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Uganda's Debt Sustainability: Testing The Efficacy of Debt Overhang Theory

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Abstract: The primary objective of this paper is to discern the impact of key economic variables, including primary balance, real interest rate, GDP growth rate, real effective exchange rate, and current account balance, on the long-term and short-term sustainability of the country's debt. Drawing on an array of econometric analyses within the Auto Regressive Distributed Lag framework, the study establishes that a fiscal surplus and sound management positively influence debt sustainability in the long run. However, it reveals that higher real interest rates pose challenges, leading to increased debt loads. While GDP growth's impact remains inconclusive, a fluctuating real effective exchange rate and the influence of the current account balance on debt dynamics emerge as crucial determinants. The study recommends a cautious fiscal approach, interest rate management, economic growth stimulation, exchange rate stability, and a focus on achieving and maintaining current account surpluses as pivotal strategies for ensuring Uganda's long-term debt sustainability. Nonetheless, the study acknowledges limitations related to sample size and endogeneity, encouraging further research to enhance generalizability and address potential omitted variables.

Keywords: *Debt sustainability, Debt Overhang Theory, Uganda*

1. Introduction

Public debt emerges as a crucial financing tool for nations facing resource constraints and developmental challenges, a scenario particularly pertinent to developing countries (Debrun et al., 2019). While facilitating economic growth and social welfare, public debt simultaneously poses risks to macroeconomic stability and long-term sustainability if it surpasses a nation's repayment capacity (Wyplosz, 2011). Therefore, comprehending the determinants of debt sustainability is imperative for shaping judicious macroeconomic policies. This study explores the factors that influence Uganda's debt sustainability. Uganda is a developing African country that is currently dealing with a large increase in its public debt. Although Uganda benefited from the Multilateral Debt Relief Initiative (MDRI) during the 1990s and 2000s, there are concerns regarding the country's recent increase in debt from both global and internal sources (Atta-Mensah & Ibrahim, 2020). Understanding the dynamics of debt sustainability in Uganda holds broader implications for navigating the challenges posed by the increasing debt burdens.

The global discourse on debt sustainability has predominantly focused on its multifaceted impacts, yet limited attention has been directed towards Uganda's unique circumstances. Previous research highlights the intricate interplay between debt and economic variables, underscoring the need for tailored investigations into Uganda's evolving debt landscape. Despite existing studies on debt sustainability, a discernible gap exists in comprehending Uganda's specific determinants, particularly in the context of its recent debt escalation. This research aims to bridge this gap by elucidating the factors influencing Uganda's debt sustainability, providing a nuanced perspective crucial for informed policymaking.

Acquiring fresh insights into Uganda's debt sustainability is imperative due to the evolving economic landscape. The paper contends that such insights are essential for crafting effective policies that mitigate risks associated with mounting debt, ensuring the nation's economic resilience. Uganda, having faced resource challenges, turned to public debt for financing key development projects. The nation's debt history, including the MDRI benefit and recent debt surge, provides a contextual backdrop. External borrowing, driven by the quest for foreign direct investment (FDI), adds another layer to Uganda's economic narrative, necessitating a thorough exploration. The research is theoretically influenced by the debt overhang theory, suggesting that elevated debt levels can hinder the progress of economic growth. This theory will serve as the conceptual framework underpinning the analysis, offering a lens through which to interpret the empirical findings on Uganda's debt sustainability. The manuscript aims to elucidate the factors influencing debt sustainability in Uganda, utilizing

both a cointegration approach and a model focused on the dynamics of public debt. By explicitly connecting the research aims with the identified gap, the study aspires to furnish a comprehensive understanding of Uganda's debt sustainability dynamics.

2. Literature review and hypothesis development

Empirical literature review

Debt sustainability: In the context of debt sustainability, a nation's indebtedness is deemed sustainable when its government consistently fulfills both present and future debt service obligations, avoiding the need for debt rescheduling or the accumulation of additional liabilities (Mohammadi and Tsiropoulos, 2020). This perspective on debt sustainability aligns with the fundamental tenets of the debt overhang theory, emphasizing the importance of borrowers consistently fulfilling debt service payments while maintaining a stable trajectory without significant alterations to income or spending patterns. Expanding on this definition, Mohammadi et al. (2007) underscore that debt sustainability is realized when a government not only services its debt commitments but also satisfies the intertemporal budget constraint. This advanced technique stresses the demand for ongoing financial responsibility throughout time by introducing a temporal component. Reputable institutions like the International Monetary Fund (IMF) employ key criteria such as the government debt-to-current fiscal revenue ratio, the debt-to-exports ratio, and the debt-to-GDP ratio to evaluate the sustainability of debt. These metrics are crucial in determining how well a nation complies with these sustainability standards (IMF, 2000).

The first set of indicators from the IMF includes measurements that examine the makeup and arrangement of a nation's debt. In particular, the ratio of short-term debt to total debt and the share of concessional debt to total debt offer valuable insights into the complexity of debt sustainability (IMF, 2000). The following set of indicators, which includes figures like debt service as a percentage of GDP, government debt service as a percentage of current fiscal revenue, and external debt service as a percentage of exports, is given more immediate attention. These measures function as early warning indicators, highlighting the effects of intertemporal trade-offs brought about by previous borrowing decisions and shedding light on possible problems with debt payment.

A forward-looking perspective on debt sustainability is encapsulated in the third set of indicators, exemplified by the average interest rate on outstanding debt as a percentage of nominal GDP growth (Muhanji & Ojah, 2011). This indicator provides a glimpse into the evolving debt burden over time, offering valuable insights into the trajectory of a nation's fiscal health. Aligning with the works of reputable scholars, the debt-to-exports ratio is employed in evaluating Uganda's debt sustainability. This choice aligns with the overarching framework of the debt overhang theory, acknowledging the significance of assessing debt to a country's export capacity to ascertain the sustainability of its financial commitments.

Primary balance and debt sustainability: The primary balance is a crucial component in the sustainability of debt. Studies show that maintaining a non-explosive debt position is consistent with the primary balance's reaction to shocks (Reis, 2022). However, fiscal consolidation as a response to debt management may be detrimental to long-term growth and macroeconomic stability. In line with the existing literature, an increasing debt-to-GDP ratio is expected to necessitate a positive adjustment in the primary surplus to maintain debt sustainability. Primary balances in Latin America and the Caribbean become less responsive as debt levels rise, potentially signaling the onset of fiscal fatigue. Favorable economic conditions and growth may have an impact on how the primary balance responds to growing debt, as it is reliant on institutional dynamics and underlying growth. Overall, the primary balance is an important factor in assessing and ensuring debt sustainability.

The national debt increases because of long-term deficit spending, requiring the government to pay back the borrowed funds with interest to the public (Reis, 2022). The government's regular borrowing to finance its fiscal deficits increases the deficit, as it has to pay interest on its existing debt. The budget deficit could rise if the government's borrowing exceeds its expectations, increasing its interest payments (Mwankemwa & Luvanda, 2022). A government that runs persistent fiscal deficits will eventually face the risk of default or insolvency unless it receives special financial assistance (Deheri & Nag, 2022). According to statistics on the

budget balance of Sub-Saharan Africa as a percentage of GDP from 2017 to 2021, with projections until 2027, the region had a budget deficit of about 5.12% of GDP in 2021 (Malla & Pathranarakul, 2022). The external debt of Africa, excluding South Africa, grew by an average of 4.3%, reaching $591 billion in total. The external debt of some countries, such as Senegal and Cote D'Ivoire, is expected to grow by more than 10% in the coming years (Nsonwu, 2022). Many African countries have experienced negative effects of debt burdens on their long-term economic growth, such as lower GDP growth, reduced investment and capital formation, and higher taxes to generate more revenue to repay the debts (Manasseh et al., 2022). Recent studies on debt sustainability by the IMF and the Ministry of Finance indicate that Uganda's debt is sustainable at present, but there is a slight possibility that it will become unsustainable in the medium and long term (Mageto, 2022).

Gross Domestic Product and debt sustainability: The factors influencing the economic growth of countries are diverse and complex, as explored in numerous studies (Batrancea et al., 2022; Alagidede & Ibrahim, 2017). However, a high debt level can impede economic development (Herndon et al., 2014). Various analyses and research focus on debt sustainability and the causes of debt fluctuations. Piscetek (2019) argues that the primary balance is a pivotal factor in changing the debt level, while factors such as the interest-growth difference and currency rate exert a relatively less significant influence. On a micro level, some research also indicates that fiscal pressures have a favorable effect on businesses' financial performance (Batrancea et al., 2021). This contrasts with macro-level analysis, where fiscal pressures lead to increasing debt levels for countries. Moreover, fiscal pressure influences the short- and long-term financial stability of public companies (Batrancea, 2021). The dynamics of debt could also be affected by the output gap and the need for significant stock-flow adjustments to pay for political and social expenditures (Mupunga & Le Roux, 2016). D'Erasmo, Mendoza, and Zhang (2016) conducted a panel study using data from 117 nations and discovered that variations in interest rates, currency rates, inflation, and economic growth rates were in charge of the debt dynamics. Interest rate growth differentials play a major role in debt dynamics in the case of most African countries (Ncube & Brixiová, 2015).

The ratio known as debt to GDP calculates a nation's total debt and divides it by its GDP. Analysts use GDP as a stand-in for economic output to determine a nation's capacity to pay its debts (Thullah, 2023). A high debt-to-GDP ratio raises the likelihood of default, which is detrimental. According to a World Bank analysis (Liu, 2023), a continuous ratio higher than 77% would be detrimental to economic expansion. According to Song and Zhou (2020), a high debt-to-GDP ratio increases the probability and danger of default, which may lead to financial panic in both local and international markets.

Japan faces the highest global debt-to-GDP ratio, a consequence of long-term economic stagnation and demographic challenges. As of the early months of 2023, the debt ratio stood at 221.32% of GDP (Tsigaris et al., 2023). In 2021, Japan's central government exhibited a gross debt equivalent to 263% of GDP. While borrowing may seem affordable as long as the average return is close to zero, this is not sustainable as Japan falls behind the rest of the world in monetary tightening. Among African countries, Eritrea has the highest debt-to-GDP ratio, at 175.1% of GDP (Owusu-Nantwi & Owusu-Nantwi, 2023). The deputy governor of the Bank of Uganda, Michael Atingi-Ego, reported to the parliament's Finance Committee in November 2022 that the national debt had reached 80 trillion shillings by the end of September 2022, equal to about 50% of GDP. This is in the year 2023 (Serumaga).

One long-term concern posed by a high debt percentage to GDP is an increase in deficit spending that causes rapid near-term inflation. These factors make it harder for the country to pay off its debts, as they lead to higher interest rates, slower revenue growth, and a small but increased danger of a fiscal crisis (Liu, 2023). Uganda's public debt is manageable in the medium term, with the expected implementation of fiscal consolidation measures and the phasing out of crisis measures. Uganda faces a moderate risk of an external and overall public debt crisis due to the country's limited capacity to absorb shocks. However, stress testing highlights deviations from the norm for public debt and external debt burden, especially in light of export shocks.

Exchange rate and debt sustainability: The actual effective exchange rate is calculated by deducting the price deflator, also referred to as the cost index, from the nominal effective exchange rate, representing a currency's value about a basket of other currencies (Thuy & Thuy, 2019). An uptick in the real effective exchange rate, which raises export costs and reduces import costs, indicates a decline in trade competitiveness (Boubakri et

al., 2019). For a country to experience a reduction in trade competitiveness due to an increase in its real effective exchange rate, there must be an escalation in export prices and a decrease in import prices (Tran, 2022).

Greenidge et al. (2010) investigated the factors influencing foreign debt within the Caribbean Community using a co-integration test and dynamic OLS. Their findings indicated a negative correlation between exports and the real effective exchange rate (REER). In Kiptoo's (2012) analysis of the determinants of Kenya's external debt sustainability, it was disclosed that there is a positive association between exports and GDP with debt sustainability. The research also demonstrates a substantial inverse link between foreign debt and debt sustainability. Mahmood et al. (2009) used a number of techniques, such as the debt-to-export ratio, to investigate the topic of Pakistan's debt sustainability. Their results show that while the budget deficit is a very important element, the interest rate has a relatively small effect.

External effects were examined in the debt accumulation studies conducted by Ajayi (2000) in Nigeria and Barungi and Atingi (2000) in Uganda. The study's findings demonstrate that these countries' real effective exchange rate (REER) and terms of trade (TOT) significantly affect their foreign debt. The Relative Economic Efficiency Ratio, Total Outstanding Debt, Interest Rate, and Fiscal Deficit are among the metrics that Loser (2004) identified as indicators of how sustainable foreign debt is in low- and middle-income nations. According to Bader and Magableh's 2009 research, Jordan's external debt accumulation was influenced by a number of factors, including the budget deficit, the overall amount of external debt, and the saving gap. Furthermore, it was discovered that REER was the most significant element impacting the total amount of foreign debt.

Awan et al. (2011) examined the effects of terms of trade, currency rates, and the fiscal deficit on Pakistan's external debt and found a strong, long-term correlation between these explanatory factors and foreign debt. Comparably, a more recent study conducted by Awan et al. (2015) found that Pakistan's external debt was significantly predicted by the budget deficit, trade openness, and nominal currency rate. In their investigation of the variables affecting Malaysia's external debt, Pyeman et al. (2014) emphasized the importance of GDP, FDI, and exports. In a study assessing Nigeria's ability to meet foreign debt obligations, Imimole et al. (2014) utilized co-integration analysis and found, while not reaching statistical significance, a negative correlation between the external debt-to-GDP ratio and total external debt. Ajayi (1991), through regression analysis, discovered a negative association between the debt-to-export ratio, Nigeria's government fiscal position, and the deceleration of income growth in developed nations. Additionally, he asserted that the rise in Nigeria's debt-to-export ratio was triggered by a decline in the country's terms of trade.

Trade openness and debt sustainability: Trade openness refers to the facilitation of cross-border trade and economic activity because of greater economic and political ties between nations. The unrestricted flow of capital and labor, as well as international financial and economic transactions, unite these nations (Igudia, 2004). The results demonstrate that freer trade promotes investment and development. Two trade policies that affect economic growth are the real effective exchange rate and the average weighted tariff rate (Chhabra et al., 2023).

Kim (2011) demonstrates that industrialized nations benefit from openness to trade in terms of economic growth and real income whereas underdeveloped countries suffer from it. The amount of financial development and inflation also affects the true impact of trade. Trade liberalization negatively impacts economic growth in countries characterized by weak financial systems, whereas its effect is minimal in countries with robust financial systems. Increased trade openness fosters economic growth in nations with low inflation, but it has minimal impact on those with high inflation. Kim, Lin, and Suen (2012) demonstrate that whereas trade has the opposite effect in countries with these attributes, it promotes economic development in those with high incomes, low rates of inflation, and little to no agricultural exports.

The European Union (EU) is one of the most trade-friendly regions of the globe because of its relatively low import levies. In 2019, over 63% of EU imports were duty-free, according to Eurostat research. As of 2023, the European Union (EU) had signed 29 FTAs with a total of 40 countries and territories (Mtar & Belazreg). The average level of trade openness among African countries in 2018 was 74%, based on data from 49 different nations. Sudan had the lowest percentage, at 1.3%, while Djibouti had the highest at 300.4%. Kelbore (2015),

and Namahoro et al., (2023). From what we can tell, Uganda's trade openness peaked at 41.92% in 2021 (Isaku, 2021). Greater trade openness will increase the nation's GDP and stimulate economic activity, which will lower the debt-to-GDP ratio and make it more manageable. (Biemudo et al., 2022).

Debt sustainability analysis has been the subject of a number of research in addition to the literature on debt dynamics (Ghosh et al., 2013). Most of these studies use a stochastic analysis of debt and the fiscal reaction function. Pakistan's debt is extensively assessed, however most of the research to date has focused on either the causes of debt growth or its long-term viability. Various major components are identified in the available research as causes of debt increase or reduction.

The primary deficit and ER fluctuations were determined to be the main factors of debt accumulation in Pakistan by Bilquees (2003) and Chandia and Javid (2013). Awan et al., (2011), provide additional evidence in support of these results. However, the authors of this study indicate that Pakistan's trade openness has an additional effect on the country's debt load. In contrast, Akram's (2011) studies suggest that economic growth and stability have a favorable impact on lowering debt levels. Pakistan's debt levels are generally considered to be unsustainable or poorly sustainable in the research on debt sustainability that makes use of the fiscal reaction function (Chandia et al., 2019). While these studies don't focus on predicting or forecasting the sustainability of public debt, Naveed and Islam (2022) do, and they find that Pakistan's debt is unsustainable for the 2019–2025 projection period.

Some research has indicated a negative association between trade openness and debt sustainability (Babatunde, 2011; Eris & Ulasan, 2013), even though there is empirical evidence of a favorable relationship between the two. Increased levels of trade openness, say Solomon and Tukur, (2019))), may be detrimental to economic growth due to the uncertainty it introduces into the economy and the accompanying fluctuations in the exchange rate and inflation. Similarly, Malefane and Odhiambo (2019) studied how freer trade affected Lesotho's ability to service its debt. In both the short and long term, the authors cited above find that trade has no appreciable impact on debt sustainability, regardless of the proxy of trade openness employed.

Real effective interest rate and debt sustainability: As measured by the GDP deflator, the real interest rate refers to the lending interest rate adjusted for inflation. Nevertheless, comparing lending rates across countries poses challenges due to the diverse terms and conditions associated with them. The International Monetary Fund (IMF) relies on data from the World Bank to compute the GDP deflator. According to Reis (2022), a real interest rate is an interest rate that provides a more accurate representation of the cost of borrowing and lending money by factoring in the impact of inflation on the value of money.

Since the 2008 financial crisis, many countries have seen a negative divergence between the implicit interest rate on government debt and nominal GDP growth, as stated in an IMF working paper (2020). The findings indicated that it would get harder for less developed countries to meet their debts without simultaneously raising the principal amount owed on such loans, especially in light of the recent sharp hikes in interest rates observed in many countries.

Empirical evidence to date reveals a detrimental impact on debt sustainability as real interest rates on borrowed funds grow in emerging nations. Ahmed and Maarouf (2021) studied how real interest rates affected the sustainability of debt in a sample of 99 developing nations to figure out how debt negatively affects these countries. The direct impact of interest rates on debt sustainability, the pressure of debt service on available cash, and the indirect impact of debt on government expenditure and deficits are the three transmission channels identified by their results via which interest rates eventually affect debt sustainability. The analysis concludes that higher interest rates slow down both economic development and the sustainability of debt. In a comparable study from 2004, A growth accounting model was used by Patillo et al. on a sample of sixty-one developing nations. Their findings demonstrated that these nations' average levels of foreign debt increased, which resulted in a nearly one percentage-point delay in the growth of total factor productivity, lending rates, and physical capital per capita.

3. Methodology

Data, research design and research approach

This study utilized a longitudinal research design. Data used was for a period of 32 years that is a period ranging from 1991 to 2022, this data was corrected from World Bank development indicators and Uganda Revenue Authority.

Specification procedure, data and estimation techniques

Theoretical framework: This study uses Mupunga and Le Roux's (2016) public debt dynamics model as its theoretical foundation for examining Uganda's debt sustainability factors. The model also establishes a relationship between changes in the total public debt as a percentage of GDP and changes in real GDP, real effective interest rate, real GDP, real exchange rate, and economic openness, among other significant macroeconomic variables. The model assumes that these variables include the main factors that influence a country's debt dynamics, such as its exchange rate risk, fiscal condition, borrowing costs, and trade performance.

The model can be expressed as follows:

$DSt = \beta 0 + \beta 1\ PBt + \beta 2\ REERt + \beta 3\ RGDPt + \beta 4\ EXRt + \beta 5\ OPENt + \varepsilon t$ ..... *(1)*

The elements in this instance include: PBt, representing the primary balance; REERt, signifying the real effective interest rate; RGDPt, denoting the real GDP; EXRt, indicating the real exchange rate; OPENt, reflecting the openness of the economy; and εt, symbolizing the white noise process.

Description of the variables and model estimation: The government's financial condition is evaluated through the primary balance, excluding interest payments on outstanding debt. A positive primary balance indicates a fiscal surplus, while a negative primary balance signals a fiscal deficit. A fiscal surplus tends to decrease the debt-to-GDP ratio, whereas a fiscal deficit can elevate it. Hence, the anticipated sign for β1 is negative.

The actual effective interest rate, accounting for inflation and currency fluctuations, reflects the government's cost of borrowing. An increase in real effective interest rates implies higher costs for servicing debt, potentially leading to an increase in the debt-to-GDP ratio. Consequently, the expected sign for β2 is positive.

Real GDP, a metric for measuring a nation's economic growth, influences the debt-to-GDP ratio in two ways. Accelerated economic growth has the potential to reduce the debt-to-GDP ratio by boosting government revenue and reducing the need for borrowing. However, rapid economic development may also result in heightened demand for public goods and services, placing additional pressure on the government to increase spending, potentially raising the debt-to-GDP ratio. Therefore, the expected sign for β3 is unclear or ambiguous. The relative expenses of domestically produced and imported goods are impacted by the actual exchange rate, and this can have dual effects on the debt-to-GDP ratio. A decrease in the actual exchange rate might influence the debt-to-GDP ratio by increasing the value of external debt in terms of the local currency. Simultaneously, a decrease in the real exchange rate can potentially lower the debt-to-GDP ratio, enhance the competitiveness of local exporters, and diminish the trade deficit. Consequently, the anticipated sign of β4 is not definitively clear. The degree of an economy's integration with the global market is measured by its level of openness, and this factor can influence the debt-to-GDP ratio in two distinct ways. Enhanced transparency may contribute to a reduction in the debt-to-GDP ratio by facilitating external funding and access to foreign currency. However, greater openness can also result in more unpredictable capital flows and heightened susceptibility to external shocks, potentially increasing the debt-to-GDP ratio. Hence, the anticipated sign of β5 is ambiguous.

Model estimation

In addition, the model was further extended by additional openness of the economy as suggested by Mohammadi and Tsiropoulos (2020) and now the model is specified as;

$$InDS_t = \beta_0 + \beta_1 InPB_t + \beta_2 InREER_t + \beta_3 InRGDP_t + \beta_4 InEXR_t + \beta_5 InOPEN_t + \varepsilon_t \quad \text{..... (2)}$$

Whereby;

In represents the natural log

B_0 represents the constant

B_1 to B_5 represent the parameters of the independent variables
OPE is the openness of the economy

Model ii was estimated in ARDL form as

$$\Delta DS_t = \beta_0 + \beta_1 DS_{t-1} + \beta_2 PB_{t-1} + \beta_3 REER_{t-1} + \beta_4 RGDP_{t-1} + \beta_5 EXR_{t-1} + \beta_6 OPEN_{t-1} \sum_{P=0}^{n1} \theta 1\, \Delta DS_{t-p} + \sum_{P=1}^{n2} \theta 2\, \Delta PB_{t-p} + \sum_{P=0}^{n3} \theta 3\, \Delta REER_{t-p} + \sum_{P=0}^{n4} \theta 4\, \Delta RGDP_{t-p} + \sum_{P=0}^{n5} \theta 5\, \Delta EXR_{t-p} + \sum_{P=0}^{n6} \theta 6\, \Delta OPEN_{t-p} + \varepsilon_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Data type and source

Variable	Definition	Source
Debt sustainability	Total public debt as a percentage of GDP	Bank of Uganda
proportion of primary balance to GDP	The primary balance refers to the discrepancy between the government's revenue collection and its outlays for public goods and services.	Bank of Uganda
Real GDP	A macroeconomic metric that accounts for inflation and assesses the worth of the products and services generated by an economy over a given time frame	World Bank
Real effective interest rates	The real interest rate is the lending interest rate that has been adjusted for inflation using the GDP deflator.	Bank of Uganda
Real effective exchange rate	A weighted average of multiple foreign currencies can be used to determine the value of a currency by dividing the actual effective exchange rate by a cost index or price deflator.	IMF
Openness of the economy	The extent to which imports and exports, or nondomestic transactions, occur and impact a country's economy's size and growth	World Bank

4. Empirical results and discussion

Descriptive analysis: The data that was used for this study was for the period that did not have missing values. A general description of the data's properties was given through the summarization of descriptive statistics. By doing this, it was possible to guarantee that the data was suitable for estimation and would not yield inaccurate findings. Specifically, a computation was made to summarize the values of the mean, minimum, maximum, and standard deviation.

Table 1: Summary of study variables

Variable	Mean	Standard Deviation	Minimum	Maximum
DEBT	46.4326	27.95301	14.79281	141.1539
Primary Balance	.0976023	3.649355	-5.223994	13.40504
Real Interest Rate	5.112639	21.04402	-53.44	23
GDP growth rate	6.085	2.403918	.39	11.52
Real Effective Exchange Rate	153.7923	108.6067	91.73405	511.0456
Current Account Balance	-885,000,000	997,000,000	-3,550,000,000	49,200,000

Observations for all variables = 32. Source: Researcher's computation using secondary data

The analysis shows the descriptive statistics of six variables that are related to debt sustainability in Uganda: DEBT, PB, REER, GDP, REXR, and CAB. The results indicate that the variables have different means, standard deviations, minimums, and maximums, reflecting different levels of variability and dispersion in the data. The variable DEBT has the highest mean and the largest range, suggesting a high and diverse level of indebtedness in Uganda. The variable PB has the lowest mean and a wide range, implying a low and variable level of fiscal surplus in Uganda. The variable REER has a moderate mean and a relatively narrow range, indicating a

moderate and stable level of borrowing cost in Uganda. The variable GDP has a high mean and a reasonable range, suggesting a high and well-behaved level of economic growth in Uganda. The variable REXR has a high mean and a large range, indicating a high and diverse level of exchange rate risk in Uganda. The variable CAB has a negative mean and a large range, implying a negative and dispersed level of trade balance in Uganda. The results also show that the variables were log-transformed to deal with outliers. A general observation that can be derived from these statistics is that Uganda faces significant challenges and risks for its debt sustainability and stability, as it has a high and increasing debt-to-GDP ratio, a low and variable fiscal surplus, a high and diverse exchange rate risk, and a negative and dispersed trade balance.

Pre estimation diagnostics

Unit Root Tests: The Augmented Dickey-Fuller (ADF) test, one of the stationarity tests most frequently used in academic literature, was employed in the study's subsequent stationarity tests on model variables. By testing the null hypothesis, the ADF test seeks to ascertain if a unit root exists in a given time series sample. If, at the 5% significance level, the test-statistic (t-statistic) within the Augmented Dickey-Fuller (ADF) test is lower than the corresponding critical value, the null hypothesis cannot be rejected. The analysis examined the presence of unit roots both at the levels of the variables and their initial differences.

Table 2: ADF test results

	ADF		
Variables	**Levels**	**First difference**	**Integration**
DEBT	-2.451	-3.089**	I(1)
Primary Balance	-0.212	-6.651***	I(1)
Real Interest Rate	-3.172**	-	I(0)
GDP growth rate	-7.847***	-	I(0)
Real Effective Exchange Rate	-4.471***	-	I(0)
Current Account Balance	-4.873***	-	I(0)

Source: Researcher's computation using secondary data

The results of the unit root test in the table above indicate that debt and primary balance are non-stationary in levels and therefore require transformation in the form of one-time differencing to become stationary. The other variables are hover stationary in levels. The results thus indicate that the variables to be included in the model have mixed levels of stationarity.

Cointegration test: It suggests that some of the study variables may have long-term associations because it was found that some of them were non-stationary at levels and that they only became stationary after being differencing once. Cointegration is the property of variables that exhibit a long-term relationship. Therefore, the presence of cointegration among the study variables needs to be confirmed. To find this long-term association, the study used the limits test for cointegration within the Auto Regressive Distributed Lag framework.

Using the limits test, the null hypothesis—that there is no cointegration among variables—is examined. At all levels of significance, the null hypothesis is rejected if the calculated F and t-statistics are greater than the tabulated critical values at the upper and lower bounds; otherwise, it cannot be rejected. The test's outcomes are displayed in Table 3 below.

Table 3: ARDL bounds test results

Wald statistics: F = 7.814. t = -4.140

	10%		5%		1%		P-values	
	I(0)	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**
F	2.525	3.930	3.094	4.719	4.516	6.671	0.000	**0.004**
t	-2.482	-3.792	-2.866	-4.259	-3.664	-5.230	0.004	**0.060**
Decision	r		.		.			

H0: no level relationship. Source: Researcher's computation using secondary data

The computed Wald statistics, with F = 7.814 and t = -4.140, were tested against critical values at various significance levels (10%, 5%, and 1%), according to the cointegration test results using the Pesaran, Shin, and Smith (2001) limits test in the table. With a computed F-statistic that exceeded all critical values and a corresponding p-value of 0.000, the F-test yielded a significant result, offering compelling evidence to reject the null hypothesis that there is no cointegration (I(0)). On the other hand, the t-test produced inconsistent findings, with the t-statistic surpassing the critical value at the 10% significance level but falling short of the crucial values at the 1% and 5% significance levels. At the 1% significance level, the null hypothesis that there is no cointegration (I(1)) was further refuted by the p-value of 0.004. As a result, the study concluded that there is cointegration, or a long-term relationship, between the variables at the 10% significance level.

The test for multicollinearity

When an independent variable in a multiple regression equation has a substantial correlation with one or more other independent variables, it presents an econometric problem known as multicollinearity. Multicollinearity undermines the statistical significance of the impacted variables in a model. To test multicollinearity, this study first constructed a correlation matrix between the independent variables. Next, it computed the variance inflation factor (VIF) for each independent variable. The outcomes that follow are shown;

Table 4: Test for multicollinearity

	1	2	3	4	5	6
DEBT (1)	1.0000					
Primary Balance (2)	0.2865	1.0000				
Real Interest Rate (3)	-0.2621	0.0119	1.0000			
GDP growth rate (4)	0.0393	-0.2335	0.2987	1.0000		
Real Effective Exchange Rate (5)	0.4275*	0.0019	**-0.8060***	-0.2654	1.0000	
Current Account Balance (6)	0.1271	-0.1024	0.0336	0.0353	0.0013	1.0000

* Indicates significance at 0.05 level. All variables are in log form. Source: Researcher's computation using secondary data

The correlation analysis was conducted as a preliminary step toward testing for multicollinearity among the variables in the dataset. The results show generally weak correlations among most variables, which is reassuring as it suggests that multicollinearity may not be a significant concern in the regression model. Nonetheless, a robust negative and statistically significant correlation of -0.8060 exists between the Real Effective Exchange Rate and Real Interest Rate. This denotes a substantial linear connection between these two variables. This discovery necessitates additional scrutiny, as heightened multicollinearity between the Real Effective Exchange Rate and Real Interest Rate could potentially impact the accuracy of the model and the reliability of coefficient estimates. To thoroughly examine the existence and consequences of multicollinearity, a Variance Inflation Factor (VIF) analysis was employed. This approach aims to offer a more comprehensive insight into the interconnections among the variables and contributes to maintaining the stability and interpretability of the regression model.

Table 5: VIF Results

Variable	VIF	1/VIF
Real Interest Rate	2.94	0.340054
Real Effective Exchange Rate	2.87	0.348715
GDP growth rate	1.17	0.853153
Primary Balance	1.08	0.928673
Current Account Balance	1.01	0.985791
Mean VIF	**1.81**	

All variables are logged. Source: Researcher's computation using secondary data

The Variance Inflation Factor (VIF) results show that all independent variables in the model have VIF values below 5. This indicates that there is no significant multicollinearity among the variables. Generally, VIF values

above 10 are considered indicative of severe multicollinearity, but in this case, all variables have VIF values well below these thresholds. The mean VIF value of 1.81 further supports the observation of minimal multicollinearity. As a result, the regression model is not adversely affected by multicollinearity, and the coefficient estimates for the independent variables can be reliably interpreted. The relatively low VIF values imply that the independent variables contribute independently to explaining the variance in the dependent variable, and the model can be considered stable for further analysis and inference.

Model estimation

The ARDL model was determined to be the optimum estimating technique due to the mixed nature of stationarity of the model variables and the short time series employed in this study. This is because the ARDL model is well-known in situations involving small samples and data that exhibit mixed orders of integration. Enkoro (2016) claims that the main benefit of the ARDL approach is that, with the right augmentation, it can overcome endogeneity and serial correlation issues. For the model variables, two lags were the ideal lag duration. Before creating the final ARDL model's error correction form, this was established using the ARDL framework. The table below displays the ARDL model's results in error correction form.

Table 6: Results of the estimated ARDL model

Dependent Variable: **D.(Debt to GDP)**			
Independent Variables	**Coefficient.**	**Std. Error**	**P>|t|**
ADJ $Debt_{L1}$	-0.2046304***	.0494267	0.000
	Long Run		
Primary Balance	0.1554868*	0.0787306	0.062
Real Interest Rate	0.2919845***	0.1007568	0.009
GDP growth	0.2519068	0.2977203	0.407
Real Effective Exchange Rate	1.949161***	0.4930953	0.001
Current Account Balance	-0.0772669**	0.034031	0.034
	Short run		
$Debt_{t-1}$	0.3946573***	0.1084379	0.002
D(Real interest rate)	-0.0162872	0.0152704	0.298
Real interest $rate_{t-1}$	-0.0317295**	0.0115002	0.012
D(Real Effective Exchange Rate)	-0.5245274**	0.2256006	0.030
D(Current Account Balance)	0.0169105***	0.0038951	0.000
Current Account $Balance_{t-1}$	0.0099788***	0.0028474	0.002
Constant	-1.679549***	0.4635137	0.002
R-squared = 0.8677			
Adj R-squared = 0.7920			
Root MSE = 0.0958			
Number of obs. = 34			
Log-likelihood = 39.695046			
Sample: 1988 - 2021			
ARDL(2,0,2,0,1,2) regression			

Notes: D = First difference in variable. ***, **, * Indicate significance at 1%, 5% and 10% levels respectively.
Source: Researcher's ARDL computation using secondary data

The above table's ARDL results show that, in the near term, the ratio of debt to GDP from the prior year has a beneficial impact on the amount of debt that exists now. To be more precise, if all other variables remain the same, a percentage rise in debt from the prior year causes a 0.39 percentage increase in debt from the current year. The fact that this effect is significant at the 1% level indicates that the debt-to-GDP ratio is persistent.

On the other hand, debt is negatively impacted by real interest rates in the near term, albeit this impact only becomes noticeable after a year. In particular, a percentage increase in the real interest rate after a year results in a 0.03 percentage reduction in the amount of debt. However, with time, the effect grows and becomes positive, with a percentage increase in the real interest rate translating into a 0.29 percentage increase in the amount of debt.

The results also show that a percentage increase in the real effective exchange rate usually results in a 0.52 percentage reduction in debt when all other variables are held constant. This implies that debt is negatively impacted by exchange rates in the near term. Over time, the impact increases and becomes positive; a one percent increase in the exchange rate corresponds to a 1.95 percent increase in debt.

It has been shown that there is a short-term positive correlation between the amount of debt and the current account balance. For instance, the debt increases by 0.169 percentage points in the current period and by 0.0099788 percentage points in the subsequent year when the current account balance's percentage terms grow. This beneficial effect gradually becomes negative and lowers the debt level by 0.77 with each percentage rise in the current amount.

The findings also show that primary balance has a long-term, positive impact on debt level, with an increase in primary balance of 1% translating into a 0.155 percentage increase in debt. At the 10% level, this effect is present, albeit marginally so. In contrast, it has been found that GDP growth very slightly reduces debt over the long term.

The model's constant term (-1.679549) is significant and negative, indicating that if the designated independent variables were absent, Uganda's debt level would also be negative.

Post-estimation diagnostic tests

After estimating the model, the study proceeded to carry out further diagnostic tests to determine that there were no common econometric problems.

Serial correlation test: The Breusch-Godfrey LM test for serial correlation was used in the investigation. There is *no serial association*, which is the null hypothesis for this test. The null hypothesis is rejected if the corresponding chi-square value is not significant at the 5% threshold of significance. The B-Godfrey test's chi-square value (0.462), according to the study, was not significant at the 5% level. It was therefore impossible to reject the null hypothesis. Thus, the investigation concluded that serial correlation was not an issue for the model. The results are presented in 7 below

Heteroscedasticity test: The study carried out The Breusch-Pagan test to check for the presence of Heteroscedasticity. The null hypothesis under this test is *no Heteroscedasticity*. If the chi-square value associated with this test is not significant at a 5% level of significance, then the null cannot be rejected, else it is rejected. This study observed that the chi-square value (0.30) was not significant at the 5% level. Thus the null hypothesis of the test could not be rejected. The study thus concluded that the estimated model did not suffer from heteroscedasticity. The results are presented in table 7 below

Table 7: Serial correlation and Heteroscedasticity test results

Test	lags(p)	Chi(2)	df	Prob.
B-Godfrey test	1	0.462	1	0.4966
Breusch-Pagan		0.30		0.5835

Source: Researcher's computation using secondary data

Test for Normality of residuals: The Skewness & Kurtosis test for Normality was utilized in the study to verify if the residuals in the model had a normal distribution. Normalcy is the test's null hypothesis. The null hypothesis cannot be rejected if the chi-square value, skewness, and kurtosis values are not significant at the 5% significance level. If not, it is rejected. The results are presented in table 8 below

Table 8: Skewness & Kurtosis tests for Normality results

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
r	36	0.0694	0.6840	3.74	0.1539

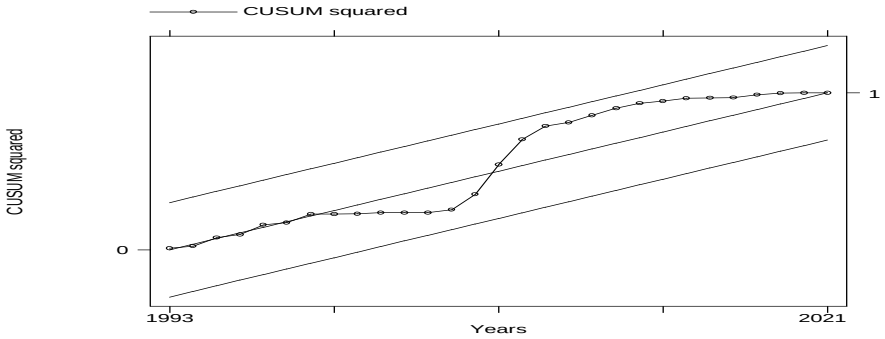
Ho: Normality. Source: Researcher's computation using secondary data

The findings show that the residuals' skewness and kurtosis tests both point to a roughly regularly distributed set of data. The non-significant p-values obtained from both tests suggest that there is no significant difference between the skewness and kurtosis of the data and those expected from a normal distribution. As a result, these tests do not provide compelling evidence to refute the model's residuals' assumption of normalcy.

Test for Model Stability

The study tested whether the estimated model was stable. The Cumulative Sum (CUSUM) test was used. This test is based on recursive regression residuals plotted against possible break points in the model within critical bounds of 5% significance. The model is stable if the CUSUM of residuals falls within the 5% critical bounds. The test results are represented in the form of a graph in the figure below.

Figure 1: The CUSUM graph



The CUSUM graph indicates that the dotted line (the cumulative sum of residuals) entirely falls within the upper and lower critical bounds over the tested study period (1993-2021). The study thus concluded that the estimated model is stable.

Discussion

Effect of primary balance on debt in Uganda

The hypothesis posits a positive relationship, and the ARDL model results support this, revealing a positive coefficient of 0.1554868 in the long run. This indicates that an increase in "Primary Balance" leads to a proportional rise in "Debt to GDP," and vice versa, assuming other variables remain constant. The results imply that a greater debt-to-GDP ratio is linked to a larger primary balance, which indicates government revenue exceeding expenditures. On the other hand, a negative primary balance (deficit) indicates that government expenditure is out of proportion to receipts, which leads to increased borrowing and an increased debt-to-GDP ratio.

In the Ugandan context, the positive relationship is attributed to persistent budget deficits, reliance on a few sectors vulnerable to global shocks, and the need for substantial funding for economic growth and development initiatives. Additionally, inefficiencies in public financial management and weak revenue mobilization further contribute to challenges in maintaining fiscal sustainability and managing public debt dynamics effectively.

Effect of real interest rate on debt in Uganda

The second aim of this study is to assess the influence of the real interest rate on debt sustainability in Uganda, hypothesizing a negative correlation. However, the ARDL model outcomes reveal a long-term positive coefficient of 0.2919845, indicating a positive connection between the "Real Interest Rate" and "Debt to GDP." Specifically, for every one-unit rise in the "Real Interest Rate," the "Debt-to-GDP ratio increases by about 0.292 units, and conversely, assuming other variables remain steady. The observed positive correlation is elucidated by the dynamics of debt financing in Uganda. A heightened "Real Interest Rate" implies increased government costs for servicing its debt. With escalating borrowing costs, the government's interest payments on outstanding debt also rise, leading to a higher proportion of the country's GDP being allocated to servicing debt obligations. Consequently, an elevated "Debt to GDP" ratio is noted with an increase in the "Real Interest Rate."

The association between the "Real Interest Rate" and "Debt to GDP" is further nuanced by macroeconomic factors and monetary policy. Central bank decisions to elevate interest rates, whether in response to inflation or to attract foreign capital, can influence government borrowing costs and contribute to alterations in the "Debt to GDP" ratio. The analysis suggests that, both in the long run and short run, a higher "Real Interest Rate" is linked to a larger "Debt-to-GDP ratio, indicating increased debt servicing costs in the long term and an immediate response to changes in interest rates in the short term.

Effect of GDP growth rate on debt in Uganda

The third objective of the research was to determine how Uganda's GDP growth affected its debt, with the corresponding hypothesis being that GDP growth improves Uganda's ability to sustain its debt. As per the findings of the ARDL model, the non-significant coefficient implies that there is no statistically significant correlation between "Debt to GDP" and "GDP Growth Rate" over an extended period. In particular, the coefficient value of 0.2519068 indicates that, under the assumption that all other independent variables remain constant, an increase of one unit in the "GDP Growth Rate" is linked to an increase of roughly 0.252 units in the "Debt-to-GDP ratio. Similarly, a drop of one unit in the "GDP Growth Rate" is equivalent to a drop of 0.252 units in the "Debt to GDP" ratio.

The absence of statistical significance implies that, in the long run, in the Ugandan context, "GDP Growth Rate" might not be a significant determinant of changes in the "Debt to GDP" ratio. The non-significant coefficient suggests that other factors, such as borrowing choices, fiscal policy, and external economic shocks, may have a greater influence on Uganda's debt levels than the "GDP Growth Rate" in explaining changes in the debt dynamics of the country.

Effect of real effective exchange rate on debt in Uganda

The study's fourth objective was to determine how GDP growth affected Uganda's debt, with the corresponding premise being that *GDP growth has a positive effect on debt sustainability in Uganda*. According to the ARDL model findings, there is a positive long-term association between "Debt to GDP" and the "Real Effective Exchange Rate." An increase in the "Real Effective Exchange Rate" is correlated with a notable upswing in the "Debt-to-GDP ratio, while a decrease in the exchange rate is linked to a significant reduction in the debt ratio, as indicated by the statistically significant coefficient of 1.949161 at the 1% level (p-value = 0.001). The emphasis on the long-term effect underscores how the real effective exchange rate continues to influence the country's debt dynamics.

While keeping other variables constant, a negative coefficient indicates that short-term variations in the real effective exchange rate adversely impact the "Debt to GDP" ratio in the current period. Put simply, for each unit increase in the short-run change of the real effective exchange rate, the "Debt to GDP" ratio decreases by approximately 0.525 units, and vice versa.

The results imply that the dynamics of the nation's debt exert both short- and long-term effects on fluctuations in the real effective exchange rate. Over time, a higher real effective exchange rate is linked to an increased debt-to-GDP ratio. This association may be attributed to various factors, such as diminished export competitiveness or currency appreciation leading to higher debt obligations denominated in foreign currencies. Short-term fluctuations in the exchange rate may swiftly and negatively impact the debt ratio, influencing debt payments and financial stability.

Effect of openness on debt in Uganda

The study's fifth objective was to determine how GDP growth affected Uganda's debt, and its related hypothesis was that *openness would help Uganda's debt sustainability*. The economic openness of a nation is measured through the current account balance. According to the ARDL model results, there exists an inverse correlation between the "Current Account Balance" and the "Debt to GDP" ratio, as indicated by the negative coefficient. Specifically, the "Debt to GDP" ratio decreases by approximately 0.077 for every unit increase in the current account balance, while keeping all other variables constant. Conversely, a one-unit decrease in the current account balance leads to about a 0.077 increase in the debt ratio.

This inverse relationship implies that a current account surplus, where a country's exports surpass its imports, is associated with a lower debt-to-GDP ratio. Conversely, a current account deficit, indicating that imports exceed exports, is correlated with a higher debt-to-GDP ratio. This pattern is attributed to how the current account balance reflects a country's net trade position and its ability to finance expenditures and investments.

A current account surplus provides additional financial resources to the country, which can be utilized to repay existing debt, invest in productive activities, or build reserves. Consequently, this contributes to a diminished debt-to-GDP ratio. Conversely, a current account deficit implies a need for external financing to cover the shortfall, potentially leading to increased borrowing and higher debt levels relative to the size of the economy, resulting in a higher debt-to-GDP ratio.

The relationship between the debt-to-GDP ratio and the current account balance changes direction when comparing the long- and short-term effects. In the short term, higher debt relative to GDP is associated with a higher current account balance, whether from the prior or present period. However, sustained current account surpluses are linked to lower levels of debt relative to GDP over the long term.
This change in effect from the short run to the long run suggests that short-term fluctuations in the current account balance may have transient implications for the debt dynamics, while sustained improvements in the trade balance over time can contribute to a more substantial reduction in the debt burden

5. Conclusions from the Study

Primary Balance demonstrates a statistically significant and positive coefficient in the long run. This finding suggests that maintaining a fiscal surplus and sound fiscal management can contribute to reducing the "Debt to GDP" ratio, indicating the crucial role of prudent fiscal policies in managing debt levels over time. Higher real interest rates are linked to greater levels of debt in relation to GDP, as the "Real Interest Rate" long-term coefficient shows a highly significant and positive coefficient. The effect of growing interest rates on public debt should be considered by policymakers, since it has the potential to increase debt loads and jeopardize long-term debt sustainability. The "Real Effective Exchange Rate" exhibits a highly significant positive coefficient over the long term, indicating a possible relationship between rising debt levels relative to GDP and falling real effective exchange rates. Policymakers should consider the influence that exchange rate fluctuations have on the costs associated with repaying debt as well as the overall sustainability of debt. Finally, in the long run, the "Current Account Balance" shows a statistically significant and negative coefficient that emphasizes the role that trade balances play in determining the dynamics of debt. Long-term current account deficits may result in greater debt, although sustained surpluses might help lower the "Debt to GDP" ratio.

Policy Recommendations
Given the significant impact of the "Primary Balance" on the "Debt-to-GDP ratio in the long run, policymakers should prioritize maintaining a fiscal surplus and prudent fiscal management. Implementing measures to enhance revenue generation, control government expenditures, and reduce budget deficits can contribute to reducing the debt burden and ensuring long-term debt sustainability. Long-term fiscal discipline and responsible fiscal policies are essential for maintaining a healthy debt-to-GDP ratio.

The substantial effect of the "Real Interest Rate" on the debt dynamics highlights the importance of interest rate management in debt sustainability. Policymakers should carefully monitor and manage interest rates to avoid significant increases in borrowing costs. Implementing measures to stabilize interest rates and promote monetary policies that strike a balance between economic growth and inflation control can help mitigate the negative impact of high-interest rates on government debt.

Although "GDP growth" does not show a statistically significant effect on the "Debt to GDP" ratio, it remains a critical factor for overall economic development. Policymakers should continue to prioritize policies that stimulate economic growth and productivity. Sustained efforts to improve the business environment, enhance infrastructure, and invest in human capital can foster economic expansion, which indirectly contributes to debt sustainability by increasing the capacity to service debt.

Policymakers should take note of the finding that a decline in the "Real Effective Exchange Rate" is linked to higher debt levels relative to GDP. It is advisable to pursue cautious foreign exchange management and exchange rate stability to lessen the impact of exchange rate volatility on debt levels. Reducing dependence on debt denominated in foreign currencies and diversifying sources of income might help mitigate the risks associated with exchange rate volatility.

The significant influence of the "Current Account Balance" on debt dynamics underscores the importance of trade balances in debt sustainability. Policymakers should strive to achieve and maintain current account surpluses, as they contribute to reducing the "Debt to GDP" ratio over time. Encouraging export-led growth strategies, promoting domestic industries, and implementing policies that enhance competitiveness in international markets can all support efforts to achieve sustainable trade balances.

Limitations and areas recommended for further research

Sample Size and Period: The study's reliance on a relatively small sample size of 34 observations covering the period from 1988 to 2021 may limit the generalizability of the findings A more extensive dataset and a lengthier time frame have the potential to offer a comprehensive understanding of the connections between variables and the dynamics of debt. Additionally, the inclusion of more recent data may capture the effects of recent economic events and policy changes.

Endogeneity and Omitted Variables: The ARDL regression approach assumes that the independent variables are exogenous, but there may be endogeneity issues where the variables affect each other. Omitted variables that are not accounted for in the model could also bias the results. Future studies could address endogeneity issues and find potential missing variables that could affect debt dynamics by utilizing sophisticated econometric techniques like panel data models or instrumental variable estimates.

Country-Specific Context: The study's analysis is based on data from a specific country (not mentioned in the provided table). As a result, the findings may be influenced by the unique economic, political, and institutional characteristics of that country. Therefore, caution should be exercised when applying the results to other countries or regions. Comparative studies across multiple countries could provide valuable insights into the generalizability of the observed relationships.

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