to estimate long run and short run behaviors of the variables. Therefore, this study is made different from others studies.

The core objective of this study is to determine a key factor which affects external debt servicing in Ethiopia.

Specifically

- To show trend of external debt servicing ratio to total export of goods in Ethiopia.
- To determine the short run and long run relationship between external debt servicing and independent variables.

The finding of this research would be; helps as input for policy makers to design proper and effective and alternative policy to external debt servicing of Ethiopia, serve as reference for those who interested to investigate on the area of determinants of external debt service.

The structure of the study organized as follows: first sections consists of background of the study, statement of the problem and objective of the studies, second sections, a body of theories the relationship between external debt, external debt servicing and economic growth was reviewed; empirical review of previous studies in Ethiopia and other developing country, thirdly, methodology and data source of the study. And finally, result analysis and discussion as well conclusion and recommendation are presented.

## Materials and Methods

### Theoretical reviews

There are various theories which try to discuss the relation between external debts and other factors affecting the economy. For example, debt overhang hypothesis posits that certain levels of external borrowing can affect the economy positively. However, beyond certain levels, the economy is likely affected due to the burden debt servicing. Similarly, this theory argues that positive economic growth is likely to reduce debt servicing. The implication of this theory is that countries with high level and sustained economic growth are likely to have lower debt burden.

The take-off theory by Rostow, 1950 held that for an economy to take off there has to be a substantial amount of investment to be made. For countries with a credit problem, public borrowing becomes a good alternative. As Harrod, 1974 state that foreign capital injection can be used to enhance the investment rate in developing countries by augmenting domestic savings and without lowering the level of domestic consumption. He advocated for foreign aid in boosting to ensure that Less Developed Countries (LDCs) can sustain themselves economically. However, the theory is unclear on the role of a public depression in growth. The framework to investigate the flow of foreign assets required for a certain level of economic growth. In their analyses they reported that net capital inflows influence the level of a country's debt serving. For instance, more foreign investment in the domestic economy creates more revenues which can be used to repay external debt. Rosenstein-Rodan noted that the flow of financial resource to developing countries from the developed world is critical for pushing these countries out of poverty. He was therefore, giving a justification for foreign aid to developing countries. Through Rostenstain-Rodan was of the view that any assistance in the form of loans could result in adverse effects on such economies.

### Neoclassical theory

The theory states that rise in current expenditure will lead to budget deficit under full employment that will result to a rise in interest rates [11]. The neo-classical economists posit that borrowing has an undesirable effect on the economy growth because it results to crowding out of investment which hinders capital formation [12]. The theory postulates that increasing borrowings would result to more imports and less exports resulting to an adverse effect on the current account balance of a country.

Under the neoclassical theories a negative association between borrowing and growth is expected. Fiscal deficit leads to decrease in government savings, when the rise in private savings does not make up for a drop in government savings it raises the general interest rate which negatively effects on economic growth. The neo-classical theory argued that budget deficit and borrowing is harmful and countries should practice system of balanced budgeting [13]. The neoclassical economic growth model posits external debt arises when capital-constraint countries seek for borrowing abroad [14].

### The theory debt overhang

The debt overhang theory suggests that if a country is highly indebted to the extent that the debt is more than its repayment capacity, debt service will strangle investments and hinder economic growth [15]. Debt overhang is a circumstance where the debt burden is so huge that a country cannot secure further debts to finance new project. The theory posits that public debt and public debt servicing impact economic growth by making debt repayment priority rather than other expenditure [16]. Excessive public borrowing has a dual effect to the domestic economy. The first is crowding out effect and also hike in increase interest rate. High interest payment obligation can raise a country's budget shortfall. Huge debt service will hamper growth by reducing the public resources productive spending to stimulate growth [17].

### Empirical reviews

Various researchers have tried to explain what determine debt service in several countries across the world. The study estimated results using Vector Error Correction Model (VECM) after confirming long run relationship in the series [18]. The study found that GDP was positively related to debt service. They study conclude that increase in exports and economic growth rate was a remedy to external debt burden. The flow of capital to debt service ratio, the growth of exports, imports to reserve ratio and per capita income had a significant impact on the external debt servicing.

A study by Sargent, used a longitudinal method to predict what factors explained debt servicing. Both domestic and external public debts of 44 economies in both developing and developed countries were investigated. By employing the debt-service model, the study investigated that payments of debts were largely explained by economies amount of exports. In addition, countries with fewer exports had a high probability of default or reschedule debt servicing.

Furthermore, using monetary approach, the study reported a positive link between inflation and public debt service. The study therefore, concludes that inflation and exports were key determinants of country's debt service.

Similarly, a study by Mayo, Barrett et al., applied a logit regression model on longitudinal data for 48 countries and established that GDP growth rate, disbursed external stock to the ratio of exports, reserve to import ratio, and inflation, determines external debt servicing. In particular, the study established the debt service and GDP were positively related. On the contrary, the study reported a negative effect of inflation to external debt servicing.

The study by Shah and Pervin examined factors determining debt servicing in some selected developing countries. The study focused specifically on the factor driving countries not honors their debt obligations. Results of the study established that among the key factors explaining public debt servicing are the per capita income, export to GDP ratio and inflation. In addition, the study found that countries with lower per capita income were more likely to default than those with higher GDP per person. Furthermore, inflation was found to affect external public debt service negatively. Another study conclude within the sub-Saharan region has established real capital inflows was very key in determining an economy's ability to settle her external debt obligations [19].

The study Hall and Sargent argues that improvement in the balance of payment through exports is a key determinant of debt servicing in emerging economies. In addition, the study observed that a larger capital inflow of capital is a solution to the debt service burden facing developing countries. The study concluded a country's volume of international trade determines debt service in developing countries. However, the findings of this study could have been biased given that the estimation relied on Ordinary Least Square regression (OLS) which suffers from various challenges such as endogeneity, multicollinearity and even heteroscedasticity.

The Awan, Qasim et al., defined debt servicing as the money which is mandatory for the repayment of interest and principal owed to creditors. The empirical relationship between external debt service of African countries on the one hand and commodity prices, terms of trade, exchange rates and loan terms (interest rate, term to maturity and grace period) external debt service is the portion of current revenue used in settling past expenditures. And therefore, is not available to the domestic economy for consumption and/or investment in the current period, the implication is that external debt service is likely to have a negative effect on present and future economic growth and development.

The Lahiri and Dinh confirmed that export, import, income inequality, inflation and efficiency of investment are able to explain almost 85 percent of the cross country variation in debt servicing performance using a panel data of 57 less developing countries includes African, Latin American, Asia, Middle East and Europe.

## Overview of research

Several studies around the world have been reviewed in terms of theory, empirical evidence and reports. Generally, this literature indicates that more attention has been given to the relationship between debt service and economic growth, while it is not incorporate key determinants that affects public debts servicing such as total export of goods and service, current account balance, trade openness, government effectiveness index. There is limitation of literature, even on the theories explaining determinants of public debt servicing and significance. Some studies related to debt service, have taken more attention to factors affecting debt service such as Kenya, Ghana, South Africa, etc. while, not in Ethiopia is supported by empirical evidence.

## Data and methodology

**Data type and source:** This study used secondary time series data. The span of data covered from 1987/88 to 2021/22 was collected from the National Bank of Ethiopia and the World Development indicator data. Variables incorporate is external debt service as dependent variables, while real gross domestic product, consumer price index, current account balance, total export of goods and services, external debt stock, trade openness, real effective exchange rate and government effectiveness is independent variables. Nature of variables of data used in this study is collected based on literature reviewed.

## Description of the variables

**External debt service:** It is external debt service is the payments of both principal and interest charged on the external debt. That means cash of foreign currency that is required for a particular time period to cover the repayment of interest and principal of external debt.

**Current account balance:** Compares a country's net trade in goods and services, plus net earnings, and net transfer payments from the rest of the world during specified period. Generally, large persistent current account deficit may signal ill-performance and vulnerability of the economy [20]. Persistent Current Account Deficit (CAD) is a key indicator of low national savings and investments, lack of international competitiveness and structural economic problem such as an undeveloped financial system. Also current account imbalance means a potential loss of output, increased unemployment and unbalanced economic growth.

**Trade openness:** It is degree of openness to trade may provide additional evidence regarding to determinants of external debt service in economies. Trade openness can relate to both internal demand factors and external supply factors. We expect a positive relationship between trade openness and debt service capacity. Indeed, if a developing country is more open to trade, that is more globalized and more integrated with global financial system. The degree of openness of a country is said to bring enormous benefit in terms of enlargement in growth rate and increase levels of national income. It is also postulated that the open trade regime is a significant predictor to reduced probability of debt rescheduling.

**Real gross domestic product:** It is a measure of a country potential wealth, productivity and return on investment. When the economy grows, more output could be realized and used to finance their loan payment. Debt servicing is likely to deprive the economy of the resources for investment and hence, contract national income. These means the causality between GDP and external debt servicing may have either negative or positive relationship.

**External debt:** It is huge pressure on debt service coverage because the higher the level of external debt stock, meaning that the higher would be the repayment. Therefore, this will lower the country's debt servicing capacity. A country's external debt is postulated to have a negative impact on the debt servicing capacity of a country.

**Government effectiveness:** It captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Data used for this indicator is estimated of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performances) as world development indicators.

**Consumer price index:** It is used proxy for inflation. *i.e.*, an increase in the money supply, causing the Consumer Price Index (CPI) to increase. When the general price level rises, each unit of currency buys fewer goods and services; which is a reduction in the purchasing power of money. As a result, higher level of inflation brings tension or lack of confidence among business community and households. Mainly this variable relate to the political situation of a country were incorporated in the creditworthiness study as they assumed political instability has the power to influence the decision for external borrowing and capital flight issues in the home country.

**Real effective exchange rate:** It is the weighted average of a country's currency in relation to other major currencies that compares nation's currency value against the weighted average of the currencies of its major trading partners. An increase in a nation's REER is an indication that its exports are becoming more expensive and its imports are becoming cheaper. It is losing its trade competitiveness.

## Estimation methodology

The study used ARDL model which is a multiple regression model. Econometric models were built based on this model. ARDL approach takes into account the short and long run relationship simultaneously. The ARDL bounds testing model is a co-integration method developed by Pesaran et al. to test existence of the long run relationship between the variables. It has some advantages over other type of co-integration tests and it is relatively a better model. The approach is used irrespective of whether the series are integrated at same or mixed I(0) or I(1). Another advantage it has is that it allows the use of different optimal lags for the different variables, which is not possible with other co-integration test like the Engle and Granger model Johansen co-integration test.

The model specification in this study to identify the determinants of external debt service repayment in Ethiopia is specified as the following: The model shown in Equation (1) is the econometric equation of the model, while, Equation (2) show the ARDL equation.

$$DS = f(CAB, X, TO, RGDP, EXDT, GEF, REER, CPI) \quad (1)$$

Where, DS=external debt service, CAB=Current Account Balance, X=total export of goods and service, TO=Trade Openness, RGDP=Real Gross Domestic Product, EXDT=External Debt, CPI=Consumer Price Index, REER=Real Effective Exchange Rate and GEF=Government Effectiveness.

The Pesaran, Shin, and Smith, the Error Correction Model (ECM) of the unrestricted Auto Regressive Distributed Lag (ARDL) equation of equation (1) is specified as follows:

$$\begin{aligned} \Delta \log DS_t = & \beta_0 + \sum_{j=1}^p \beta_{1j} \Delta \log DS_{t-j} + \sum_{j=1}^p \beta_{2j} \Delta CAB_{t-j} + \sum_{j=1}^p \beta_{3j} \Delta \log X_{t-j} + \sum_{j=1}^p \beta_{4j} \Delta \log RGDP_{t-j} + \\ & \sum_{j=1}^p \beta_{5j} \Delta \log EXDT_{t-j} + \sum_{j=1}^p \beta_{6j} \Delta \log TO_{t-j} + \sum_{j=1}^p \beta_{7j} \Delta \log CPI_{t-j} + \sum_{j=1}^p \beta_{8j} \Delta \log REER_{t-j} + \sum_{j=1}^p \beta_{9j} \Delta GEF_{t-j} + \\ & \theta_1 \log DS_{t-1} + \theta_2 CAB_{t-1} + \theta_3 \log X_{t-1} + \theta_4 \log RGDP_{t-1} + \theta_5 \log EXDT_{t-1} + \theta_6 \log TO_{t-1} + \\ & \theta_7 \log CPI_{t-1} + \theta_8 \log REER_{t-1} + \theta_9 GEF_{t-1} + \epsilon_t \end{aligned} \quad (2)$$

After finding the long-run association existing between variables, the study uses the Error Correction Model (ECM) to find the short-run dynamics. ECM shows the speed of adjustment in the long-run equilibrium after a shock in the short run. The ECM general form of Equation (2) is specified as below equation:

$$\begin{aligned} \Delta \log DS_t = & \beta_0 + \sum_{j=1}^p \beta_{1j} \Delta \log DS_{t-j} + \sum_{j=1}^p \beta_{2j} \Delta CAB_{t-j} + \sum_{j=1}^p \beta_{3j} \Delta \log X_{t-j} + \sum_{j=1}^p \beta_{4j} \Delta \log RGDP_{t-j} + \\ & + \sum_{j=0}^p \beta_{5j} \Delta \log EXDT_{t-j} + \sum_{j=1}^p \beta_{6j} \Delta \log TO_{t-j} + \sum_{j=1}^p \beta_{7j} \Delta \log CPI_{t-j} + \sum_{j=1}^p \beta_{8j} \Delta \log REER_{t-j} + \\ & \sum_{j=1}^p \beta_{9j} \Delta GEF_{t-j} + \delta ECM_t \end{aligned} \quad (3)$$

Where;  $\Delta$  is the first difference operator, log stands for natural logarithmic transformation.

$\beta_{ij}$  ( $i=1,2,3,\dots,9$ ) are short run coefficients on variable  $i$  at lag  $j$ ,  $\theta_i$  ( $i=1,2,3,\dots,9$ ) are long-run coefficients on variable and  $p$  indicate the optimum lag length of the variable under study, and  $\delta$  the coefficient of speed of adjustment.

Time series methodologies were adopted by this study. Both descriptive statistics and inferential statistics were produced in this study. Descriptive statistics took the forms of mean, standard deviation, minimum and maximum values of the variables as well as skewness and kurtosis analysis, while inferential statistics is regression analysis. To analyze time series analysis whether there are the long-run relationships and short run dynamic among the variables of interest, ARDL co-integration approach was developed by Pesaran and Shin are used.

It has three advantages in comparison with other previous and traditional co-integration methods. The first one is that the ARDL does not need that all the variables must be integrated of the same order and it can be applied when the variables are integrated of order one, order zero or integrated. The second advantage is ARDL test is relatively more efficient in the case of small and finite sample data sizes. The third advantage, applying the ARDL technique gives unbiased estimates of the long-run model.

**Pre-estimation tests**

**Test for unit roots:** Econometric studies started by exploring the stationarity of the series data using the Augmented-Dickey-Fuller (ADF) tests procedure which proposed by Dickey. Working with non-stationary time series is leads to wrong inferences and conclusions which bring spurious regressions. To avoid spurious regression ADF is adjusts the existence of serial correlation by including lags as compared to others tests. The test procedure states that; null hypothesis the variables have unit root or non-stationary against alternative hypothesis is the variables are stationary. A unit root is said to exist in a time series of the value of  $\varphi=0$  in the below equation.

The null hypothesis for both tests is that the data are non-stationary. We want to reject the null hypothesis for this test, so we want a p-value of less than 0.05 (or smaller).

**Lag length determination:** To select the appropriate lag length of a time series data the most common lag selection criteria are: Likelihood ratio test (LK), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinan Criterion (HQC) was used.

**Co-integration tests:** The pre-condition for applying the ARDL model is the existence of a long run relationship between the dependent variable external debt service and vectors of independent variables; it is only possible to proceed to this model. We check co-integration or long run relationships by applying the bounds test, based on the F-test statistic. The decision of existence in co-integrations (null hypothesis) decided by F-statistic which is if exceeds the upper bound, we conclude that we have co-integration.

**Post estimation tests:** The model that has been used for testing the long-run relationship and coefficients is further tested with the diagnostic tests of Serial Autocorrelation and Heteroskedasticity.

The stability of the model and the coefficients are checked through the CUSUM and CUSUM-Q, while the graphical presentation of the recursive coefficients is used to judge the stability of the coefficients.

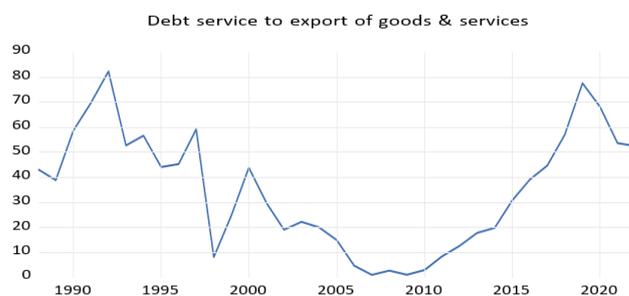
	DS	CPI	CAB	EXDT	GEFF	TO	X	RGDP	REER
Mean	13720.82	56.35	-58998.6	231779	20.1602	0.1312	32452.88	793969.9	152.87
Median	1680.6	19.65	-13414.3	51193.05	20.398	0.0789	7331.258	490970.4	140.21
Maximum	105225.5	293	-651.68	1451355	40.2912	0.4813	200105.5	2248600	344.52
Minimum	510.2	7.59	-304404	6175.6	2.0423	0.0087	279.026	238826.2	93.78
Std. dev.	25246.83	66.62	81806.69	377402.4	13.8335	0.1236	46402.14	624075.2	58.66
Skewness	2.23	1.92	-1.3188	1.9958	0.0487	0.8859	1.913498	1	1.8
Kurtosis	7.19	6.43	3.6219	6.0018	1.3876	2.8576	6.602564	2.68	6.14
Jarque-Bera	54.61	38.76	10.7097	36.3761	3.8051	4.6084	40.28	6.02	33.29
Probability	0	0	0.004725	0	0.1492	0.0998	0	0.0492	0

**Table 1.** Descriptive summary statistics.

**Result and Discussions**

**Descriptive analysis**

The below Figure 1 depict that the ratio of external debt service to total export of goods and service in Ethiopia. The debt service ratio to total export is fluctuates since 1990 to 2005. While, since 2006 to end of 2019 the trend of external debt service to total export is increasing. As an initial clue the total export of goods and service of Ethiopia are tremendously increasing, while external debt service fluctuates over the periods. That means the ratio of external debt service to the total export of goods and service is oscillate until 2005, while since 2006 the repayment of external debt is increasing even also total export is increasing. But after end of 2019 the ratio is reducing that means external debt repayment is decreasing conversely total export is increasing. The higher the ratio of debt service to exports of goods and services, the greater will be the likelihood that in the event of a severe decline in export earnings the country will no longer be able to meet debt-service obligations.



**Figure 1.** Trend of external debt service to total export of goods and service.

Table 1 indicate that the descriptive summary represented value of mean, median, minimum, maximum, standard deviation, skeweness, etc. of variables.

The average annual value of external debt service of Ethiopia was 13720.82 million birr per year. The minimum and maximum external debt service is 510.20 and 105225.50 million birr respectively during the same period. A standard deviation of 25246.83 million birr indicated a high variation from the mean during the period under study. The median of external debt service is 1680.60 million birr as shown in Table 1 which is not the same as the mean value of 13720.82 million birr indicates that the observations are not symmetrically distributed. The figure and graph supported the study background that reveals that Ethiopia had tremendously increasing of the external debt service and the ratio of external debt service also increasing its above optimal IMF recommends.

Table 1 shows that external debt service was positively skewed implying that the distribution had a long right tail. Jarque-Bera was used to determine whether the observations were normally distributed or not. This test captures the difference between skewness and kurtosis of observations. Table 1 shows that Jarque-Bera statistic rejects the null hypothesis of normal distribution for all variables because the probability is less than 0.01 ( $P < 0.01$ ).

Variables	I(0)		I(1)	
	Intercept	Intercept+trend	Intercept	Intercept+trend
LogDS	0.2595 (0.9725)	-1.1183 (0.9109)	-5.5208 (0.0001)*	-5.6576 (0.0003)*
LogCAB	-3.5314 (0.0151)*	-2.8900 (0.0815)***	-4.2727 (0.0020)*	-5.1896 (0.0010)*
LogCPI	1.8101 (0.9996)	-0.2939 (0.9876)	-4.5463 (0.0010)*	-5.0489 (0.0014)*
LogEXTD	0.1075 (0.9617)	-1.4960 (0.8113)	-4.7779 (0.0005)*	-4.7333 (0.0031)*
GEFF	-1.9853 (0.2916)	-1.2647 (0.8798)	-6.5711 (0.0000)*	-7.2229 (0.0000)*
LogRGDP	1.3689 (0.9985)	-2.4841 (0.3333)	-3.8370 (0.0062)*	-4.4029 (0.0071)*
LogTO	-0.4772 (0.8834)	-2.6942 (0.2452)	-4.7377 (0.0006)*	-4.6541 (0.0038)*
LogX	0.0551 (0.9572)**	-2.9948 (0.1496)	-5.0084 (0.0003)*	-4.9815 (0.0017)*
LogREER	-1.9114 (0.3233)	-1.8681 (0.6488)	-5.1933 (0.0003)*	-5.1000 (0.0012)*

Note: \*, \*\*, \*\*\* indicate that level of significance at 1%, 5%, 10% respectively.

**Table 2.** Unit root for the variables.

**Bound co-integration tests:** The F-statistic of 12.5994 indicates that significance of the co-integration tests of the variables in the model. The

value of statistic is above upper bound bands which depict that there is long run relationship in ARDL model (Table 3).

F-Bounds test	Value	Null hypothesis: No levels relationship		
		Signif.	I(0)	I(1)
F-statistic	12.5994	10%	1.92	2.89
k	8	5%	2.17	3.21
		2.50%	2.43	3.51
		1%	2.73	3.9

**Table 3.** Bound test for co-integrations of the model.

**ARDL estimated output:** The ARDL long run estimation output of below Table 4 has significant result. Result in the table below indicates that long run relationship between dependent variable external

debt service payment and independent variables. The current account balance, real domestic economic growth, external debt, trade openness, consumer price index, real effective exchange rate, total export

of goods and service and government effectiveness are selected indicators that affect external debt service repayments in Ethiopia. Based

on Akaike Information Criterion (AIC) ARDL automatic optimal lag length (4, 0, 1, 1, 0, 2, 0, 2, 1) selected for variables listed in below (Table 4).

Dependent Variable: LOGDS				
Method: ARDL				
Selected Model: ARDL(4,0, 1, 1, 0, 2,0, 2, 1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGCAB	-0.009226	0.062748	-0.14704	0.8858
LOGCPI	-3.409137	1.151526	-2.96054	0.0130*
LOGRGDP	5.911187	1.11873	5.283839	0.0003*
LOGX	0.062302	0.495028	0.125855	0.9014
LOGTO	0.622054	0.657895	0.945522	0.0647**
LOGREER	0.227271	0.917869	0.247607	0.809
LOGEXDT	-1.685891	0.24248	6.952687	0.0000*
GEFF	-0.666803	0.534095	-1.24847	0.2378
C	64.00643	17.71356	3.613414	0.0041

**Table 4.** ARDL long run estimation result.

The long run result output indicates that consumer price index, real gross domestic product, trade openness, external debt has significant variables at different 1% and 10% level of significance. While, current account balance, total export of goods and service, real effective exchange rate and government effectiveness are insignificant.

External debt service and consumer price index has negative relationship and significant at 1% level of significance. Interpreted as a one percent change in consumer price index will decrease external debt service repayment by 3.7607 percent, while by keeping other variables are constant. For instance, higher inflation disturbs economic activity as well affects aspect of business by making expensive cost of goods and services which miserable standard life of people which affect cash you have on hand. A higher rate of inflation is a sign of internal economic tension and riskier the government is perceived to be. It influences the demand for foreign funds through its adverse impact on the trade accounts. Also inflation would tend to cause export demand to fall and import demand to rise, and the growing trade deficit, in turn, would increase trade-financing requirements or foreign currency. Mean that when inflation is high, the value of a country currency weakens. This is because goods become more expensive, and it becomes less attractive for investors to do business, less export of goods, etc. The inverse is also true. The study supported different literature.

Economic growth and external debt service in Ethiopia has positive and significant relationship at 1% level of significance. A one percent increase in real gross of domestic economic growth will increase external debt service by 5.8686, keeping all other variables as constant. Imply that having improve/increases in economic development will ability or capability to repay the external debts. The implications that countries with high level and sustained economic growth have low external debt burden. Also support that an increase in export and economic growth rate is remedy for external debt burden.

The trade openness is positive and significant relation at 10% level of significance with external debt service in Ethiopia. Indicate that one percent increase in trade openness will lead to increase external debt service by 2.1932, keeping all other variables constant. Indicate that the outward or inward orientation of a given country's economy. Outward orientation refers to economies that take significant advantage of the opportunities to trade with other countries. Trade openness brings many economic benefits, such as increased technology transfer, transfer of skills, increased labour and total factor productivity and economic growth and development which in turns increase capacity of external debt service in Ethiopia. The implication is the more open for trade or exchange goods with other country attract also FDI, human capital which improve economic developments.

The external debt and external debt service has negative and significant relationship at 1% level of significance. An increase in one percent change in external debt borrowing will decrease the external debt service of Ethiopia by 1.3054 remaining other variables constant. Mean that an increase of external debt is the more burdens to borrower countries, when the debt is not properly spending on infrastructural development and generate an income. Large amount of money that one country or owes to another, which difficult to repay and massive debt burden on the borrower countries. The study suggests that country highly indebted is extended that debt is more than its repayment capacity. That means, debts service will strangulate investment and hinder of economic growth, huge debt cannot secure further debts to finance and construct new projects.

**Short run estimation:** The coefficients of short run estimated output of the variables are similar sign with long run estimated output. This, CPI, RGDP, TO and external debt variables in both short run and long run the same sign implication to determining of external debt service in Ethiopia. While, some variables are not displayed in short run result because of the maximum lag of those variables is zero.

Adjusted R-squared reveal that 79% of the variability observed in the dependent variable external debt service is explained by regressor

variables in the model. Durbin Watson value of 2.5 reveals that no autocorrelation problems (Table 5).

ARDL error correction regression				
Dependent variable: D(LOGDS)				
Selected model: ARDL(4,0, 1, 1, 0, 2,0, 2, 1)				
Variable	Coefficient	Std. error	t-Statistic	Prob.
D(LOGCPI)	-5.69143	0.675646	8.423679	0
D(LOGRGDP)	5.868649	1.230878	4.767855	0.0002
D(LOGTO)	2.193244	0.446134	-4.91611	0.0002
D(LOGEXDT)	-1.30542	0.227222	5.745116	0
D(GEFF)	-0.35561	0.286329	-1.24197	0.2321
ECM(-1)*	-0.39252	0.052198	-7.51995	0
R-squared	0.844839	Mean dependent var		0.009025
Adjusted R-squared	0.793118	S.D. dependent var		0.622207
S.E. of regression	0.283006	Akaike info criterion		0.540306
Sum squared resid	1.922223	Schwarz criterion		0.948445
Log likelihood	0.084948	Hannan-Quinn criter.		0.677632
Durbin-Watson stat	2.596837			

**Table 5.** ARDL short run estimated output.

The error correction term is interpreted as the speed of adjustment towards long run equilibrium or the measure of removing the disequilibrium of external debt service due to various shocks to its long run equilibrium. Thus, the ECM coefficient measures how quickly/slowly the relationship returns to its equilibrium path and it must have a statistically significant coefficient with a negative sign. In our short run model, the coefficient of the error correction term in ARDL model is negative and less than one. It is also statistically significant at less than a 1% level of significance. This result ensures that DS converges to its long run equilibrium. Its magnitude indicates that about 39% of the disequilibrium in the DS is corrected per year implying that the disequilibrium due to various shocks is nearly corrected within less of

half year. This shows that it takes about less than half year to return to the long-run equilibrium level after the shocks.

### Diagnostic and stability tests

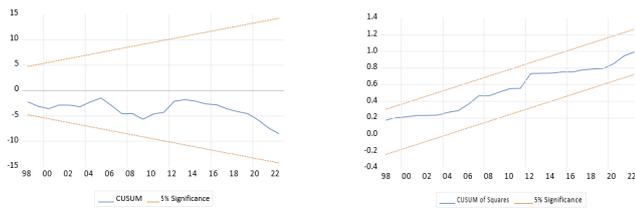
Table 6 below gives the diagnostic tests of the ARDL estimation model. According to the test statistics, the model has no specification problem, the residuals are normally distributed with constant variance (no problem of heteroscedasticity) and there is no serial correlation (no problem of heteroscedasticity). Thus, the classical assumptions are satisfied indicating that the estimates of the efficiency and policy implications of the model are reliable.

Tests	Statistics	P-value	Remark
Normality test of the residual-Jarque-Bera test	0.0549	0.9729	Normal
Breusch-Godfrey LM serial correlation test	1.1349	0.4231	No serial correlation
Breusch-Pagan-Godfrey heteroscedasticity test	1.4549	0.2308	No heteroscedasticity
Ramsey reset test (F-statistic)	1.5737	0.2418	No specification problem

**Table 6.** Diagnostic tests of the ARDL estimated model.

Graphical representations of CUSUM and CUSUM of squares tests are shown in Figure 2 on below figure. As graph of regression recursive stability estimates shows the CUSUM and CUSUMQ test is

stable. The figure shows that, the band within bounds of the critical region for test at 5% level of significance, suggesting that the residual variance is stable.



**Figure 2.** Testing for stability of estimated residual stability tests.

## Conclusion

This study identifies factors that determine external debt service of Ethiopia in short run and long run analysis. Using time series data covers from 1987/8 to 2021/22, the study used ARDL model estimations which capture dynamic simulations among the variables as well lag of response and independent variables. The pre-estimation of ARDL model of unit root tests reveals that all variables are no stationarity problem. Also result of the bound test shows that there is long run association between DS and factors of current account balance, inflation, economic growth, trade openness, and government effectiveness, total export of goods, real effective exchange rate and accumulated external debt.

Result of ARDL estimated long run and short run reveal that inflation, economic growth, trade openness, and accumulated external debt are among variables that significantly affects external debts service of Ethiopia. Accordingly, inflation and external debt are negative impacts on external debt repayment. While, real GDP and trade openness has positive impacts.

## Recommendations

Based on finding the following recommendations were forwarded:

- Stabilizing of inflation; controlling money supply via selling securities in the open market, reserve requirement, that affect short-term interest rates, which in turn influence longer-term rates, while, improve or increase economic activity and economic growth.
- Being easily outward and inward trade orientation has significant advantage in improving economic growth and attracts FDI, which in turns generate foreign currency as well as easily repay external debt.

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