# PUBLIC DEBT SUSTAINABILITY:

## ESTIMATING THE FISCAL REACTION FUNCTION FOR UGANDA (1981/82 – 2016/17)

BY

BULIME NSUBUGA ENOCK WILL
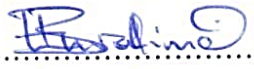
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DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH AND GRADUATE TRAINING IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTER OF ARTS DEGREE IN ECONOMICS OF MAKERERE UNIVERSITY

2019

# DECLARATION

I, **BULIME NSUBUGA ENOCK WILL** hereby declare that this dissertation titled "Public Debt

Sustainability: Estimating the Fiscal Reaction Function for Uganda (1981/82 – 2016/17)" is my

original work that has not been submitted to any academic or research institution for any academic

degree or award. I have fully acknowledged all the sources that are not original to the work that I

gleaned from during this study.

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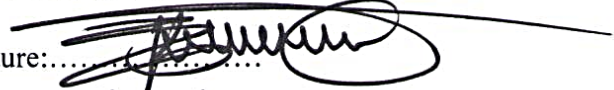
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## CERTIFICATION

The undersigned certify that they have read the dissertation titled "Public Debt Sustainability: Estimating the Fiscal Reaction Function for Uganda (1981/82 – 2016/17)" in the process of guiding the author to ensure that it is fully adequate in scope and quality. They thereby recommend it for submission to the Directorate of Research and Graduate Training in partial fulfilment of the requirements for the award of a Master of Arts degree in Economics of Makerere University.

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# DEDICATION

To Mrs. Rose Nakazibwe Bulime, who loves and supports me throughout my good endeavours. With that,

I have focused and pressed on to the finish line.

# ACKNOWLEDGEMENT

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# ABBREVIATIONS

| | |
|---|---|
| ADF | Augmented Dickey-Fuller |
| ARCH | Autoregressive Conditional Heteroskedasticity |
| ARDL | Autoregressive Distributed Lag |
| BOU | Bank of Uganda |
| CUSUM | Cumulative Sum |
| DSA | Debt Sustainability Analysis |
| DSF | Debt Sustainability Framework |
| EAMU | East African Monetary Union |
| ECT | Error Correction Term |
| GDP | Gross Domestic Product |
| GMM | General Method of Moments |
| HIPC | Highly Indebted Poor Countries |
| IDA | International Development Association |
| IMF | International Monetary Fund |
| LICs | Low-Income Countries |
| MDR | Multilateral Debt Relief |
| MoFPED | Ministry of Finance, Planning and Economic Development |
| NPV | Net Present value |
| OLS | Ordinary Least Squares |
| PP | Phillips-Perron |
| PVBC | Present Value Budget Constraint |
| RESET | Regression specification error test |
| SBIC | Schwarz's Bayesian information criterion |
| TAR | Threshold Autoregressive |
| U.S | United States |
| UGX | Ugandan Shillings |
| USD | United States Dollar |
| VAR | Vector Autoregression |
| VECM | Vector Error Correction Mechanism |
| VIF | Variance Inflation Factors |

# ABSTRACT

This study examines the sustainability of Uganda's public debt from 1981/82 to 2016/17. The study uses the fiscal reaction function approach to find out whether the government's reaction to the growing debt is responsive and systematic. The study uses annual secondary time series data obtained from the Ministry of Finance, Planning and Economic Development, the Bank of Uganda and the World Bank Database for World Development Indicators of 2018. The autoregressive distributed lag estimation approach is used based on the order of integration of the study variables and the presence of a long run relationship. The results show that, in the long run, the government has been able to respond to past debt build-up in a sustainable way by increasing the primary balance. However, in the short run, the government has not been responsive to the debt bulge which poses risks to debt sustainability. The study suggests that in order to guarantee future debt sustainability, the government should strengthen the primary balance by reducing wasteful expenditures through eliminating corruption, reducing fiscal slippages and supplementary budgets and curbing the creation of more administrative units which increase the funding burden of the government.

# CHAPTER ONE

# INTRODUCTION

## 1.0 Introduction

This section gives the background of the study, the problem statement, the research objectives, the research questions, the significance of the study, the scope of the study and the organisation of the study.

## 1.1 Background to the study

The inquiry about the sustainability of public debt is paramount in the macroeconomic analysis of fiscal policy and public finances. Governments and scholars examine whether the public debt and its projected path are consistent with those of government's revenues and expenditures, that is to say, whether fiscal solvency conditions hold (D'Erasmo, Mendoza, & Zhang, 2016). Bohn (1998) also shows that the government is committed to debt sustainability if the primary balance is improved during or in anticipation of periods of increasing public debts.

The national debt stock in developed, emerging market and developing economies is growing at unprecedented levels in history. The 2000s are characterised by growing public expenditures generating large fiscal deficits that have led to increasing debt to gross domestic product (GDP) ratios in various countries. The developing economies debt is predominantly external whereas the developed and emerging market economies debt is largely domestic. Historically, the growing public debt in the 1970s and 1980s culminated in a debt crisis in a number of developing countries (Tanzi & Blejer, 1988; Kumar & Ter-Minassian, 2007).

Following the global financial crisis of 2007–2009, global interest in examining public debt sustainability and its impact on macroeconomic stability were rekindled with the possibility of a future global debt crisis anticipated by some economists (Reinhart & Rogoff, 2011). The European debt crisis, characterised by defaulting governments indicates that sovereign debts may not be inherently risk-free. In other words, governments might default on their loan obligations unless the necessary fiscal adjustments are made.

The debt sustainability question re-emerged in most African countries after the completion of the Heavily Indebted Poor Countries (HIPC), enhanced HIPC and Multilateral Debt Relief (MDR) initiatives (Diogo, Birdsall, Okonjo-Iweala, Woods, & Robinson, 2017). This is mainly because of the rising debt levels fuelled by increasing domestic and non-concessional borrowing for financing infrastructure and human capital investments. The other reasons include weak fiscal institutions, increasing interest payments on debts, decreasing donor support and reductions in foreign direct investments to non-natural resource sectors (Diogo et al., 2017; Mustapha & Annalisa, 2018).

Uganda's public debt creates reasonable doubts regarding the government's solvency because of its bulge, the increasing interest payments and the deteriorating primary balance. The debt is also growing at a rate obscuring the debt relief obtained in the past. Uganda received HIPC debt relief in 1997/98, enhanced HIPC debt relief in 2000/01 and MDR in 2005/06 that significantly reduced the debt (Teunissen & Akkerman, 2004; Suruma, 2014; MoFPED, 2017b). To date, the country is still benefitting from HIPC assistance. However, Uganda's debt has increased rapidly from 2006/07 onwards. For instance, Figure 1.1 (see page 3) shows that the debt has increased from UGX 4,611 billion in 2006/07 to UGX 33,755 billion in 2016/17. Of the total debt in 2016/17, the domestic debt share is 34 percent and external debt share is 66 percent (MoFPED, 2017a). The nominal debt

to GDP ratio was 38.1 percent in 2016/17 and it is projected to rise to 47.8 percent in 2020/21 mainly driven by external borrowing to finance infrastructure projects enshrined in the ambitious Vision 2040 (MoFPED, 2017a; MoFPED, 2018).
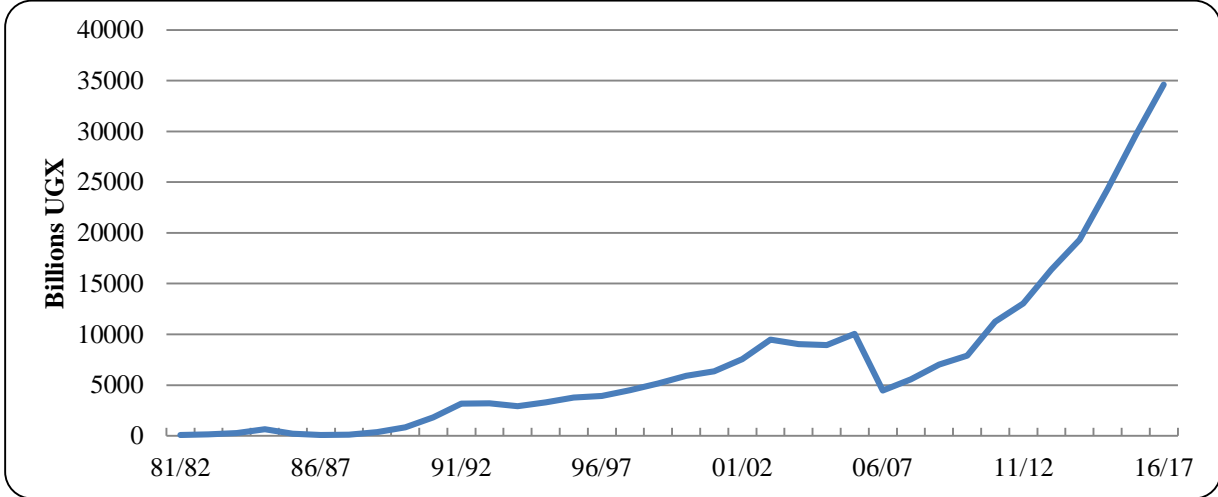


**Figure 1.1: Evolution of Uganda's public debt (UGX Billion)**
*Source:* Data from Bank of Uganda Annual Reports (various years) and World Bank (2018)

The increase in the public debt is also attributed to the widening fiscal deficit arising from the growing public sector expenditure due to the creation of more local government administrative units, salary increments for public servants in response to continued industrial action and the rampant corruption that has plagued government. Unfortunately, the increases in public expenditures are not matched by increases in government revenue hence perpetuating borrowing.

During the period under review, the government has undertaken a number of reforms and fiscal actions to promote fiscal discipline that would, in turn, ensure debt sustainability. Some of the key reforms include merging of the Ministry of Finance and Ministry of Planning and Economic Development to integrate planning and budgeting and the formation of Uganda Revenue Authority to improve revenue collection. Other reforms include the introduction of a cash flow management system to control government spending and borrowing and the introduction of the Medium Term

Expenditure Framework to improve the allocative efficiency of limited budget resources (Kuteesa, Tumusiime-Mutebile, Whitworth, & Williamson, 2010). These reforms strengthened revenue and public expenditure management and spurred economic growth. Other actions include the introduction of the commitment control system to address the problem of domestic expenditure arrears and the lobbying for and reception of debt relief (which involves debt rescheduling, forgiveness and debt buyback) to reduce Uganda's debt burden (Kuteesa et al., 2010). In addition, the government also came up with a number of strategies to improve debt management including the Debt Strategy (1991), the Enhanced Debt Strategy (1995), the Debt Strategy (2007) and the Public Debt Management Framework (2013) (MoFPED, 2007; Kuteesa et al., 2010; MoFPED, 2013). These actions have partly contributed to fiscal discipline and also enabled the government to manage the debt within sustainable limits.

Uganda's public debt is also a matter of public and policy concern because of the increasing budget allocations to interest payments and the deteriorating primary balance. The increasing interest payments crowd out funding for other key government priorities such as investments in the social sectors of education and health. The deterioration in the primary balance could be attributed to the increasing noninterest government expenditure, the low domestic revenues and the deterioration of the current account balance. The deterioration in the primary balance could signal a decline in the fiscal discipline of the fiscal authorities and might compromise debt sustainability in the future. Figure 1.2 (see page 5) shows that from 2006/07 to 2016/17, the interest payments increased from UGX 236 billion to UGX 2,360 billion respectively (representing an almost nine percent increase) whereas the primary balance (government revenue minus noninterest government expenditure) deteriorated from UGX -162 billion to UGX -1181 billion over the same period.
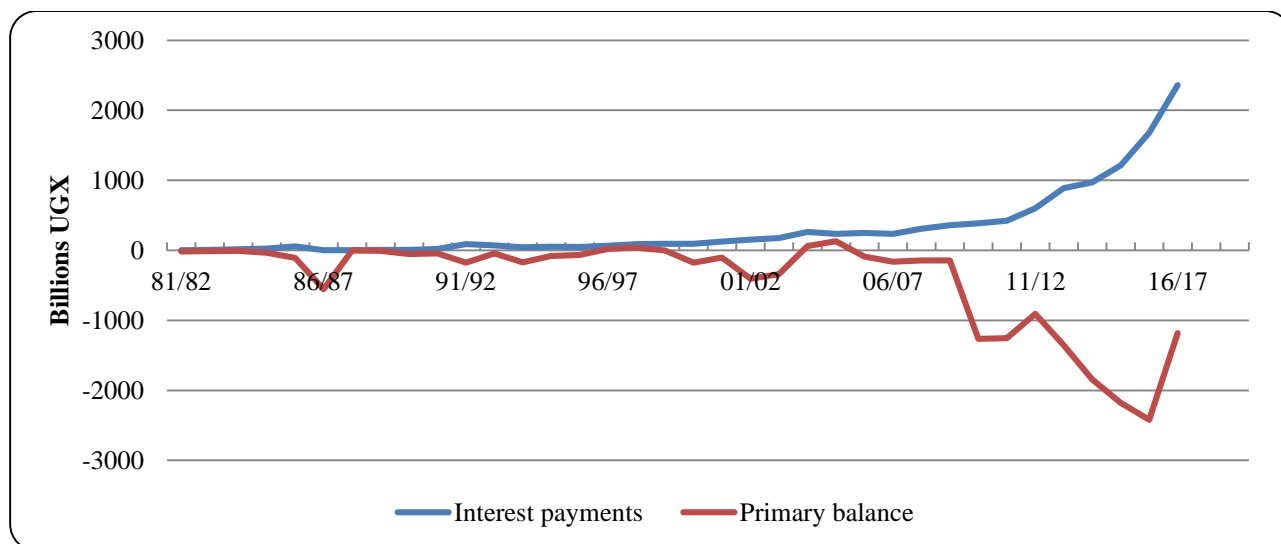
**Figure 1.2: Evolution of Uganda's interest payments and the primary balance (UGX Billion)**
*Source:* Data from Background to the budget reports (various years)

Previous studies show that the growth of developing countries greatly depends on macroeconomic stability supported by country-specific policies (Azam, Fosu, & Ndung'u, 2002). Uganda's fiscal policy aims at ensuring macroeconomic stability to support inclusive and sustainable economic growth and socio-economic transformation (MoFPED, 2017c). However, economic growth has slowed down since 2011/12, and the current expansionary fiscal policy characterised by the growing debt is yet to stimulate it. The growing debt levels are precursors to instability in key macroeconomic variables like inflation and exchange rates by straining foreign reserves and budget resources (Murandafu, 2007; MoFPED, 2016a). MoFPED (2016a) indicates that interest payments on public debt and arrears repayments take the first call on the available budget resources.

Several studies assess the state of Uganda's public finances and debt sustainability position. For instance, Wamala (1994) and Mugabi (2004) demonstrate that large fiscal deficits compromise the sustainability of Uganda's public debt. Muvawala (1998) also shows that the sustainability of Uganda's external debt is jeopardised by the ever-increasing external debt. Hisali and Guloba (2013) also indicate that the government was able to achieve the inflation target at the expense of

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unsustainable domestic debt levels. Ejalu (2016) also provides evidence that Uganda's fiscal policy is unsustainable since there is no cointegrating relationship between government expenditure and taxes. These studies provide knowledge about the key issues that compromise the sustainability of public finances and public debt.

On the other hand, the Debt Sustainability Analysis (DSA) reports by the Ministry of Finance, Planning and Economic Development (MoFPED) for 2016/17 and the International Monetary Fund (IMF) for 2016 indicate that Uganda's debt is sustainable (and is no cause for concern)[1] in the medium term and long term (MoFPED, 2017a; IMF, 2016a). This conclusion is contrary to the earlier evidence by different scholars who argue that Uganda's burgeoning deficits and debt compromise debt sustainability. The MoFPED report of 2016/17 further shows that Uganda moved from low to moderate risk of debt distress due to projection of a higher rate of debt accumulation in the medium term driven by the need for infrastructural development. It also highlights vulnerabilities and risks that could compromise debt sustainability such as low domestic revenues, lower exports, lower real GDP growth, worsening borrowing terms and sustained exchange rate depreciation.

While previous findings provide evidence on the state of Uganda's public finances and debt sustainability, they overlook the role of fiscal policy responses in ensuring debt sustainability in the face of growing public debts. Given Uganda's development aspirations and immense financing needs, borrowing remains inevitable (hence, the trend exhibited in Figure 1.1 on page 3 is likely to continue) and yet the global development finance landscape has evolved with a reduction in Official

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[1] The fiscal rules, particularly the ceiling of 50 percent of GDP on gross public debt in net present value (NPV) terms seems to weaken governments' response to the growing public debt. This rule is meant to be achieved by 2020/21. In 2016/17 the debt to GDP (NPV terms) was 27.1 percent in 2016/17 (MoFPED, 2017a). The large gap between the target (fiscal rule) and the actual debt-GDP (in NPV terms) might encourage increased borrowing with limited restraint.

Development Assistance. For instance, from 2010/11 to 2016/17, International Development Association's share in total public debt reduced from 61.9 percent to 45.2 percent while China's share increased from 3.3 percent to 20.3 percent (MoFPED, 2017a). The changing economic and financing conditions also raise concerns on how Uganda can finance its development aspirations and maintain debt sustainability.

## 1.2 Statement of the problem

The sustainability of Uganda's public debt has become a matter of great public concern. This is because of the rapidly rising public debt, the increasing budget allocations to interest payments and the deteriorating primary balance (see Figures 1.1 and 1.2 on pages 3 and 5). The debt stock is also growing at a rate that obscures the debt relief obtained under different arrangements (HIPC, enhanced HIPC and MDR initiatives). The government is undertaking fiscal policy actions to improve the primary balance and ensure that the total public debt remains sustainable. However, in the face of growing public debt and with different fiscal actions, earlier studies do not provide evidence on the fiscal policy (primary balance's) response to debt accumulation. The government's response to debt accumulation is essential for ensuring debt sustainability. It is also informative in signalling the potential problems linked to future policies and provides lessons that future policymakers can learn from. Therefore, an inquiry into the sustainability of Uganda's public debt by estimating the fiscal policy reaction function is timely.

It is against this background that this study assesses the extent to which fiscal policy has been instrumental in ensuring debt sustainability in Uganda by estimating the fiscal reaction to debt accumulation. In other words, is the government undertaking systematic and corrective fiscal measures to ensure sustainable debt levels?

## 1.3 Objectives

**General Objective**

The general objective of this study is to assess the extent to which fiscal policy (proxied by the primary balance) has been instrumental in ensuring debt sustainability.[2]

**Specific Objective**

To examine the response of the primary balance to GDP to changes in the debt to GDP ratio and non-debt determinants.

## 1.4 Research question

The research question answered by this study is, "what is the response of the primary balance to GDP to changes in the debt to GDP ratio and non-debt determinants?"

## 1.5 Significance of the study

The present study contributes to the existing literature on Uganda's fiscal policy in the following ways. First, previous studies focused on how growing fiscal deficits and debts compromise the sustainability of debt and public finances (Wamala, 1994; Mugabi, 2004; Muvawala, 1998; Hisali & Guloba, 2013). However, this study will provide evidence on the government's fiscal policy response (proxied by the primary balance) to increases in the debt by adjusting the primary balance, despite the frequent primary budget deficits. Second, Ejalu (2016) focused on fiscal sustainability by examining the presence of a cointegrating relationship between fiscal variables and fiscal policy adjustments to the output gap and deficits. This study uses the primary balance as the response variable and considers other independent variables like the temporary fluctuations in the noninterest government expenditures[3] (expenditure gap), the current account balance, debt relief, fiscal rules

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[2] This study uses the primary balance as a measure of the fiscal policy response or action.
[3] Noninterest government expenditure refers to government expenditure exclusive of interest payments.

and elections that influence the government's fiscal policy actions. Third, this study uses the fiscal reaction function approach to identify the government's fiscal policy reaction to past debt accumulation. Earlier studies have employed other approaches such as the IMF Debt Sustainability Framework [DSF] (MoFPED, 2017a; IMF, 2016a), present value budget constraint approach (Ejalu, 2016) and the accounting approach (Hisali & Guloba, 2013; Mugabi, 2004) to examine the sustainability of Uganda's debt, fiscal policy and public finances. However, these approaches are unable to provide evidence on the government's past response to growing public debts.

## 1.6 Scope

The study covers the period starting from 1981/82 to 2016/17. This is because the government has undertaken a number of fiscal actions to restore and maintain fiscal discipline and economic order that were compromised especially between 1971 and 1979. In addition to that, Uganda has accumulated a large public debt (both domestic and external) to meet its immense financing needs during this period. Therefore, this period is important for assessing fiscal responses in the face of growing public debt.

## 1.7  Organisation of the study

The rest of the study is organised as follows: chapter two provides the reviewed theoretical and empirical literature. Chapter three describes the methodology that this study adopts. The fourth chapter presents the results, their interpretation and discussion. The study concludes with chapter five that presents a summary of the study, conclusion, policy recommendations, the study limitations and the areas for further research.

## 2.0  Introduction

This section provides a review of the theoretical and empirical literature on the key debt sustainability approaches which include the present value budget constraint, debt stabilising primary balance, fiscal reaction function, and the IMF-DSF approach. However, the empirical review focuses on the present value budget constraint, fiscal reaction function, IMF-DSF approach and other Ugandan studies. The chapter concludes with a summary of the literature review while highlighting the knowledge gap for Uganda and how the study intends to close it.

## 2.1     Theoretical review

### 2.1.1    Present Value Budget Constraint

The present value budget constraint (PVBC) has been the starting point for the analysis of debt and fiscal sustainability in a number of country specific and cross county studies (Burnside, 2005). This approach uses the econometric tests of stationarity of the government debt and a cointegrating relationship between debt and primary balance to examine debt sustainability. Quintos (1995) argues that countries have limits to borrowing and face a present value borrowing constraint. Therefore, governments balance their budgets inter-temporarily by setting the current value of debt equal to the discounted summary of expected future surpluses. Fiscal policy and a country's public debt are unsustainable if the intertemporal budget constraint is violated since the public debt growth rate exceeds the economic growth rate.  Romer (1996) asserts that countries that embark on unsustainable fiscal policies have an ever-increasing debt to GDP ratio that violates their budget constraint. The PVBC approach has been criticised for estimating the transversality condition that

involves discounting the government debt at a given interest rate (Bohn, 1998). Consequently, this test is sensitive to the choice of discount rates.

### 2.1.2   Debt stabilising primary balance

This approach focuses on the long run implications of a deterministic version of the intertemporal government budget constraint. It uses the government budget constraint evaluated at steady state as a condition relating the long run primary balance as a share of GDP and the debt to GDP ratio (Buiter, 1985; Mauro, Romeu, Binder, & Zaman, 2013). The two sustainability conditions are the No Ponzi Game and the intertemporal budget constraint where the present value of public debt must asymptotically converge to zero, which correspondingly means that the already existing debt amount must be paid off by future primary surpluses. This approach also requires the calculation of the primary balance required by the government to ensure that the debt remains sustainable. Ley (2010) argues that the larger the real interest – growth differential (the difference between real interest rate and real GDP growth rate), the larger the required debt stabilising primary balance. This approach is partly flawed since it only defines the long run debt for a given long run primary balance (or vice versa) if stationarity holds, or defines lower bounds on the short run dynamics of the primary balance. Secondly, this approach does not account for uncertainty and considerations about the asset market structure (D'Erasmo et al., 2016).

### 2.1.3   Fiscal reaction function

Sims (1994) makes a conceptual distinction between passive (Ricardian) fiscal policy and active (non-Ricardian) fiscal policy. Ricardian fiscal policy does not pragmatically stabilise government debt whereas non-Ricardian fiscal policy actively aims at stabilising government debt. Bohn (1998) argues that earlier fiscal and debt sustainability tests are inconsistent and ambiguous because they do not adjust for the temporary fluctuations in GDP and the temporary fluctuations in noninterest

public expenditures. He proposed an approach that emphasises the role of stable fiscal policy reactions in dealing with accumulating debts. In this case, debt sustainability is a result of the revealed behaviour of the fiscal authorities. This approach entails estimating fiscal policy reaction functions that are similar to the Taylor reaction functions in monetary policy. The fundamental concern by this method is whether the primary balance is systematically raised when the debt level rises. Bohn (2011) further asserts that debt sustainability is achieved if the primary balance responds positively to changes in the debt to GDP ratio.

This approach has a number of advantages that make it superior to the earlier and other methods. First, it does not estimate likely shocks and their respective probabilities. Second, it makes no assumptions about interest rates. Third, it does not determine the acceptable debt level thereby avoiding the contentious Country Policy Institutional Assessment process by the IMF-DSF. Fourth, it identifies whether the debt is not sustainable because of undisciplined past policies or because of adverse shocks (Wyplosz, 2005). Lastly, D'Erasmo et al. (2016) also commend this approach for providing a direct and powerful method for conducting non-structural empirical tests that are sufficient to satisfy fiscal solvency because they require data on the primary balance, outstanding debt and a few control variables. The main weakness of this approach is that it is backward looking (Wyplosz, 2005; Baldi & Staehr, 2013). In other words, this approach uncovers the fiscal response to the debt within the estimation sample without indicating the fiscal reaction to debt in the future.

### 2.1.4 IMF Debt Sustainability Framework

The IMF uses different approaches to evaluate debt sustainability accounting for the country's level of development, the burden of debt and the ability to borrow from different sources. The formal frameworks for conducting public and external DSAs include the DSF for low-income countries

(LICs) and the DSF for market access countries. The DSF aims at assessing the country's debt position, vulnerabilities in the debt structure and the alternative debt stabilising policy actions (IMF, 2017). While conducting DSAs, the framework considers a baseline scenario (based on macroeconomic projections of the government's intended policies) and applies sensitivity tests to the baseline scenario. The country's vulnerability to debt distress is assessed based on the projected paths of the various debt indicators under the baseline scenario and the stress. Uganda is assessed using the standardised joint World Bank or IMF DSF-LICs with independent DSAs carried out by the MoFPED and the IMF. This approach has also received a fair share of criticism in different studies (Wyplosz, 2005; Debrun, Celasun, & Ostry, 2006).

## 2.2    Empirical review

**Present value budget constraint**

Empirical evidence on the consistency of fiscal policy with the present value budget constraint has generated different results. For instance, Hamilton and Flavin (1986) examine the sustainability of fiscal policy in the United States (U.S.) using 1960 to 1984 data. Their study aims at finding out how long the government budget deficits could continue unchecked giving rise to issues about the desirability and feasibility of perpetual deficits. They test for unit roots in the real deficit and the real debt to find out whether the present value budget constraint was met. They find that the discounted debt was stationarity (an indicator for sustainability), thus concluding that the fiscal policy was sustainable. They argue that the government must promise to balance its budget in expected present value terms in order to continue issuing interest-bearing debt.

Trehan and Walsh (1988) examine the sustainability of fiscal policy in the U.S. They use data from 1890 to 1896 and focus on the deficit inclusive of interest payment contrary to Hamilton and Flavin

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(1986) that focus on deficit exclusive of interest payments. They test for the presence of a cointegrating relationship between government expenditures inclusive of interest and tax revenues and revenues from seignorage to find out whether the government violated the intertemporal budget constraint and whether the deficit inclusive of the interest is stationary. They find that that the U.S. government's fiscal policy was consistent with the intertemporal budget balance and that the government expenditure inclusive of interest is stationary. They concluded that fiscal policy was sustainable. However, their results indicated that the tax-smoothing hypothesis does not hold.

Wilcox (1989) extends Hamilton and Flavin's (1986) framework by allowing for stochastic real interest rates and non stationarity in the noninterest surplus. He examines the sustainability of fiscal deficits in the U.S. and finds that the fiscal policy was not sustainable (if it was allowed to continue indefinitely) since it would not ensure that the forecast trajectory for the discounted value of the debt would converge to zero. This finding is contrary to Hamilton and Flavin's (1986) and Trehan and Walsh's (1988) findings.

Ejalu (2016) examines the sustainability of fiscal policy for Uganda, Kenya, Burundi, Rwanda and Tanzania using data from 1980 to 2016. She also examines the fiscal policy adjustments using both linear and nonlinear adjustments of fiscal variables. Using the present value budget constraint approach by Hamilton and Flavin (1986), she finds that there was no long run (cointegration) relationship between taxes and expenditure for Uganda thus concluding that Uganda's fiscal policy was not sustainable during that study period. Ejalu (2016) also finds no evidence of budgetary correction or tax response to the output gap and deficits. However, her study does not account for other economic shocks that affect government's fiscal actions. Unlike Ejalu's (2016) study, the current study considers the primary balance as the response variable and considers other

independent variables like the temporary fluctuations in noninterest government expenditure, the current account balance, fiscal rules, elections and debt relief.

**Fiscal Reaction Function Approach**

Bohn's (1998) seminal paper addresses the question about fiscal and debt sustainability by examining the reaction of the primary balance to debt accumulation. He examines the behaviour of the U.S. public debt and deficits using data covering the period from 1916 to 1995. His study aims at finding out the government's response to debt accumulation basing on Barro's (1979) tax smoothing theory. He estimates the fiscal reaction function and finds that the government responded to the increasing debt to GDP ratio by raising the primary surplus (or reducing the primary deficit). He concluded that the U.S. fiscal policy was sustainable since it satisfied the intertemporal budget constraint.

Several studies extend Bohn's approach considering other developed and emerging market economies. For instance, Mendoza and Ostry (2008) examine fiscal solvency and public debt sustainability in both emerging market and advanced countries. Using data from 1970 to 2005, they find that the primary surplus response to growing debts was positive in both industrial and emerging market economies, therefore, indicating debt sustainability. Similarly, Ghosh, Kim, Mendoza, Ostry and Qureshi (2013) study the extent to which public debt in 23 advanced economies over the period of 1970 to 2007 can increase without compromising fiscal solvency. They extend Bohn's approach by including a nonlinear stochastic model specification allowing for sovereign default risk. They find a positive response of the primary balance to lagged debt at moderate levels but the coefficients fall sharply at high debt levels especially around 90-100 percent of GDP and also

obtained fiscal space[4] estimates. Luporini (2013) also finds evidence of a positive primary surplus response to increases in the debt to GDP ratio in Brazil. This implies that fiscal policy in Brazil was sustainable for the period covered during the study.

The other studies that considered developed and emerging market economies focused on the long run and short run response of the primary balance to changes in the debt. These include Jeong (2014) for U.S., United Kingdom and South Korea; Berti, Colesnic, Desponts, Pamies and Sail (2016) for Finland and Belgium; Pamungkas (2016) for Indonesia; Shastri, Giri and Mohapatra (2017) for Bangladesh, Pakistan, India and Sri Lanka and Barbier-Gauchard and Mazuy (2018) for European Union countries. These studies provide mixed evidence concerning the sustainability of public debts in the different countries in the short and long run.

For instance, Barbier-Gauchard and Mazuy (2018) estimate the fiscal reaction functions of European Monetary Union member states using data for 1990:Q1 to 2017Q2. First, they observed that Austria, Belgium, Germany and Finland responded positively to increases in debt in both the short and long run. Second, they find that Lithuania, Malta, Slovakia and Slovenia positively responded to debt in the long run but with a negative response to debt in the short run. Third, they find that Greece and Italy's primary balances responded negatively to the growing debts in the long run but with a positive response to debt in the short run. Lastly, they find that the primary balance of Portugal and Spain negatively responded to public debt growth in both the short and long run.

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[4] These measure the distance between observed debt ratios and the largest debt ratios that can be supported given debt limits implied by the presence of default risk.

Previous studies also estimated the fiscal reaction functions for various developing countries. Ghatak and Sánchez-Fung (2007) estimated fiscal reaction functions for Peru, the Philippines, South Africa, Thailand and Venezuela covering the period from 1971 to 2000 using ordinary least squares (OLS). They observe that fiscal policy in all the countries was not sustainable since they did not increase their primary balance in response to higher debt to GDP ratios.

Burger, Stuart, Jooste and Cuevas (2012) also estimate the fiscal reaction function for South Africa using OLS, Vector Autoregression (VAR), Threshold autoregressive (TAR), General method of moments (GMM), State-Space modelling and Vector error correction mechanism (VECM). The study estimates models using fixed parameters (like OLS, VAR, TAR, GMM, and VECM) for the 1974- 2008 period while the state-space model is estimated for the 1946-2008 period.[5] They find that the government implemented a sustainable fiscal policy guaranteeing debt sustainability. The differences in the study periods might explain the different results obtained by Ghatak and Sánchez-Fung (2007) and Burger et al. (2012).[6] In addition, South Africa's debt to GDP ratio reduced further from 2000 until 2008. This shows the sensitivity of results to the study period, the estimation technique used and the evolution of debt.

Other developing country studies also focus on the short run and long run response of the primary balance to debt. These include Asiama, Akosah and Owusu-Afriyie (2014) for Ghana, Amankwah, Ofori-Abedrese and Kamasa (2018) for Ghana and Makau, Ocharo, and Njuru (2018) for Kenya. For instance, the study by Amankwah et al. (2018) estimated the fiscal reaction function for Ghana using the autoregressive distributed lag (ARDL) approach for the period covering 1990 to 2016.

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[5] This is because the structural breaks in the data from 1946-2008 would bias the results. However, the state space model with its variable parameter is not affected by the breaks in the data.

[6] The study by Burger et al (2012) considered a longer time period than that of Ghatak and Sánchez-Fung (2007).

They find that there is a positive relationship between the primary balance and the growing public debt in the long run. However, the short run response to debt was negative in the long run.

**Other Uganda specific studies**

Wamala (1994) studied the sustainability of the public sector deficit in Uganda for the period covering 1970 to 1993 and he finds that the fiscal deficit was unsustainable. Mugabi (2004) used the accounting approach (based on solvency) to examine the sustainability of fiscal deficits in Uganda between 1988 and 2003. He also observes that the level of public sector deficits, given the macroeconomic conditions at the time, was unsustainable and that this compromised the sustainability of the country's public debt. Muvawala (1998) finds that the burgeoning external public debt compromised the sustainability of external debt. Hisali and Guloba (2013) employ the accounting approach to fiscal policy consistency to analyse the sustainability of fiscal policy. They observe that the consolidated deficits were consistent with the attainment of the inflation and GDP growth rate targets. However, they assert that Uganda has achieved the inflation target at the cost of an unsustainable domestic debt.

The IMF and MoFPED have also conducted separate DSAs for Uganda. The previous DSAs indicate that Uganda's burgeoning public debt is sustainable in the medium and long term at low risk of debt distress (IMF, 2015; MoFPED, 2016b; IMF, 2016a). However, the recent DSA by the MoFPED shows that the debt has moved to moderate risk of debt distress, though still sustainable (MoFPED, 2017a). The rapidly rising debt justifies reasonable doubts about solvency and fiscal stability thereby undermining the fiscal strategy built on the perception that Ugandan debt is safe and no cause for concern.

## 2.3     Summary of the literature

The reviewed literature indicates that there are different theoretical and empirical approaches to examining the sustainability of public debts. The empirical literature on public debts, deficits and debt sustainability shows mixed findings which tend to be explained by differences in the time periods of different studies, study variables, type of data used, debt stock (external or domestic) and methodologies (estimation techniques) used. Concerning Uganda, MoFPED and the IMF assert that Uganda's debt is sustainable in the medium and long term. On the other hand, other studies indicate that the large fiscal deficits compromise debt sustainability (Wamala, 1994; Mugabi, 2004), the growing domestic debt (Hisali & Guloba, 2013) and the large external debt (Muvawala, 1998). This debate could be linked to a number of factors such as the focus of the different studies. Whereas IMF and MoFPED make projections about future debt sustainability, other Ugandan studies have mainly focused on the past and current trends in the fiscal variables.

Based on the reviewed studies, this study finds that literature on Uganda's public debt and public finances has overlooked the government's fiscal policy behaviour in response to debt accumulation in the past. Therefore, there is no empirical evidence on the government's fiscal response to past debt build-up. The fiscal reaction function approach is suitable for examining fiscal policy responses to the growing debts. This approach has been applied in debt sustainability studies for specific countries but no study has used this approach for Uganda. This study attempts to close the knowledge gap by estimating the fiscal reaction function for Uganda thereby providing empirical evidence on fiscal policy responsiveness to debt accumulation. This study also uses a more complete data set covering both external and domestic debt compared to earlier studies that focused either on external or domestic debt only.

# CHAPTER THREE

# METHODOLOGY

## 3.0 Introduction

This section presents the theoretical framework, econometric model specification, study variables, hypotheses, estimation procedure, the data used and the data sources.

## 3.1 Theoretical Framework

The key aspects of assessing the sustainability of public debts are solvency and liquidity. The government is solvent if it satisfies the intertemporal budget constraint whereas it is liquid if the instantaneous budget constraint is satisfied. This study follows the solvency aspect of debt sustainability based on the fiscal reaction function approach of assessing debt sustainability pioneered by Bohn (1998). This approach investigates government's fiscal policy response in coping with debt accumulation over time. The study assumes that the government increases the primary balance in response to rising debts to stabilise the public debt to GDP ratio.

Considering a real economy, the study postulates that the government cannot rely on money creation to reduce the value of its outstanding public debt. Following Bohn (1998), the starting point for the analysis of the sustainability of the public debt is the standard government budget constraint that describes the accumulation of public debt:

$$d_{t+1} - d_t = r_t d_t - s_t ,$$   (3.1)

where $d_{t+1} = \dfrac{D_{t+1}}{Y_{t+1}}$, is the debt to GDP ratio in period $t+1$, $Y_{t+1}$ is the real gross domestic product in period $t+1$, $d_t = \dfrac{D_t}{Y_t}$, is the debt to GDP ratio in period $t$, $D_t$ is the debt in period $t$, $Y_t$ is the

real gross domestic product in period $t$, $s_t = \dfrac{S_t}{Y_t}$, is the primary balance to GDP ratio, $S_t$ is the

primary balance (government revenue minus noninterest government expenditure) in period $t$ and

$r_t$ is the real interest rate on debt contracted in period $t$. Therefore $r_t d_t$ is the real interest payment

on government debt in period $t$. Equation (3.1) means that the change in government debt (left-hand

side of equation [3.1]) is equal to the real interest payment on debt minus the primary balance to

GDP (right-hand side of equation [3.1]).

Bohn (2011) posits that, theoretically and fundamentally, the government follows a sustainable debt

policy under the following conditions. First, the present value of the public debt converges to zero

asymptotically (or the intertemporal budget constraint is satisfied). Second, the government does

not play a Ponzi game (government should not issue more debt without servicing the existing debt

by rolling it over with interest). Lastly, the government should be able to service its debt even under

adverse conditions.

From equation (3.1), the study seeks to find a systematic relationship between the primary balance

to GDP and the debt to GDP ratio. In line with Bohn (1998), the study assumes that the government

chooses a primary balance to GDP ratio that is a positive linear function of the debt to GDP ratio

and other non-debt determinants. Therefore, the governments' fiscal reaction function (i.e. the

response of primary balance to public debt) is written in the following form:

$$ s_t = \alpha_d d_t + \mu_t + \varepsilon_t \, , \tag{3.2} $$

where the coefficient $\alpha_d$ measures the responsiveness of the primary balance to changes in the

debt ratio, $\mu_t$ captures all the systematic non-debt determinants of the primary balance and $\varepsilon_t$ is

the independent and identically distributed error term. The first term on the right-hand side of

equation (3.2) indicates that the primary balance increases with an increase in the debt. The reaction function shows that the sufficient condition for debt sustainability is that the government reacts systematically to increases in government debt by adjusting the primary balance.

The existing theories influence the choice of the non-debt determinants and other control variables. First, the study relies on tax smoothing theory that argues that fiscal deficits respond primarily to recessions, temporarily high government noninterest expenditures and anticipated inflation (Barro, 1979; Barro, 1986). The theory assumes that the government finances its expenditures either through current taxation or by issuing public debt. Therefore, the excess burden of taxation can be minimised, maintaining a relatively stable tax rate rather than raising it in one period or lowering it in another, by running budget deficits or surpluses. The tax smoothing theory proposes the running of budget deficits (surpluses) in case of temporary increases (decreases) in the governments' noninterest spending. In addition, budget deficits (surpluses) are feasible when the economy is contracting (expanding). This enables the government to avoid abnormally high tax rates during periods when its expenditures are unusually high or when output is low by borrowing. The non-debt determinants provided by this theory include the temporary fluctuations in noninterest government expenditure and the cyclical fluctuations in output or GDP. The proxy for temporary fluctuations in noninterest government expenditure is the expenditure gap to GDP (GVAR) and the proxy for the cyclical fluctuations in output is the output gap to GDP (YVAR).

The inclusion of tax smoothing theory variables (i.e. GVAR and YVAR) as components of $\mu_t$ accounts for the potential impact of omitted variables hence ensuring that the model is correctly specified and consistent (Bohn, 1998).

In line with Barro's (1986) tax smoothing theory, $\mu_t$ is defined as,

$$\mu_t = \alpha_g GVAR_t + \alpha_y YVAR_t \qquad (3.3)$$

where $GVAR_t = \dfrac{G_t - G_t^*}{Y_t}$ and $YVAR_t = \left[ 1 - \left( \dfrac{Y_t}{Y_t^*} \right) \bullet \left( \dfrac{G_t^*}{Y_t} \right) \right]$,

where $G_t$ is the noninterest government expenditure (i.e. government expenditure exclusive of interest payments), $G_t^*$ is the trend noninterest government expenditure, and $Y_t^*$ is the trend GDP. The study obtains the trend GDP and trend noninterest government expenditure by applying the Hodrick-Prescott filter. Substituting equation (3.3) into (3.2) yields the following equation:

$$s_t = \alpha_0 + \alpha_d d_t + \alpha_g GVAR_t + \alpha_y YVAR_t + \varepsilon_t \qquad (3.4)$$

According to the tax smoothing theory, the third term on the right hand side of equation (3.4) indicates that the primary balance decreases when the government expenditure is above potential (i.e. when $G_t > G_t^*$). Intuitively, for a developing country like Uganda, GVAR is important because financing key sectors (with temporarily high expenditures) like the security sector and the works and transport sector tend to increase the budget deficit, and, as long as insecurity or infrastructure gaps prevail, trigger high fiscal deficits which decrease the primary balance. The fourth term on the right hand side of equation (3.4) indicates that the primary balance decreases when the output is below potential (i.e. when $\dfrac{Y_t}{Y_t^*} < 1$). The output gap also depends on the trend noninterest government expenditure G*. Therefore the effect of cyclical fluctuations on the primary balance to GDP depends on the ratio, G*/$Y_t$. The variable, YVAR, is equally important because the government undertakes actions to stimulate economic activity when the economy is contracting through deficit financing instead of raising taxes since the economy is not performing well.

Second, the study relies on the twin deficits hypothesis that argues that there is a strong positive relationship between the government's fiscal balance and the current account balance. This suggests that an increase in the fiscal balance would lead to an increase in the current account balance and vice versa. There is a debate in the empirical literature on the direction of causation with different studies providing inconclusive evidence. First, some studies indicate unidirectional causality from the fiscal balance to the current account balance (Nickel & Vansteenkiste, 2008; Sakyi & Opoku, 2016). Second, others show unidirectional causality from the current account balance to the budget balance (Summers, 1988; Marinheiro, 2006; Sobrino, 2013). Third, studies show the existence of bidirectional causality (Mukhtar, Zakaria, & Ahmed, 2007; Bakarr, 2014). Lastly, some studies find no causality between the deficits in any direction (Ferda & Kasim, 2013). Therefore, the inclusion of the current account balance makes it possible to test, in particular, the hypothesis of twin deficits in the case of Uganda. The study extends equation (3.4) to include the current account balance as a component of $\mu_t$ .

$$s_t = \alpha_0 + \alpha_d d_t + \alpha_g \text{GVAR}_t + \alpha_y \text{YVAR}_t + \alpha_c cab_t + \varepsilon_t \tag{3.5}$$

where $cab_t = \dfrac{\text{CAB}_t}{Y_t}$ is the current account balance to GDP ratio and CAB is the current account balance. The fifth term on the right hand side of equation (3.5) indicates that the primary balance increases with an increase in the current account balance.

Third, the study relies on debt relief literature. The provision of debt relief to heavily indebted poor countries is expected to reduce the respective countries' debt burdens while ensuring debt sustainability. This would consequently enable them to improve their fiscal balances due to reductions in the debt servicing obligations and reception on debt relief funds (that are reallocated to social economic services) thus relieving pressures on government expenditure. Uganda has

benefited from debt relief initiatives including write-offs, new loans to service payments falling due, social infrastructure grants and contributions to HIPC trust fund to service payments falling due (BOU, 1999; Teunissen & Akkerman, 2004; Suruma, 2014; MoFPED, 2017b). The study includes a debt relief dummy to find out the impact of debt relief on the primary balance in the case of Uganda.

Fourth, according to fiscal rules literature, fiscal rules aim at influencing the fiscal administration of the government to ensure fiscal discipline and fiscal responsibility. Fiscal rules are long-lasting constraints on fiscal policy through numerical limits on budgetary aggregates (IMF, 2016b). In November 2013, Uganda consented to the East African Monetary Union (EAMU) convergence criteria. According to the criteria, countries should keep their gross public debt below 50 percent of GDP in net present value (NPV) terms and a budget deficit rule (including grants) of 3 percent of GDP (United Nations Economic Commission for Africa, 2018). The study uses the fiscal rule dummy to study the influence of fiscal rules' on the primary balance in the case of Uganda.

Lastly, political business cycle theory posits that the incumbent government runs expansionary fiscal policy prior to an election to influence election outcomes in their favour (ensuring re-election). Previous studies show that voters interpret this increase in government expenditure (due to expansionary fiscal policy) as an indicator of government competence hence reward it by voting them back into the office (Rogoff, 1990; Alesina, Roubini & Cohen 1997). This fiscal policy action tends to worsen the fiscal position by widening fiscal deficits. Therefore, this study considers an election dummy to examine the effect of elections on the primary balance.

**3.2 Econometric Model Specification**

The systematic empirical model applied to annual observations follows from equation (3.5). The study extends equation (3.5) by including the debt relief dummy, fiscal rules dummy and the elections dummy. The study specifies the following econometric model:

$$s_t = \alpha_0 + \alpha_d d_t + \alpha_g \text{GVAR}_t + \alpha_y \text{YVAR}_t + \alpha_c cab_t + \alpha_r drelief_t + \alpha_f frule_t + \alpha_e elec_t + \varepsilon_t$$

**(3.6)**

The theory has the following expectations for the coefficients. (1) The coefficient $\alpha_d$ is expected to be positive if the government is committed to reducing or maintaining a steady debt-GDP ratio conditional on non-debt determinants. (2) The coefficient $\alpha_g$ is expected to be negative since temporary increases in government expenditure would induce the government to decrease its primary balance due to increases in deficits financed by borrowing. (3) The coefficient $\alpha_y$ is expected to carry a negative sign since the primary balance would decrease if the economy is contracting because the government would be expected to borrow in order to stimulate the economy through running deficits. (4) The coefficient $\alpha_c$ is expected to be positive since an improvement in the current account balance leads to an improvement in the primary balance. (5) The coefficient $\alpha_r$ is expected to be positive since debt relief is assumed to improve the primary balance. (6) The coefficient $\alpha_f$ is expected to be positive since fiscal constraints aim at improving the fiscal behaviour of the government hence leading to improvements in the primary balance. (7) The coefficient $\alpha_e$ is expected to be negative since using expansionary fiscal policy (through deficits) to influence elections worsens the primary balance.

**3.3 Variables**

This study chose these variables based on the theoretical relationship between the dependent variable and independent variables and on their inclusion in earlier studies. The dependent variable

is the primary balance to GDP ($s_t$) and the independent variables are debt to GDP ($d_t$), expenditure gap to GDP ($GVAR_t$), output gap to GDP ($YVAR_t$) and current account balance to GDP ($cab_t$). The dummies include the debt relief ($drelief_t$), fiscal rule ($frule_t$) and election ($elec_t$).

**Primary balance to GDP**

The primary balance is the fiscal balance exclusive of interest payments on public debt.[7] It is computed as the government revenue minus the noninterest government expenditure. The primary balance is scaled by real GDP. As a measure of government's fiscal response, the primary balance is preferred to the cyclically adjusted primary balance because it shows the total fiscal impulse of the government to growing debts and it is observable hence making it less prone to ex-post revisions (Checcherita-Westphal & Žďárek, 2017). Additionally, the government can easily control its primary expenditures. Lastly, the use of the primary balance helps to evaluate the impact of automatic stabilisers and discretionary policy actions. Previous studies that use this variable include Bohn (1998), Baldi and Staehr (2013) and Checcherita-Westphal and Žďárek (2017).

**Debt to GDP ratio**

The total public debt is the outstanding stock of debt (both domestic and external) at the end of each fiscal year. The total public debt is scaled by real GDP. The inclusion of this variable facilitates the analysis of the primary balance's reaction to the level of public debt, which signifies whether the government is responsible enough to guarantee debt sustainability. This variable has been used in studies such as Bohn (1998), Ghatak and Sánchez-Fung (2007), Burger et al. (2012), Mauro et al. (2013) and Amankwah et al. (2018).

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[7] Uganda's government revenue is equivalent to tax revenue plus grants since grants play a key role in financing government expenditure. Therefore, this study considers this definition of government revenue. The primary balance is therefore equivalent to government revenue minus government expenditure exclusive of interest payments.

**Expenditure gap to GDP**

This variable is a proxy for the temporary fluctuations in noninterest expenditures. The study uses the Hodrick-Prescott filter to obtain the trend component of noninterest government expenditure. The study calculates the expenditure gap by subtracting the trend of noninterest government expenditure from the realised values. This variable is then scaled by real GDP. Similar studies that use this variable include Bohn (2008), Jeong (2014) and Shastri et al. (2017).

**Output gap to GDP**

This variable is a proxy for the temporary fluctuations in real GDP over time and it represents the business cycle component. The study uses the Hodrick-Prescott filter to obtain the trend component of real GDP. The study calculates the output gap by subtracting the actual GDP values from the potential GDP. The output gap is then divided by the potential GDP. The output gap to GDP depends on the trend noninterest government expenditure G*. Therefore the output gap to GDP is multiplied by the ratio, $G^*/Y_t$. This variable has been used by Bohn (1998) and Ghatak and Sánchez-Fung (2007). The study uses the output gap to GDP to test the response of the primary balance to cyclical variations in GDP.

**Current account balance to GDP**

The current account balance is a component of the balance of payments. It consists of the trade balance, the net factor income and net cash transfers. In this study, the current account balance inclusive of grants is considered since Uganda is a recipient of grants which play a key role in its fiscal expenditure. The current account balance is expressed as a ratio of real output. Studies like

Checcherita-Westphal and Žďárek (2017) and Makau et al. (2018) have used this variable to test the twin deficits hypothesis.

**Debt relief dummy**

This is a binary variable capturing the effect of debt relief on the primary balance. This dummy is equal to one from 1997/98 to 2016/17 and zero from 1981/82 – 1996/97. Earlier studies that used this variable include Asiama et al. (2014).

**Election dummy**

This dummy captures the effect of the political budget cycle (proxied by the presidential and parliamentary elections) on the primary balance. This dummy is equal to one for the year preceding the election, the election year and the year after elections (1994/95 – 1996/97, 1999/00 – 2001/02, 2004/05 – 2006/07, 2009/10 – 2011/12 and 20014/15 – 2016/17) and zero for other years. This variable has been used by Galli and Padovano (2008), Asiama et al. (2014), Pamungkas (2016) and Checcherita-Westphal and Žďárek (2017).

**The fiscal rule dummy**

This dummy captures the effect of the supranational fiscal rules on the primary balance. It is equal to one from 2013/14 to 2016/17 and zero for the other years. Previous studies using fiscal rules are Checcherita-Westphal and Žďárek (2017) and Barbier-Gauchard and Mazuy (2018).

**3.4 Hypotheses to be tested**

1. There is a positive relationship between the primary balance to GDP and the debt to GDP.
2. There is a negative relationship between the primary balance to GDP and the expenditure gap to GDP.
3. There is a negative relationship between the primary balance to GDP and the output gap to GDP.
4. There is a positive relationship between the primary balance to GDP and the current account balance to GDP.

## 3.5 Estimation Procedure

### 3.5.1   Unit root tests

This study uses the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests that examine the null hypothesis of a unit root against the trend stationarity alternative (Dickey & Fuller, 1979; Phillips & Perron, 1988). The study accounts for the presence of structural breaks that bias the results of the ADF and PP tests. These tests include the Zivot and Andrews (1992) unit root test that deals with only one structural break and the Clemente, Montanes and Reyes (1998) test that allows for one or two structural breaks. The Zivot and Andrews (1992) endogenous structural break test utilises the full sample, using different dummy variables for each break date. It tests the joint hypothesis of a unit root with no break in the series. The Clemente et al. (1998) test treats the break dynamics in two ways. First, the innovation outlier (IO) model assumes that the structural break occurs gradually, with the breaks following the same dynamic path as the innovations. Second, the additive outlier (AO) model assumes that the structural break occurs immediately. This study used the additive outlier approach because it is able to detect a sudden change in a series over time.

### 3.5.2   Cointegration test

The standard econometric theory suggests that some variables are linked by a long run relationship (are cointegrated). The presence of a cointegrating relationship between variables implies that they may drift away from each other in the short run. Therefore, it is expedient to examine the presence of a cointegrating relationship between the study variables. One of the key approaches to testing cointegration is the Engle and Granger (1987) two-step approach based on assessing whether the single-equation estimates of the equilibrium errors are stationary. The other approaches include the Johansen (1991) test based on the VAR approach and the Pesaran, Shin and Smith (2001)

Autoregressive Distributed Lag (ARDL) bounds test approach. The choice of the approach to use in testing for cointegration depends on the stationarity properties of the study variables.

The Engle and Granger (1987) method is advantageous because it is economical and super-consistent. However, it has a number of limitations. First, it is not applicable in case there is more than one cointegrating relationship since it assumes that there is a unique cointegrating variable. Second, an error made in the first step will be carried in the second step since it is a two-step approach. Third, it carries a finite sample bias that implies that superior estimates could be obtained by accounting for short run dynamics. The Johansen (1991) approach resolves the first limitation because it can be used in the presence of multiple cointegrating vectors. These two approaches are not applicable in case the study variables have different orders of integration (i.e. order one and order zero).

However, the Pesaran, Shin and Smith (2001) test is applicable in case variables have different orders of integration but not in the case of I (2) variables. It also has other advantages including (i) it does not have an endogeneity problem (ii) it can be used in small samples and (iii) the ARDL model is also suitable for forecasting and for disentangling long run relationships from short run dynamics. However, this approach can only be used in a single equation and on the assumption of one cointegration relationship which makes it less general than the Johansen approach (1991).

**The ARDL Model**

The study specifies the generalised ARDL Model (p, q) as follows:

$$y_t = c_0 + \sum_{i=1}^{p} \varphi_i y_{t-i} + \sum_{i=0}^{q} \beta_i' x_{t-i} + \varepsilon_t, \tag{3.7}$$

where $y_t$ is a vector and the variables in $x_t$ are purely I (0) and I (1) or cointegrated; the coefficients

are $\varphi_i$ and $\beta_i'$; the constant is $c_0$; i=1,…k while $p$ and $q$ are the optimal lags. The study assumes

that $p \geq 1$ and $q \geq 0$. For this study, the lag order q for all variables is chosen based on the Schwarz

Bayesian information criterion (SBIC) which selects a more parsimonious model. The vector of

error terms is $\varepsilon_t$. The model shows that the dependent variable is a function of its lagged values,

the current and lagged values of the exogenous variables.

Reparameterisation of model 7 in conditional error correction form gives rise to:

$$\Delta y_t = c_0 - \lambda(y_{t-i} - \vartheta x_t) + \sum_{i=1}^{p-1} \alpha_{yi} \Delta y_{t-i} + \sum_{i=0}^{q-1} \alpha_{xi}' \Delta x_{t-i} + \varepsilon_t. \tag{3.8}$$

The speed of adjustment coefficient $\lambda = 1 - \sum_{j-1}^{p} \varphi_i$ measures the strength of the dependent

variable's response to a deviation from the equilibrium relationship in one period. The long run

coefficients $\vartheta = \frac{\sum_{j=0}^{q} \beta_j}{\lambda}$, show the equilibrium effects of the independent variables on the dependent

variable. The short run coefficients $\alpha_{yi}, \alpha_{xi}$ represent the short run fluctuations unaccounted for by

distortions from the long run equilibrium. The equilibrium error correction term (ECT) is given by:

$ECT = y_{t-1} - \vartheta_{xt}$.

To test for the existence of cointegration among the variables included in the model, this study uses

the critical values obtained by Kripfganz and Schneider (2019) because they are better than the

near-asymptotic critical values by Pesaran et al. (2001) and the finite sample critical values by

Narayan (2005). The null of no cointegration is not rejected if the F-statistic is closer to zero than the lower bound of the critical values. The null is rejected if the F-statistic is more extreme than the upper bound of the critical values.

In the presence of a long run relationship, the fiscal reaction function specified in an unrestricted error correction model form will be estimated to examine the long run and short run relationship. Similarly, the speed of adjustment from the short run disequilibrium toward the long run equilibrium is estimated. The estimated fiscal reaction function is specified as follows:

$$\Delta s_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta s_{t-i} + \sum_{i=1}^{q} \alpha_d \Delta d_{t-i} + \sum_{i=1}^{q} \alpha_g \Delta \text{GVAR}_{t-i} + \sum_{i=1}^{q} \alpha_y \Delta \text{YVAR}_{t-i} + \sum_{i=1}^{q} \alpha_c \Delta cab_{t-i} + \alpha_r drelief_t + \alpha_f frule_t + \alpha_e elec_t + \varepsilon_t$$

(3.9)

### 3.5.3  Hodrick-Prescott filter

The Hodrick and Prescott (1997) filter is used to obtain the trend components of real GDP and the government's noninterest expenditure. The Hodrick-Prescott (HP) filter is applied to data from various data generating processes to separate a time series into the different trend and cyclical components. This approach specifies a trend in the data and then filters the data by removing a trend. The smoothing parameter determines the smoothness of the trend and different studies have set the smoothing parameter to 400, 100 and 25. However, Ravn and Uhlig (2002) conclude that the smoothing parameter should be adjusted according to the fourth power of a change in the frequency of observations. Their value was close to that proposed by Baxter and King (1999). This study sets the smoothing parameter to 100 for annual fiscal year data.

### 3.5.4  Diagnostic tests

The study carries out diagnostic tests to determine the appropriateness of the model for Uganda and to examine whether the standard regression model assumptions are upheld. These include serial correlation test, heteroscedasticity test, multicollinearity test, normality test, specification test

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(Ramsey regression specification error test [RESET] for omitted variables) and the parameter stability tests (based on recursive residuals and OLS residuals).

## Serial correlation

Serial correlation occurs in time series when the errors associated with a given time period carry over into future periods. The presence of serial correlation in regression estimates renders them inefficient and unbiased. The study uses the Breusch and Godfrey serial correlation LM test (the null hypothesis is "no serial correlation"). This test is more general than the Durbin and Watson test (1971) which is only valid for nonstochastic regressors and for testing the possibility of a first-order autoregressive model for the regression errors. The Breusch and Godfrey test does not require all the regressors to be strictly exogenous. The Durbin Watson test is not valid in ARDL models because the lagged dependent variable is not strictly exogenous by construction (Kripfganz & Schneider, 2018).

## Heteroscedasticity test

Heteroscedasticity occurs if the residuals tend to increase or decrease with the values of the predictor variable(s) and it affects the precision of the regression estimates. In linear regression analysis, if the errors of the model are not homoscedastic, the estimated model coefficients are neither unbiased nor efficient. First, the study uses the Breusch and Pagan (1979) test that specifies the null hypothesis of "constant variance." Second, the study also employs Engle's (1982) Lagrange multiplier test for the presence of autoregressive conditional heteroskedasticity (ARCH) effects. A time series that exhibits conditional heteroscedasticity (autocorrelation in the squared series) has ARCH effects. The null hypothesis for the ARCH test is that "there are no ARCH effects".

## Multicollinearity test

Multicollinearity arises when the explanatory variables are highly correlated which is a serious failure of the model assumptions. The presence of multicollinearity results in inflated standard errors and statistically insignificant coefficients though a statistical relationship exists between the dependent and independent variables. This study examines the variance inflation factors (VIF) for the different variables included in the model. According to Chatterjee and Hadi (2012), there is evidence of multicollinearity if the largest VIF is greater than 10 and if the mean of all the VIFs is considerably larger than one.

**Normality test**

The study uses the Skewness – Kurtosis test advanced by D'Agostino, Belanger and D'Agostino (1990). The test is similar to the Jarque and Bera (1987) test of normality that is biased since it does not correct for sample size. Therefore, this study adopts the Skewness – Kurtosis test by D'Agostino et al. (1990) because it makes adjustments for sample size. The null hypothesis is that the error term is normally distributed.

**Specification test**

The study uses the Ramsey (1969) regression specification-error test (RESET) to test for omitted variables. This test is important since it is strongly related to the assumption of independence between the error term and explanatory variables. The presence of omitted variables renders our regression coefficients inconsistent. The null hypothesis is that the "model has no omitted variables".

**Parameter stability**

This study performs the cumulative sum (CUSUM) test to test for parameter stability of the linear regression coefficients overtime (Ploberger & Kramer, 1992). Ploberger and Kramer's (1992) simulation study shows that the recursive CUSUM test (based on recursive residuals) has better power to detect parameter instability occurring early in the sample than the test based on OLS residuals. However, the OLS CUSUM test has better power to detect parameter instability occurring later in the sample. Both tests have the null hypothesis that "all parameters are stable or constant over time". The study performs both tests to detect any breaks (occurring either early or later in the sample) due to changes in the regression coefficients over time.

## 3.6 Data and data sources

The data covers the fiscal and other macroeconomic variables from 1981/82 to 2016/17. Data on total government revenue, government expenditure and interest payments[8] were obtained from the Ministry of Finance, Planning and Economic Development background to the budget publications (MoFPED, 1983 – 2018). This data are used to compute the primary balance and expenditure gap. Data on domestic debt, external debt[9], end of the period exchange rate and the current account balance is obtained from the Bank of Uganda annual reports (BOU, 1983 – 2018). The end of the period exchange rate (UGX/USD) is used to convert the current account balance and external debt from United States dollars to Ugandan shillings. The data on domestic debt and external debt are used to compute the total public debt.[10] Real gross domestic product data were obtained from the World Bank Database for World Development Indicators (World Bank, 2018).

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[8] The actual interest payments data for 1985/86 was missing so the study considered the preliminary value for that fiscal year.
[9] The external debt data gaps for 1983/84 – 1988/89 were filled with data sourced from the World Bank Database for World Development Indicators for 2018.
[10] No statistical agency in the country tracked the total public debt for the period under study. I considered Bank of Uganda data since it had tracked both domestic debt and external debt for the period under study.

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The study wanted to preserve concept continuity and consistency by getting all variables from a single data source in order to minimise any breaks in the data that would be attributed to changes in data sources. However, some variables were not available for the entire study period in one single source. For instance, the World Bank was preferred for real GDP data because it reports Uganda's national accounts data (like real GDP) in fiscal years. Similarly, for the entire study period, the World Bank transformed the nominal GDP by the current 2009/10 base year considered by the Ugandan statistical authority (Uganda Bureau of Statistics).

# CHAPTER FOUR

# PRESENTATION, INTERPRETATION AND DISCUSSION OF RESULTS

## 4.0  Introduction:

This chapter presents the results of the study based on the study variables adopted. It provides a description of the main study variables, the pairwise correlation between the variables, stationarity tests, long run relationship, regression results, diagnostic tests, interpretation and discussion of the results.

## 4.1  Data Description

Table 4.1 below shows the descriptive statistics of the main variables adopted for this study.

**Table 4. 1: Descriptive Statistics**

| Variables | Observations | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Primary balance to GDP | 36 | -0.012 | 0.016 | -0.064 | 0.005 |
| Debt to GDP | 36 | 0.228 | 0.148 | 0.011 | 0.597 |
| Expenditure gap to GDP | 36 | 0.00018 | 0.018 | -0.032 | 0.085 |
| Output gap to GDP | 36 | 0.00014 | 0.002 | -0.006 | 0.005 |
| Current account balance to GDP | 36 | -0.031 | 0.036 | -0.115 | 0.008 |

The data spans a period of 36 years as indicated by the number of observations per variable. The mean and median value of each variable is a good measure of central tendency since the entire mean value lies between the minimum and maximum values of the series. The debt to GDP ratio has the highest value of 0.597 whereas the current account balance to GDP ratio has the smallest value (-0.115) in the sample. The standard deviations are reasonably small and concentrated around the mean implying that there are no outliers in the series. The debt to GDP averaged at 22 percent of real GDP while the primary balance averaged at -1.2 percent of real GDP over the study period.

## 4.2 Correlation between variables

The study explores the direction and the strength of the linear relationship between the pairs of variables used in the study. Table 4.2 below presents the results of the correlation analysis.

**Table 4. 2: Correlation matrix**

| Variables | $s_t$ | $d_t$ | GVAR | YVAR | $cab_t$ |
|---|---|---|---|---|---|
| Primary balance to GDP ($S_t$) | 1 | | | | |
| Debt to GDP ($d_t$) | -0.304 | 1 | | | |
| Expenditure gap to GDP ($GVAR_t$) | -0.648** | 0.016 | 1 | | |
| Output gap to GDP ($YVAR_t$) | 0.016 | 0.121 | 0.129 | 1 | |
| Current account balance to GDP ($cab_t$) | 0.575** | -0.532** | 0.004 | 0.471** | 1 |

*Note. ** p<0.05*

The results show that there is a strong negative linear relationship between the primary balance to GDP and the expenditure gap to GDP (-0.648). This suggests that the primary balance tends to decrease with an increase in the expenditure gap. The current account balance is significantly correlated with the primary balance to GDP (0.575), the debt to GDP ratio (-0.532) and the output gap to GDP (0.471). For instance, the linear relationship between the current account balance to GDP and primary balance to GDP is moderately positive which implies that the primary balance increases with an increase in the current account balance. There is no linear relationship between the primary balance to GDP and the debt to GDP since the correlation coefficient is not significant. In addition, there is no linear relationship between the output gap to GDP with other variables since the correlation coefficients are insignificant.

## 4.3 Stationarity tests

The study conducts the ADF and PP unit root tests at levels and at first difference with one lag to examine the stationarity properties of the data. The study also carries out unit root tests

incorporating structural breaks by using Zivot and Andrews (1992) and Clemente et al. (1998). Table 4.3 below shows the results for the ADF and PP tests at level.

**Table 4. 3: Unit root and Stationarity test results at level**

| Variables | ADF (1) | PP (1) | Verdict |
|---|---|---|---|
| Primary balance to GDP | -2.640* | -3.530** | No Unit root |
| Debt to GDP | -0.494 | -0.210 | Unit root |
| Expenditure gap to GDP | -5.632*** | -6.215*** | No Unit root |
| Output gap to GDP | -2.900* | -2.825* | No Unit root |
| Current account balance to GDP | -1.468 | -1.413 | Unit root |
| Critical values: | | | |
| 10% | -2.619 | -2.618 | |
| 5% | -2.975 | -2.972 | |
| 1% | -3.689 | -3.682 | |

*Note. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1*

The ADF and PP tests results suggest that the primary balance to GDP and expenditure gap to GDP have no unit roots at the conventional 5 percent and 1 percent levels of significance, hence indicating that these variables are stationary. On the other hand, debt to GDP and current account balance to GDP have unit roots and are not stationary. The output gap to GDP is stationary at 10 percent which is not conventionally ideal in unit root testing and is usually interpreted with caution.

This necessitates testing for the presence of unit roots at first difference for debt to GDP, current account balance to GDP and output gap to GDP to find out whether they are stationary at first difference. Table 4.4 below shows the results for the ADF and PP tests at first difference.

**Table 4. 4: Unit root and Stationarity test results at first difference**

| Variables | ADF (1) | PP (1) | Verdict |
|---|---|---|---|
| Debt to GDP | -3.038** | -4.381*** | No Unit root |
| Output gap to GDP | -5.000*** | -5.862*** | No Unit root |
| Current Account Balance/GDP | -4.367*** | -5.220*** | No Unit root |
| Critical values: | | | |
| 10% | -2.620 | -2.619 | |
| 5% | -2.978 | -2.975 | |
| 1% | -3.696 | -3.689 | |

*Note. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1*

The ADF and PP tests indicate that debt to GDP, output gap to GDP and current account balance to GDP have no unit roots at first difference. This implies that they are difference stationary.

The results for the unit root tests incorporating structural breaks based on the Zivot and Andrews (1992) test and the Clemente et al. (1998) test allowing for one structural break (reported as Clemao1) and allowing for two structural breaks (reported as Clemao2) are reported in Table 4.5.

**Table 4.5: Structural break unit root test results**

| Variables | Zivot and Andrews | Clemao1 | Clemao2 | Verdict |
|---|---|---|---|---|
| Primary balance to GDP | -5.619**(2009/10) | -5.138**(2010/11) | -7.756**(1984/85,2008/09) | No Unit root |
| Debt to GDP | -2.740(2006/07) | -1.069(1992/93) | -1.595 (1992/93, 2013/14) | Unit root |
| Expenditure Gap to GDP | -5.388***(1989/90) | -4.569**(1984/85) | -4.002(1984/85, 2008/09) | No Unit root |
| Output gap to GDP | -3.403(1999/00) | -4.076**(2008/09) | -4.960(2000/01, 2008/09) | No Unit root |
| Current Account Balance to GDP | -3.886(2007/08) | -3.482(2008/09) | -4.295(1989/90, 2008/09) | Unit root |
| Critical values: | | | | |
| 10% | -4.58 | | | |
| 5% | -4.80 | -3.560 | -5.490 | |
| 1% | -5.34 | | | |

*Note.* (i) Break dates are in parentheses. (ii)*** $p<0.01$, ** $p<0.05$, * $p<0.1$

The results provide evidence of structural breaks for all the study variables. The primary balance to GDP, expenditure gap to GDP and output gap to GDP are significant at 5 percent whereas the debt to GDP and output gap to GDP are insignificant. Therefore, these results indicate that the primary balance to GDP, expenditure gap to GDP and output gap to GDP have no unit roots in the presence of structural breaks. Despite the presence of a structural break in the debt to GDP and current account balance to GDP series, the study cannot reject the null hypothesis of a unit root in the series.

The unit roots tests results provide evidence that the study variables are integrated of different orders [i.e. I(0) and I(1)]. Therefore, the preferred estimation technique is the ARDL approach because it is useful for examining the cointegration relationship between variables with different orders of integration.

## 4.4 Selection of optimal lags

This study estimates two (2) regressions. Regression 1 considers debt to GDP, expenditure gap to GDP, output gap to GDP and current account balance to GDP as the independent variables. Regression 2 extends regression 1 by incorporating the debt relief, fiscal rule and election dummies as independent variables.

The Schwarz's Bayesian information criterion (SBIC) is used to select the optimal lags for the different study variables (using STATA 15). This is because the SBIC provides consistent and parsimonious estimates of the true lag order when compared to the Akaike information criterion and the final prediction error that tend to overestimate the true lag order. For regression 1, the study estimates the ARDL model allowing for a maximum of three lags. For regression 2, the maximum lag of two (instead of three lags like regression 1) is chosen because of the presence of multicollinearity between the study variables when three lags are considered. The SBIC lags specifications for the different variables are: Model 1: ARDL (1,1,1,0,0) and Model 2: ARDL (1,1,0,0,1,0,0,0).

## 4.5 Long run relationship

The study carries out a bounds test for cointegration [proposed by Pesaran et al. (2001)] to examine the existence of the long run relationship between the variables in the two models. Table 4.6 (see page 43) provides the results of the bounds test.

**Table 4.6 : Long run relationship**

| Significance level | F-statistic | Model 1 | Model 2 |
|---|---|---|---|
| | **F-statistic** | 7.183 | 53.136 |
| | Integration-order | **F(critical)** | **F(critical)** |
| 10% | I(0) | 2.713 | 2.344 |
| | I(1) | 3.971 | 3.701 |
| 5% | I(0) | 3.314 | 2.832 |
| | I(1) | 4.750 | 4.387 |
| 1% | I(0) | 4.772 | 4.038 |
| | I(1) | 6.627 | 6.070 |

For model 1, the Pesaran et al. (2001) bounds test considers 4 long run variables, 33 observations and 2 short run coefficients. For model 2, the bounds test considered 7 long run variables, 34 observations and 2 short run coefficients. The bounds test uses the critical values and approximate p-values proposed by Kripfganz and Schneider (2019)[11]. The null hypothesis of no level relationship is rejected for the two models since the F statistic values (7.183 for model 1 and 53.136 for model 2) are greater than the critical values for the I(1) variables at the 5 percent level of significance. This result suggests that there is a long run relationship between the study variables; therefore, the study estimates the two regressions in error correction form.

## 4.6 Regression Estimates

Regression 1 presents the results of the regression model that excludes the debt relief, fiscal rules and election dummies. Regression 2 extends regression 1 by accounting for the effects of debt relief, fiscal rules and election dummies. Table 4.7 (see page 44) presents the regression results with the error correction term, the long run and the short run coefficients for the two regressions.

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[11] The Kripfganz and Schneider (2019) critical values and approximate p-values are better than the near-asymptotic critical values by Pesaran et al. (2001) and the finite sample critical values by Narayan (2005).

**Table 4.7: Response of the primary balance-GDP to debt-GDP and non-debt determinants**

| Dependent variable: Primary balance to GDP | | |
|---|---|---|
| | Model 1 | Model 2 |
| Error Correction Term | -0.573*** | -0.944*** |
| | (0.120) | (0.0674) |
| **LONG RUN** | | |
| Debt to GDP | 0.0480** | 0.0526*** |
| | (0.0193) | (0.0128) |
| Expenditure gap to GDP | -0.650*** | -0.584*** |
| | (0.142) | (0.0665) |
| Output gap to GDP | -4.161*** | -2.353*** |
| | (1.299) | (0.629) |
| Current account balance to GDP | 0.447*** | 0.325*** |
| | (0.087) | (0.0496) |
| Debt relief | | 0.000875 |
| | | (0.00302) |
| Fiscal rule | | -0.0165*** |
| | | (0.00406) |
| Election | | -0.000127 |
| | | (0.00211) |
| **SHORT RUN** | | |
| Debt to GDP | -0.0454* | -0.0568*** |
| | (0.0222) | (0.0202) |
| Expenditure gap to GDP | -0.188* | |
| | (0.0928) | |
| Current account balance to GDP | | -0.147** |
| | | (0.0628) |
| Constant | -0.00409* | -0.0110*** |
| | (0.00207) | (0.00200) |
| Observations | 33 | 34 |
| R-squared | 0.92 | 0.950 |
| Adjusted R-squared | 0.89 | 0.928 |
| F-stat | 38.5*** | 43.30*** |
| | F[7, 24] | F[10, 23] |

*Note.* (i). Standard errors for coefficients are in parentheses. (ii). F-stat degrees of freedom are in the square brackets. (iii).*** $p<0.01$, ** $p<0.05$, * $p<0.1$. (iv). The output gap to GDP and the respective dummies are not included in the short run because they had zero (or no) lags based on the optimal lag orders selected by the Schwarz Bayesian Information Criterion. In other words, the results presented here are based on the optimal lags chosen by the SBIC.

## 4.7 Interpretation and discussion of results

### 4.7.1 Diagnostic tests

The study carries out diagnostic tests to ensure that the estimated models satisfy the classical regression model assumptions and that the results are reliable and valid. Table 4.8 (see page 45) presents the diagnostic tests results.

**Table 4.8 : Diagnostic test results**

| Diagnostic test | Model 1 | Model 2 |
|---|---|---|
| Serial correlation | 0.1805 | 0.1339 |
| Heteroskedasticity | 0.7511 | 0.5723 |
| ARCH effect | 0.1406 | 0.0557 |
| Normality | 0.2182 | 0.3387 |
| Ramsey RESET | 0.3833 | 0.3651 |
| Multicollinearity (Mean VIF) | 3.27 | 2.62 |
| Parameter Stability - Recursive CUSUM | 0.5625 (0.9479) | 0.0841 (0.9479) |
| - OLS  CUSUM | 0.5432 (1.3581) | 0.3853 (1.3581) |

*Note:* 5% critical values for the CUSUM tests are in parentheses

The residuals are not serially correlated as indicated by the p-value from the Breusch-Godfrey[12] test

for all the models indicating the failure to reject the null hypothesis of "no serial correlation." The

models do not suffer from heteroskedasticity since the results of the Breusch-Pagan test have p-

values of 0.7511 and 0.5723 that are higher than the usual threshold of 0.05 (indicating the failure

to reject the null hypothesis of constant variance). The results for the ARCH effects test indicate

the failure to reject the null hypothesis that the errors are not autoregressive conditional

heteroskedastic for all the models since the p-values are significant at the 5 percent level of

significance.

The study fails to reject the null hypothesis that the error term is normally distributed, at the usual

5 percent threshold level for all the models. The study provides more evidence for normality using

Kernel density graphs in appendix A (see page 63). The study also fails to reject the Ramsey RESET

test of "no omitted variables" at 5 percent since the p-values for all the variables are higher than the

conventional threshold. There is no multicollinearity in the models since the mean VIF for all the

different models is 3.27 and 2.62 respectively. Similarly, the individual variable VIF's are less than

10 as shown in appendix B (see page 64). The study fails to reject the null hypothesis for parameter

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[12] The study does not employ the Durbin Watson because it is not valid in ARDL or Error Correction models because the lagged
dependent variable is not strictly exogenous by construction (Kripfganz & Schneider, 2018).

stability that "all parameters are stable or constant over time" since the test statistic values for both the recursive CUSUM and OLS CUSUM tests do not exceed the 5 percent critical levels. The recursive CUSUM and OLS CUSUM plots in appendix C (see page 65) also show that the parameters for the various models are stable since the CUSUM plots do not move out of the critical lines at the 5 percent level of significance.

### 4.7.2 Regression results

The previous subsection provides the diagnostic tests results that present evidence that the estimated models meet the linear regression assumptions to ensure that the results are meaningful, reliable and valid. It is against that evidence that this subsection presents the interpretation and discussion of the study findings presented in table 4.7.

**Debt to GDP**

In the long run, debt to GDP has a small and significant positive effect on the primary balance in all regressions. In all the regressions, the debt to GDP coefficient has the expected sign that is in line with the *a priori* hypothesis that there is a positive relationship between the primary balance and the public debt. In other words, an increase in the public debt increases the primary balance. The coefficients for the debt to GDP ratio are 0.0480 and 0.0526 for models 1 and 2 respectively. On average, the government has positively adjusted the primary balance to GDP by 0.05 percent in response to a one percent increase in the debt-GDP ratio, holding other factors constant.

This finding suggests that the government's reaction to past debt build-up has been responsive and systematic after controlling for other non-debt determinants of the primary balance in the long run. In other words, the government is raising the primary surplus or reducing the primary deficit to guarantee debt sustainability. This finding is consistent with Amankwah et al. (2018) for Ghana,

Berti et al. (2016) for Finland and Belgium and Burger et al. (2012) for South Africa, who found a positive relationship between the primary balance to GDP and debt to GDP.

The short run coefficient on the debt to GDP ratio is significantly negative at 10 percent for model 1 but significant at 1 percent for model 2. The coefficients are -0.0454 and -0.0568 for models 1 and 2 respectively. This implies that a one percent increase in the government debt-GDP ratio leads to a 0.05 percent reduction in the primary balance on average, holding other factors constant. This suggests that the government's policy actions are not sufficient to ensure debt sustainability in the short run. This could be explained by the government's preoccupation with short-term macroeconomic priorities such as stabilising the economy or stimulating economic growth. In most cases, meeting these priorities may necessitate borrowing because of limited domestic resources hence leading to larger unsustainable debt levels in the short run. This result is consistent with Amankwah et al. (2018) and Asiama et al. (2014) for Ghana. However, this result differs from Asiama et al. (2014) who controlled for debt level beyond 80 percent of GDP in their study which influenced the short run coefficient for the debt to GDP ratio.


**Expenditure gap to GDP**

The long run coefficients of the expenditure gap to GDP are significantly negative at 1 percent for all the regressions and in line with the *a priori* hypothesis based on the tax smoothing theory. The parameter estimates are between -0.650 and -0.584 for models 1 and 2 respectively. On average, a one percent increase in the expenditure gap leads to a 0.6 percent decrease in the primary balance, holding other factors constant in the long run. This implies that an increase in the noninterest spending above the normal level (trend level) reduces the primary balance. The government responds to temporarily high noninterest expenditures by borrowing to finance deficits as opposed

to adjusting current tax levels.[13] On the other hand, the short run coefficient is also significantly negative at 10 percent. For model 1, this suggests that 1 percent increase in the expenditure gap to GDP decreases the primary balance by 0.2 percent.

This result also signifies the government's commitment to meet temporary increases in noninterest expenditures to guarantee security and economic growth (through increased spending on security and infrastructure) by running deficits to finance these expenses. This finding is consistent with Jeong (2014) for U.S., United Kingdom and South Korea and Shastri et al. (2017) for Bangladesh, India, Pakistan and Sri Lanka. However, it is inconsistent with Amankwah et al. (2018) who find a positive relationship between the primary balance to GDP ratio and the expenditure gap in Ghana (though not statistically significant).

**Output gap to GDP**

In the long run, the output gap to GDP has a large and significant negative effect on the primary balance in all regressions. The parameter estimates are -4.161 and -2.353 for models 1 and 2 respectively. This indicates that on average, a one percent increase in the output gap leads to a 3.3 percent decrease in the primary balance, holding other factors constant. Therefore, a contraction (expansion) of the economy causes a negative (positive) effect on the primary balance. This suggests that fiscal policy is countercyclical in the sense that the government responds to a recession through expansionary fiscal policy (which in this case implies running budget deficits) in order to jumpstart the economy out of the slump or contraction.

This result is in line with the tax smoothing theory by Barro (1979) and with other studies. For instance, Amankwah et al. (2018) found a negative relationship between the primary balance and

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[13] The government is assumed to finance its expenditures through current taxation and public debt issue. This analysis ignores the issuance of currency. For instance, to finance the unusually high expenditures on infrastructure projects such as roads and dams, government has resorted to borrowing to fund their construction. Thereby, the government avoids abnormally high tax rates.

the output gap in Ghana. However, the finding is inconsistent with Shastri et al. (2017) who find that the coefficient on the output gap is positive in the case of India, Bangladesh and Sri Lanka. Pamungkas (2016) also observes that the primary balance positively responds to the output gap in Indonesia, though with a very small magnitude. The difference in the results of this study (with respect to the output gap) with those of Pamungkas (2016) could be explained by the differences in specification of the output gap. Pamungkas (2016) considered the nominal GDP whereas this study used the real GDP to compute the output gap.

**Current account balance to GDP**

The current account balance to GDP has a significantly positive effect on the primary balance in the long run for all the models. The parameter estimates are 0.447 and 0.325 for models 1 and 2 respectively. On average, a 1 percent increase in the current account balance leads to a 0.4 percent increase in the primary balance, holding other factors constant. The positive coefficient of the current account balance supports the twin deficit hypothesis for Uganda. This finding suggests that improvements in the current account balance could lead to improvements in the primary balance. In other words, the government is able to increase its fiscal space by undertaking policies to improve the current account balance. This result is consistent with Makau et al. (2018) who find that the current account balance is positively related to the primary balance in Kenya. It is also in line with Checherita-Westphal and Žďárek (2017) who found evidence in favour of the twin deficit hypothesis in a panel of European Union countries.

However, in the short run, the current account balance coefficient is significantly negative at 5 percent in regression 2 and this is inconsistent with the twin deficit hypothesis. On average, this implies that a 1 percent increase in the current account balance results in a 0.15 percent reduction in the primary balance, holding other factors constant. The deterioration in the current account

balance could reduce economic growth thereby encouraging the government to stimulate the economy through running budget deficits. This result is consistent with Makau et al. (2018) who find that the current account balance is negatively related to the primary balance in Kenya.

**The fiscal rule**

The coefficient of the fiscal rule dummy is negative and statistically significant at 1 percent in regression 2, albeit with the unexpected sign. This shows that the fiscal rules lead to deterioration in the primary balance. Since assenting to the EAMU convergence criteria, Uganda's fiscal policy is yet to be constrained by the fiscal rules especially the budget deficit rule (including grants) of 3 percent of GDP.  In addition, the gross public debt ceiling of 50 percent of GDP in NPV terms is also not strongly binding the government as observed by the drive to incur more debt as long as it is below this ceiling. This compromises efforts to ensure a decline in deficits and the debt to GDP ratio in the run-up to the East African Monetary Union by 2024. This result is inconsistent with Barbier-Gauchard and Mazuy (2018) who find that fiscal rules tend to improve the primary balance in some European countries. This difference may be because fiscal rules in these European countries are more binding therefore promoting stronger fiscal discipline.

**Conclusion**

In the two models, the signs for the long run coefficients of the four main variables (debt to GDP, expenditure gap to GDP, output gap to GDP and current account balance to GDP) in model 1 are consistent with those in model 2. In addition, the magnitudes and the levels of significance for the error correction term, the long run and short run coefficients differ especially with respect to the debt to GDP ratio. This could suggest that regression two provides stronger evidence on government's fiscal behaviour since it controls for other factors that affect government's policy actions.

### 4.7.3 Error Correction Term

The error correction term estimates the speed of adjustment of the primary balance towards the long run equilibrium following short run deviations from the long run relationship. The coefficient of the error correction term for regressions 1 and 2 is negative.[14] For instance, the error correction term for regression 1 is -0.573 and it is statistically significant at 1 percent suggesting that about 57.3 percent of the adjustment towards long run equilibrium takes place within a year. This also indicates that the long run relationship between the primary balance and its determinants is stable.

### 4.7.4 Goodness of fit and overall significance of the model

The overall goodness of fit for models 1 and 2 is 0.92 and 0.95 respectively. For model 1, the R-squared is 0.92. This implies that the debt to GDP, expenditure gap to GDP, output gap to GDP and current account balance to GDP explain about 92 percent of the variation in the primary balance. The adjusted coefficient of determination of 0.89 and 0.928 for models 1 and 2 also indicate a good fit. The overall F-statistic for models 1 and 2 is 38.5 and 43.30 respectively. The statistically significant probability values for all the models suggest the rejection of the null hypothesis that "all the regression coefficients are statistically equal to zero". This shows that the considered independent variables jointly influence the primary balance in Uganda.

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[14] It is expected to be negative in order to restore the equilibrium.

# CHAPTER FIVE
## SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

### 5.0 Introduction

This chapter presents the summary, the conclusion and the policy recommendations based on the findings of the study. It further provides the limitations of the study (including caveats) and areas for further research.

### 5.1 Summary

This study examined the extent to which fiscal policy has been instrumental in ensuring debt sustainability in Uganda by estimating the fiscal reaction function for Uganda using data for the period from 1981/82 to 2016/17. This is because the government has undertaken a number of fiscal actions to ensure that its growing debt remains sustainable yet there is limited empirical evidence on the effects of such actions. Drawing on the fiscal reaction approach advanced by Bohn (1998), this study uses the autoregressive distributed lag estimation technique to provide evidence on the short run and long run response of the primary balance to the growing debt. It also accounts for the other non-debt factors that influence the primary balance such as the expenditure gap, output gap, current account balance, debt relief, fiscal rules and elections. The results of this study indicate that the variables considered significantly influence the fiscal actions of the fiscal authorities.

### 5.2 Conclusion

An understanding of the government's response to changes in debt accumulation in the past is at the heart of assessing how it might react to the upward pressure on the public debt to GDP ratio that it currently experiences due to increased (and expected) investments in infrastructure. The key finding of this study is that on average, the Ugandan government has positively adjusted its primary balance (by raising the primary surplus or reducing the primary deficit) in response to increases in

the debt to GDP ratio in the long run. Since, the positive response would be obscured by the temporary fluctuations in government expenditures and cyclical fluctuations in output, the study accounts for them.

The estimated positive response of the primary balance to the debt to GDP suggests that Uganda's debt is sustainable in the long run in the sense that it satisfies the intertemporal budget constraint for the sample period from 1981/82 to 2016/17, despite frequent primary deficits. However, the response is still weak since it lies between 4.8 and 5.3 percent. The estimated negative primary balance response to debt to GDP in the short run indicates that the government is not sustainably responding to the growing debt and this poses risks to debt sustainability in the short run.

## 5.3 Policy recommendations

The study suggests that in order to guarantee future debt sustainability, the government should strengthen the primary balance by reducing wasteful expenditures through eliminating corruption, reducing fiscal slippages and supplementary budgets and curbing the creation of more administrative units which increase the funding burden of the government. Similarly, to check instances of perpetual borrowing, further increases in expenditures need to be matched by increases in revenues, thus the need to strengthen domestic revenue mobilisation by minimising tax exemptions and improving efficiency in tax collection.

The government should borrow smartly and invest in projects that are productive enough to enable the economy to achieve its growth potential thereby closing the output gap. Borrowing smartly entails ensuring that the government does not borrow funds beyond its capacity to repay. Investing borrowed funds in productive projects that spur economic growth would translate into increased government revenue to repay the debt. Similarly, to prevent prospective short run insolvency,

borrowing that is more concessional is preferred to non-concessional borrowing since this poses serious implications for debt repayment in the short run.

Since the current account balance is positively associated with the primary balance in the long run, economic policies designed to improve the current account balance would lead to an improvement of the primary balance. Such policies might include increasing the volumes and improving the value of exports (through value addition) to improve the competitiveness of Uganda's exports (especially agricultural and mineral exports). In addition, the government should promote the purchase of locally produced high-quality goods and services as opposed to buying similar goods and services from abroad.

Government should complement the current EAMU convergence criteria with a national debt rule (or limit). This is because the current debt limit (50 percent of debt-GDP in NPV terms) is not a strong constraint to governments' borrowing strategy because it is too high. The adopted debt limit should be lower than the current debt limit but should be flexible enough to enable the country to undertake fiscal adjustments in response to s exchange rate and interest rate shocks and natural disasters.

Lastly, because of the looming debt distress, the government should prioritise debt sustainability amidst growing concerns to stimulate the economy and to cater for temporarily high noninterest government expenditures. Government would prioritise debt sustainability by evaluating the necessity and immediacy of running perpetual deficits whenever there are temporary fluctuations in GDP or noninterest government expenditures because running perpetual deficits worsens debt sustainability prospects.[15] In case running perpetual deficits is not necessary, government can

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[15] A select committee of parliamentarians and technocrats could carry out such evaluations. In addition, it is essential that this committee is able to distinguish between temporary fluctuations and persistent fluctuations.

overlook such fluctuations in the GDP and noninterest expenditures. A commitment to debt sustainability by the fiscal authorities would ensure that the current good fiscal record suggested by this study is maintained in the future.

## 5.4 Limitations of the study and caveats

The study acknowledges the limitations and obstacles encountered that must be considered when interpreting and making inferences based on the results. The fiscal reaction function approach provides more meaningful policy evaluations when applied to annual data spanning a long period.[16] The data from government sources (particularly MoFPED and BOU) were inconsistent, missing or covering a short time period for some variables. For instance, because data gaps for the external debt from 1983/84 – 1988/89[17] (six years) would not be filled by data from any domestic source, they were filled with World Bank data from the World Development Indicators database of 2018.

This study considered the total public debt (domestic and public and publically guaranteed external debt) that has been disbursed and is outstanding. It does not consider the undisbursed external debt and domestic expenditure arrears. This study could not use data on domestic expenditure arrears because of data gaps.

This study also made some simplifying assumptions. First, the temporarily high fluctuations in noninterest government expenditures are mainly due to unexpected increases in government expenditure especially due to security and infrastructure concerns. Second, government fiscal institutions are effective in carrying out their fiscal responsibilities. Third, the government finances deficits through borrowing (and not money creation).

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[16] Due to data scarcity, most studies have used panel data methods, monthly or quarterly data. Such high frequency data would obscure fiscal policy adjustments because of their noisy nature which is mostly used for cash management purposes rather than policy evaluation (Celasun, Debrun, & Ostry, 2006).
[17] External debt data was sourced from BOU annual year books, but between 1984 and 1989 only two annual year books were published. One for 1984 and the other covering the 1986 – 1991 periods.

The fiscal reaction function approach is backward looking and it examines debt sustainability based on past fiscal behaviour. Therefore, the results should not be interpreted to mean that Uganda's debt will be sustainable in the future based on the behaviour of past governments. The results provide lessons from the past policymakers' behaviour so that current and future policymakers can better respond to the future fiscal policy challenges such as the anticipated risk of moderate debt distress.

## 5.5 Areas for further research

Future panel data analysis research examining the East African Community country government's fiscal policy responses to the growing public debt would be ideal. This is because these countries intend to fulfil the East African Monetary Union convergence criteria in the run-up to the East African Monetary Union especially through the implementation of fiscal rules. This detailed analysis could examine the effect of fiscal rules on fiscal policy actions. Fiscal reaction functions have been estimated for individual countries like Kenya and Rwanda while some East African countries have been included in other panel regressions but to the best of my knowledge, no single study has considered all the East African community countries in one panel.

Future studies can examine the relationship between the fiscal or primary balance and the current account balance (twin deficit hypothesis) in depth. Such studies could provide evidence on: (i) the various channels through which the current account balance affects the fiscal or primary balance (ii) the various channels through which the fiscal or primary balance affects the current account balance and (iii) the contribution of fiscal policy adjustments to resolving external imbalances.

To better capture fiscal behaviour such as fiscal effort, some studies have filtered out the impact of automatic stabilisers on the primary balance by using the cyclically adjusted primary balance (CAPB) as the dependent variable. Future studies could specify the cyclically adjusted primary balance as the dependent variable in fiscal reaction studies for Uganda.

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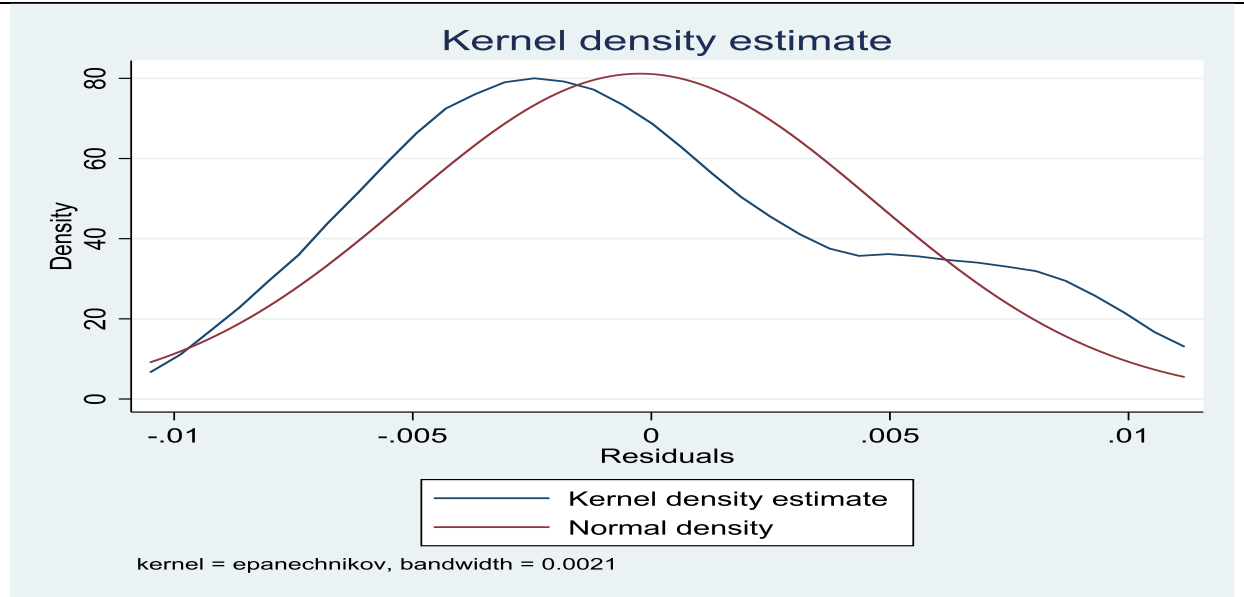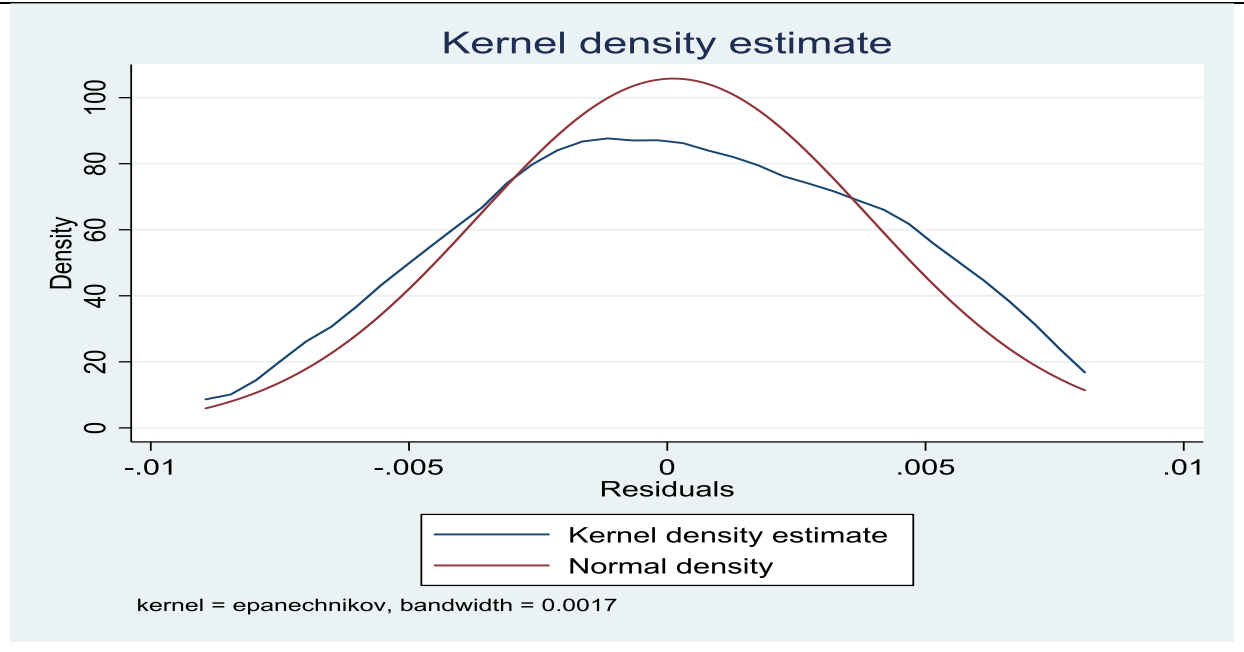
# APPENDICES

## APPENDIX A

## KERNEL DENSITY GRAPHS

**Table A1: Kernel density graphs for models 1 and 2**

| **Kernel Density graph (Model 1)** |
|---|
|  |
| **Kernel Density (Model 2)** |
|  |

# VARIANCE INFLATION FACTORS

**Table B1: Variance Inflation Factors for models 1 and 2**

| Variance Inflation Factors (Model 1) | | | Variance Inflation Factors (Model 2) | | |
|---|---|---|---|---|---|
| Variable | VIF | 1/VIF | Variable | VIF | 1/VIF |
| GVAR | | | cab | 4.93 | 0.202891 |
| D1. | 6.45 | 0.155131 | dt | 4.70 | 0.212863 |
| --. | 4.44 | 0.225332 | debtrelief | 3.32 | 0.301302 |
| st | | | fiscalrule | 2.88 | 0.347030 |
| L1. | 3.73 | 0.268326 | YVAR | 2.28 | 0.439422 |
| cab | 3.26 | 0.306294 | st | | |
| YVAR | 1.87 | 0.536013 | L1. | 1.85 | 0.539991 |
| dt | | | dt | | |
| --. | 1.73 | 0.579415 | D1. | 1.81 | 0.553422 |
| D1. | 1.41 | 0.711244 | cab | | |
| | | | D1. | 1.65 | 0.606369 |
| Mean VIF | 3.27 | | election | 1.63 | 0.612183 |
| | | | GVAR | 1.12 | 0.892980 |
| | | | Mean VIF | 2.62 | |

# APPENDIX C

## RECURSIVE CUSUM PLOTS AND OLS CUSUM PLOTS

**Table C1: Recursive CUSUM plots and OLS CUSUM plots for models 1 and 2**

| **Recursive CUSUM plot (Model 1)** | **OLS CUSUM plot (Model 1)** |
|---|---|
|  |  |
| **Recursive CUSUM plot (Model 2)** | **OLS CUSUM plot (Model 2)** |
|  |  |