

**Public Debt Sustainability:
Estimating the Fiscal Reaction Function for Uganda
(1981/82–2016/17)**

Enock W. N Bulime, Ibrahim Mukisa† & Edward Bbaale‡*

Abstract

This study examines the sustainability of Uganda's public debt from 1981/82 to 2016/17. The study adopts 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 time series data obtained from the World Bank Database for World Development Indicators of 2018; the Ministry of Finance, Planning and Economic Development; and the Bank of Uganda. The autoregressive distributed lag estimation methodology is used because of the order of integration of the study variables and the presence of a long-run relationship. The results indicate that, in the long-run, the government has responded to the growing debt sustainably by increasing the primary balance. In the short-run, the government has been unresponsive to the debt bulge, therefore, posing risks to debt sustainability. The study suggests that to ensure debt sustainability, the government should, especially in the short-run, improve the primary balance by reducing wasteful expenditures through curbing the creation of more administrative units, eliminating corruption, reducing fiscal slippages, and supplementary budgets.

JEL Classification: C22; H63; E62; E62

Keywords: autoregressive distributed lag, debt sustainability, fiscal reaction function, primary balance

I. Introduction

The inquiry about public debt sustainability is paramount in the macroeconomic analysis of fiscal policy and public finances. Governments and various scholars examine whether a public debt and its projected path are consistent with that of the government's revenues and expenditures (D'Erasmus et al., 2016). Bohn (1998) shows that a government is dedicated 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 markets, and developing economies is growing at unprecedented levels in history. On average, the debt of developing economies is primarily external, whereas the debt of developed and emerging market economies is largely domestic. Historically, growing public debts in the 1970s and 1980s culminated in a debt crisis in various developing countries (Tanzi & Blejer, 1988; Kumar & Ter-Minassian, 2007).

* Economic Policy Research Centre. Makerere University: bulimeenock1@gmail.com

† School of Economics, Makerere University: mukisaibrahim@yahoo.com

‡ School of Economics, Makerere University: eddybbaale@gmail.com

Following the global financial crisis of 2007–2009, global interest in examining public debt sustainability and its implications on macroeconomic stability was rekindled with the possibility of a global debt crisis anticipated by some economists (Reinhart & Rogoff, 2011). The European debt crisis, characterised by defaulting governments, indicates that sovereign debts are not inherently risk-free. In most African countries, the debt sustainability question re-emerged after the completion of the Heavily Indebted Poor Countries (HIPC), enhanced HIPC and Multilateral Debt Relief (MDR) initiatives. This is attributed to rising debt levels fuelled by increasing domestic and non-concessional borrowing for infrastructure and human capital investments. Other factors are weak fiscal institutions, increasing interest payments on debt, decreasing donor support, and a reduction 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, increasing interest payments, and a deteriorating primary balance. The growing debt obscures the HIPC debt relief received from 1997/98, enhanced HIPC debt relief received in 2000/01, and the MDR received in 2005/06, which significantly reduced the debt (Teunissen & Akkerman, 2004; Suruma, 2014). Figure 1 shows that public debt has increased from UGX 4.6tr in 2006/07 to UGX 33.8tr in 2016/17. Of the total debt in 2016/17, the share of domestic debt is 34 percent, and external debt is 66 percent (MoFPED, 2017b). The debt-GDP ratio is projected to rise to 47.8 percent in 2020/21, mainly driven by external borrowing to finance infrastructure projects enshrined in Vision 2040 (MoFPED, 2018).

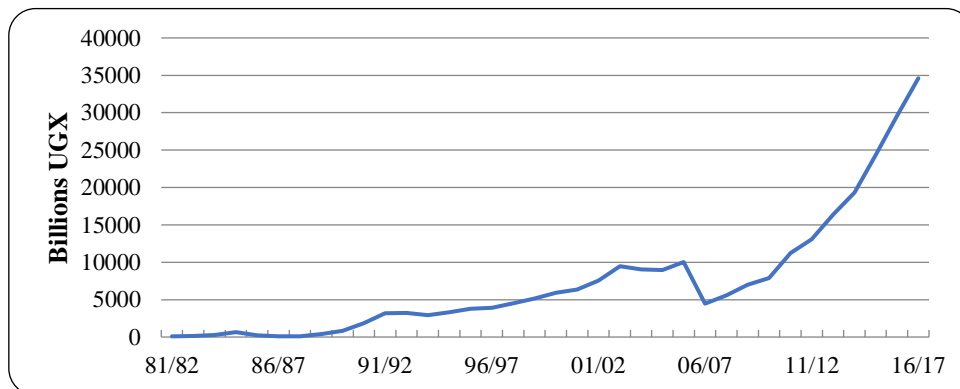


Figure 1: Evolution of Uganda's Public Debt (UGXbn)

Source: Bank of Uganda Annual Reports (various years) and WDI (2018)

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

In addition, Figure 2 shows that from 2006/07 to 2016/17, interest payments increased from UGX 236bn to UGX 2,360bn, respectively (representing an almost 900 percent increase), whereas the primary balance (government revenue minus noninterest government expenditure) deteriorated from UGX -162bn to UGX -1,181bn over the same period. The deterioration in the primary balance could be explained by the growth in government expenditure, debt, and deterioration of the current account balance.

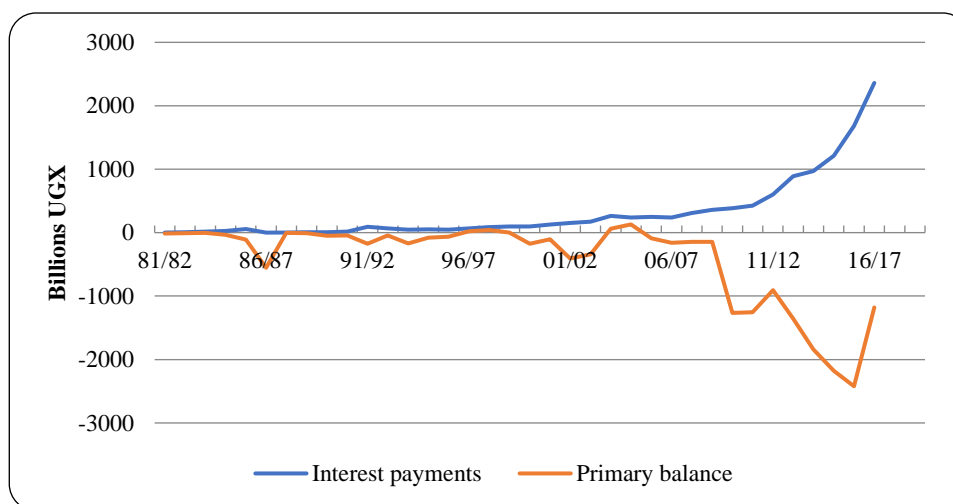


Figure 2: Evolution of Uganda's Interest Payments and Primary Balance (UGXbn)

Source: Data from the Budget Reports (various years)

During the period under review, the government has undertaken reforms and fiscal actions to promote fiscal discipline that would ensure debt sustainability. The key reforms include: (i) merging of the Ministry of Finance and Ministry of Planning and Economic Development to integrate planning and budgeting; (ii) formation of the Uganda Revenue Authority to improve revenue collection; (iii) introduction of a cash flow management system to control government spending and borrowing, and (iv) introduction of a Medium-Term Expenditure Framework to improve the allocative efficiency of limited budget resources (Kuteesa et al., 2010). 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 buyback) to reduce Uganda's debt burden (ibid.). In addition, the government came up with strategies to improve debt management, including the Debt Strategy (1991), Enhanced Debt Strategy (1995), 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 enabled the government to keep the debt within sustainable limits.

Previous studies argue that the growth of developing countries depends on macroeconomic stability supported by country-specific policies (Azam et al., 2002). Uganda's fiscal policy aimed 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 is a precursor to instability in economic 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 repayments of arrears take the first call on the available budgetary resources.

Several studies have assessed the state of Uganda's public finances and debt sustainability. These studies indicate that debt sustainability is compromised by large fiscal deficits (Wamala, 1994; Mugabi, 2004), the ever-increasing external debt (Muvawala, 1998), and the burgeoning domestic debt (Hisali & Guloba, 2013). Ejalu (2016) shows that Uganda's fiscal policy is not sustainable since there is no long-run relationship between government expenditure and taxes.

In contrast, debt sustainability analysis (DSA) studies by the Ministry of Finance, Planning and Economic Development (MoFPED), and by the International Monetary Fund (IMF) indicate that Uganda's debt is sustainable (and is no cause for concern)¹ in the medium- and long-term (MoFPED, 2017b; IMF, 2016a). MoFPED (2017b) shows that Uganda moved from low to moderate risk of debt distress due to a projection of a higher rate of debt accumulation in the medium-term driven by borrowing for infrastructural development. It also highlights vulnerabilities and risks such as low domestic revenues, lower exports and real GDP growth, worsening borrowing terms and sustained exchange rate depreciation.

Previous studies provide evidence on the state of Uganda's public finances and debt sustainability. However, 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 is likely to continue); and yet the official development assistance is decreasing. For example, from 2010/11 to 2016/17, the 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, 2017b). The changing economic and financing conditions raise concerns on financing Uganda's development aspirations while maintaining debt sustainability.

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 the governments' response to the growing public debt. This rule is meant to be achieved by 2020/21; and the debt-GDP (NPV terms) was 27.1 percent in 2016/17 (MoFPED, 2017b). The large gap between the target (fiscal rule) and the actual debt-GDP (in NPV terms) might encourage increased borrowing with limited restraint.

The general objective of this study is to assess the extent to which fiscal policy has been instrumental in ensuring debt sustainability in Uganda. The key research question answered by this study inquires whether the Ugandan government systematically adjusts its primary balance in response to growing public debt. The study contributes to the existing literature on Uganda's fiscal policy in the following ways. First, previous studies investigate how the growing fiscal deficits and debts compromise the sustainability of public finances (Wamala, 1994; Mugabi, 2004; Muvawala, 1998; Hisali & Guloba, 2013). However, this study provides evidence on the government's fiscal policy response (proxy by the primary balance) to increases in the public debt by adjusting the primary balance, despite the frequent primary deficits.

Second, while other studies (e.g., Ejalu, 2016) focus 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 temporary fluctuations in the noninterest government expenditures² (expenditure gap), current account balance, debt relief, fiscal rules, and elections -- that influence 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 employed approaches such as the IMF Debt Sustainability Framework [DSF] (MoFPED, 2017b; 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 public finances. However, these approaches do not provide evidence on how the government has responded to growing public debts to guarantee debt sustainability.

2. Literature Review

2.1 Theoretical Literature Review

2.1.1 Present Value Budget Constraint

The present value budget constraint (PVBC) is the starting point for debt and fiscal sustainability analysis in various country-specific and cross-country studies (Burnside, 2005). To examine debt and fiscal sustainability, this method tests for the stationarity of debt and the presence of a cointegrating relationship between fiscal variables. Because countries have borrowing limits, governments balance their budgets inter-temporally by setting the current value of debt equal to the discounted expected future surpluses (Quintos, 1995). Therefore, fiscal policy and public debt would be unsustainable if the intertemporal budget constraint is violated. Romer (1996) also 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 a government debt at a given interest rate (Bohn, 1998). Consequently, this test is sensitive to the choice of discount rates.

² Noninterest government expenditure refers to government expenditure exclusive of interest payments.

2.1.2 Debt Stabilising Primary Balance

This approach uses the intertemporal government budget constraint evaluated at steady state to relate the long-run primary balance to GDP, and the debt to GDP (Buitier, 1985; Mauro, Romeu, Binder & Zaman, 2013). The two conditions for sustainability are (i) No-Ponzi-Game and (ii) intertemporal budget constraint.³ This method involves the calculation of the primary balance required to guarantee debt sustainability in the long-run. Ley (2010) argues that a large (small) difference between the real interest rate and the real GDP growth rate requires a large (small) debt stabilizing 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. In addition, this method overlooks uncertainty and considerations about the asset market structure (D'Erasmus 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. He argues that the former does not pragmatically stabilise debt, whereas the latter does. In his seminal paper, Bohn (1998) argues that earlier fiscal and debt sustainability tests are inconsistent and ambiguous because they overlook temporary fluctuations in GDP and noninterest public expenditures. He proposed a novel method that emphasises the primacy of stable fiscal policy reactions in dealing with accumulating debts. Therefore, debt sustainability is a consequence of the revealed behaviour of fiscal authorities. This method estimates the fiscal policy reaction functions that are similar to the Taylor reaction functions in monetary policy. It is also concerned with the systematic adjustment of the primary balance in response to changing debt levels. Bohn (2011) indicates that countries guarantee debt sustainability when the primary balance responds positively to increases in debt.

The advantages of the fiscal reaction function approach include the following. First, it does not involve estimations of the likely economic shocks and their 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 detects whether a country's debt is unsustainable due to indiscipline in fiscal policies, or because of adverse shocks (Wyplosz, 2007). D'Erasmus et al. (2016) commend this method because it is direct and powerful for conducting non-structural empirical tests for fiscal solvency, as it requires data on the primary balance, debt and some control variables. The main weakness of this approach is that it is backward-looking as it only reveals the past response to the debt within the estimation sample (Wyplosz, 2007; Baldi & Staehr, 2013).⁴

³This requires the present value of public debt to converge asymptotically to zero, which correspondingly means that the already existing debt amount must be paid off by future primary surpluses.

⁴ In other words, it does not specify the fiscal reaction to debt in the future.

2.1.4 IMF Debt Sustainability Framework

The IMF uses various methods to evaluate the sustainability of debt in different countries, while accounting for the level of development of a country, the debt burden, and the ability to borrow from different sources. These include frameworks for examining public and external debt sustainability for low-income countries and market access countries. The framework assesses each country's debt situation, vulnerabilities in the structure of the debt, and the alternative fiscal actions to stabilise the debt (IMF, 2017). The approach uses a baseline scenario, makes projections of macroeconomic variables, including debt, and it involves the application of sensitivity tests to the baseline scenario.⁵ Both MoFPED and IMF -- using the framework for low-income countries -- independently assess Uganda's debt situation. This approach has received a fair share of criticism in different studies (Wyplosz, 2007; Debrun, Celasun & Ostry, 2006).

2.2 Empirical Review

2.2.1 Present Value Budget Constraint

Empirical evidence on the consistency of fiscal policy with the present value budget constraint has generated different results. Hamilton and Flavin (1986) examine the sustainability of fiscal policy in the US using data from 1960 to 1984. The study addressed the concerns about the desirability and feasibility of continuous deficits by finding out the extent to which budget deficits could continue perpetually. They test for unit roots in the real deficit and real debt to find out whether the present value budget constraint was met. The study results indicate that the discounted debt was stationary, which is evidence for a sustainable fiscal policy. However, they argue that the government's decision to continue borrowing must be backed up by a commitment to balance the budget in expected present value terms.

Trehan and Walsh (1988) examine fiscal policy sustainability in the U.S using data from 1890 to 1896. Unlike Hamilton and Flavin (1986) who use deficit exclusive of interest payments as a variable, their study focuses on the deficit inclusive of interest payment. In addition, they also test for the presence of a cointegrating relationship between fiscal variables⁶ to find out whether the intertemporal budget constraint is violated and whether the deficit inclusive of the interest payments is stationary. The results indicate that fiscal policy was consistent with the intertemporal budget balance and that the deficit inclusive of interest is stationary, thus concluding that fiscal policy was sustainable. However, they do not find evidence to support the tax-smoothing hypothesis.

Wilcox (1989) extends Hamilton and Flavin's (1986) framework by making an allowance for stochastic real interest rates, and non-stationarity in the noninterest surplus. He examines the sustainability of fiscal deficits in the US and finds that the fiscal policy was not sustainable if it remained unchecked because of violating the intertemporal constraint. However, their conclusion was contrary to previous studies.

⁵The projections of the various debt indicators are informed by the government's intended macroeconomic policies. The projections are used to assess a country's vulnerability to debt distress.

⁶ These include deficit inclusive of interest, tax revenues and revenues from seignorage.

Ejalu (2016) examines fiscal sustainability and fiscal policy adjustments (using both linear and nonlinear adjustments of fiscal variables) for Uganda, Kenya, Burundi, Rwanda and Tanzania using data from 1980 to 2016. Using the PVBC approach, she finds no evidence of a cointegrating relationship between taxes and expenditure for Uganda, thus concluding that Uganda's fiscal policy is not sustainable. The study also finds no evidence of budgetary corrections or tax responses to the output gap and deficits. However, Ejalu's (2016) study did not account for other economic shocks that the fiscal reaction function accounts for. Unlike Ejalu's (2016) study, the current study considers the primary balance as the response variable.

2.2.2 Fiscal Reaction Function Approach

Bohn (1998) examines the United States' fiscal and debt sustainability by examining the reaction of the primary balance to debt accumulation by using data from 1916 to 1995. Using Barro's (1979) tax smoothing theory, he accounts for other economic shocks that might affect the government's response to debt accumulation. He estimates the fiscal reaction function and finds that the government responded to the increasing debt by raising the primary surplus (or reducing the primary deficit). Therefore, he concluded that the US's fiscal policy was sustainable since it satisfied the intertemporal budget constraint.

Several studies focusing on developed and emerging market economies extend Bohn's method. Mendoza and Ostry (2008) examine fiscal solvency and public debt sustainability in both emerging market economies and advanced countries using data from 1970 to 2005. They find evidence for debt sustainability because of the positive response of primary surplus to the growing debt in both country groups. Similarly, Ghosh et al. (2013) modify⁷ Bohn's approach to examine the degree to which public debt in 23 advanced economies can increase without compromising fiscal solvency. Using data from 1970 to 2007, they find that the primary balance is increased in response to lagged debt at moderate levels. However, the results also indicate that the primary balance coefficients fall sharply at high debt levels, especially around 90-100 percent of GDP. Unlike earlier studies, they also obtained fiscal space⁸ estimates. Luporini (2013) finds evidence of a positive response of the primary balance to increases in public debt in Brazil, thus concluding that fiscal policy was sustainable.

The other strand of literature focusing on developed and emerging market economies examines the long- and short-run dynamics of the primary balance's reaction to changes in debt. These include Jeong (2014) for the United States, United Kingdom, and South Korea; Berti et al. (2016) for Finland and Belgium; Pamungkas (2016) for Indonesia; Shastri et al. (2017) for Bangladesh, Pakistan, India and Sri Lanka, and Barbier-Gauchard and Mazuy (2018) for the European Union countries. The evidence that these studies provide concerning debt sustainability (in the short- and long-run) for some countries is mixed.

⁷ They include a nonlinear stochastic model specification allowing for sovereign default risk.

⁸ 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.

For instance, Barbier-Gauchard and Mazuy (2018) examine the sustainability of public debt in various European Monetary Union countries using quarterly data from 1990 to 2017. First, they find evidence for public debt sustainability (in the short- and long-run) for Austria, Belgium, Germany and Finland. Second, for Lithuania, Malta, Slovakia and Slovenia, they find evidence for debt sustainability in the long-run, but no evidence for debt sustainability in the short-run. Third, whereas public debt in Greece and Italy was not sustainable in the long-run, it was found to be sustainable in the short-run. Lastly, they find evidence that the public debt in Portugal and Spain was not sustainable in both the short- and long-run.

Previous studies also estimate the fiscal reaction functions for developing countries. Ghatak and Sánchez-Fung (2007) examine fiscal policy sustainability in Peru, the Philippines, South Africa, Thailand and Venezuela using data from 1971 to 2000. Using ordinary least squares (OLS), the results indicate that fiscal policy was not sustainable in all the countries since they did not increase their primary balance in response to higher debt levels. Burger et al. (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 (OLS, VAR, TAR, GMM, and VECM) using fixed parameters for the 1974-2008 period, while the state-space model is estimated for the 1946-2008 period.⁹ They find evidence for a sustainable fiscal policy guaranteeing debt sustainability. The differences in the study periods might explain the differences in the results obtained by Ghatak and Sánchez-Fung (2007) and Burger et al. (2012).¹⁰ In addition, South Africa's debt to GDP ratio reduced further from 2000 until 2008. Therefore, the results are sensitive to the study period, the estimation technique used, and the evolution of debt.

Other developing country studies also focus on the short- and long-run dynamics of primary balance and public debt. These include Asiama et al. (2014) for Ghana, Amankwah et al. (2018) for Ghana, and Makau et al. (2018) for Kenya. Amankwah et al. (2018) examine debt sustainability in Ghana using the autoregressive distributed lag (ARDL) approach. Using data from 1990 to 2016, they find evidence for a positive relationship between primary balance and growing public debt in the long-run. However, the short-run primary balance response to debt was negative.

2.2.3 Other Uganda Specific Studies

Using data from 1970 to 1993, Wamala (1994) studies the sustainability of budget deficit and finds evidence for unsustainable fiscal deficits. Mugabi (2004) uses the accounting approach (based on solvency) to examine the sustainability of fiscal deficits between 1988 and 2003. He finds that the level of budget deficits, given the macroeconomic conditions at the time, was unsustainable, thus compromising debt sustainability. Muvawala (1998) finds that the burgeoning external public debt

⁹ This is because the structural breaks in the data from 1946-2008 would bias the results. However, the state space model is not affected by the breaks in the data because it uses a varying parameter.

¹⁰ Burger et al (2012) considered a longer period than that of Ghatak and Sánchez-Fung (2007).

compromised the sustainability of external debt. Hisali and Guloba (2013) analyse the sustainability of fiscal policy using the accounting approach and find that the fiscal policy did not jeopardize the attainment of inflation and GDP growth rate targets. However, they emphasise that the inflation target was achieved at the cost of an unsustainable domestic debt.

The previous independent studies by the IMF and MoFPED that examine debt sustainability indicate that Uganda's growing debt is sustainable in the medium- and long-term at low risk of debt distress (IMF, 2015; MoFPED, 2016b; IMF, 2016a). However, a recent study by MoFPED provides evidence suggesting that the debt has moved to moderate risk of debt distress, though still sustainable (MoFPED, 2017b). However, the growing debt creates reasonable suspicions about debt sustainability, thereby undermining the fiscal policy built on the perception that Uganda's debt is safe, and thus there is no cause for concern.

3. Methodology

3.1 Theoretical Framework

The assessment of debt sustainability can be approached from the solvency or liquidity perspective. The government is solvent if the intertemporal budget constraint is not violated; whereas it is liquid if the instantaneous budget constraint is satisfied. This study approaches the question of debt sustainability from the solvency perspective based on the fiscal reaction function approach by Bohn (1998). This method examines the necessary and sufficient fiscal measures taken by the government to keep debt within sustainable limits. This approach posits that a positive adjustment of the primary balance due to a burgeoning debt is sufficient evidence for actions aimed at stabilising debt (but not through money creation).

Following Bohn's (1998) approach, and considering a real economy, the analysis of debt sustainability starts with the standard government budget constraint that describes the accumulation of public debt in equation (1):

$$d_{t+1} - d_t = r_t d_t - s_t \quad (1)$$

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

Therefore $r_t d_t$ is the real interest payment on government debt in period t . Therefore, equation (1) implies that a change in debt is equivalent to the difference between the real interest payment and the primary balance.

The government follows a sustainable debt policy when: (i) the present value of public debt asymptotically converges to zero, (ii) the government does not play a Ponzi game, and (iii) the government should be able to service its debt even under adverse conditions (Bohn, 2011).

From equation (1), the study seeks to find a systematic relationship between the primary balance to GDP and the debt to GDP ratios and other non-debt determinants. Therefore, the government's fiscal reaction function (i.e., the response of primary balance to public debt) can be written as:

$$s_t = \alpha_d d_t + \mu_t + \varepsilon_t \quad (2)$$

where the coefficient α_d measures the responsiveness of primary balance to changes in the debt, μ_t represents the non-debt determinants of the primary balance, and ε_t is the independent and identically distributed error term. The first term on the right-hand side of equation (2) indicates that primary balance increases with an increase in debt.

The study relies on the existing literature to choose the non-debt determinants and other control variables. First, the study relies on the tax smoothing theory, which posits that: (i) fiscal deficits are influenced by recessions and temporarily high noninterest expenditures; and (ii) expenditures are financed by current tax revenues or loans (Barro, 1979; Barro, 1986). 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. First, the tax smoothing theory supports the usage of budget deficits (surpluses) during periods of temporary increases (decreases) in noninterest government spending. Second, budget deficits (surpluses) are ideal during a contraction (expansion). This enables a government to avoid abnormally high tax rates during periods when its expenditures are unusually high, or when output is low by borrowing. The theory provides two non-debt determinants: transitory fluctuations in noninterest government expenditure proxy by the expenditure gap to GDP (GVAR); and the temporary fluctuations in output or GDP proxy by the output gap to GDP (YVAR).

Bohn (1998) argues that including tax smoothing theory variables corrects for the potential impact of omitted variables, thereby warranting a correctly specified and consistent model. In line with Barro (1986), μ_t is defined as,

$$\mu_t = \alpha_g GVAR_t + \alpha_y YVAR_t \quad (3)$$

where,

$$GVAR_t = \frac{G_t - G_t^*}{Y_t} \text{ and } YVAR_t = \left[1 - \left(\frac{Y_t}{Y_t^*} \right) \cdot \left(\frac{G_t^*}{Y_t} \right) \right],$$

where G_t is the noninterest government expenditure (i.e., expenditure exclusive of interest payments), G_t^* is the trend noninterest government expenditure, and Y_t^* is the trend real GDP. The trend real GDP and the trend noninterest government expenditure are obtained by applying the Hodrick-Prescott filter. Substituting equation (3) into (2) yields the following equation:

$$s_t = \alpha_0 + \alpha_d d_t + \alpha_g GVAR_t + \alpha_y YVAR_t + \varepsilon_t \quad (4)$$

According to the tax smoothing theory, GVAR in equation (4) indicates that primary balance decreases when government expenditure is above potential (i.e., when $G_t > G_t^*$). Intuitively, 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, they trigger high fiscal deficits, which decrease the primary balance. On the other hand, YVAR indicates that primary balance decreases when output is below potential (i.e., when $Y_t/(Y_t^*) < 1$). The output gap also depends on the trend of noninterest government expenditure G^* . Therefore, the effect of the output gap to GDP on 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 during economic downturns through deficit financing, as opposed to raising taxes since the economy is underperforming.

Second, the study relies on the twin deficits hypothesis, which postulates that there is a strong positive relationship between the fiscal balance and the current account balance. The empirical literature testing this hypothesis is inconclusive, especially concerning the direction of causation. First, 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; Sobrino, 2013). Third, studies provide proof of bidirectional causality (Mukhtar et al., 2007; Bakarr, 2014). Lastly, some find no evidence for causality (Ferda & Kasim, 2013). Therefore, the inclusion of the current account balance makes it possible to test the hypothesis of twin deficits in the case of Uganda. Equation (4) is extended to include the current account balance as a component of μ_t .

$$s_t = \alpha_0 + \alpha_1 d_t + \alpha_2 \text{GVAR}_t + \alpha_3 \text{YVAR}_t + \alpha_5 \text{cab}_t + \varepsilon_t \quad (5)$$

where $\text{cab}_t = \text{cab}_t/Y_t$ is the current account balance to GDP ratio, and CAB is the current account balance. The term cab_t in equation (5) indicates that primary balance increases with an increase in current account balance.

Third, the study relies on debt relief literature. The provision of debt relief to heavily indebted poor countries would reduce their debt burdens and promote debt sustainability. This would enable the countries to improve their fiscal positions due to reduced debt repayments, and reception of debt relief funds.¹¹ Uganda has profited from debt relief initiatives, including debt write-offs, new loans to service payments falling due, social infrastructure grants, and contributions to the HIPC trust fund to service payments falling due (BOU, 1999; Teunissen & Akkerman, 2004; Suruma, 2014; MoFPED, 2017a). The study includes a debt relief dummy to analyse its effect on primary balance.

¹¹ Some of the funds are reallocated to socio-economic services, thus relieving pressures on government expenditure.

Fourth, the fiscal rules literature indicates that fiscal rules aim at influencing the fiscal administration of a government to ensure fiscal discipline and responsibility. Fiscal rules are long-lasting constraints on fiscal policy through numerical limits on budgetary aggregates (IMF, 2016b). Uganda consented to the East African Monetary Union (EAMU) convergence criteria in 2013. The convergence criteria require countries to keep their gross public debt below 50 percent of GDP in net present value (NPV) terms, and their budget balances (including grants) below 3 percent of GDP (UNECA, 2018). The fiscal rule dummy is used to study the influence of fiscal rules on primary balance.

Lastly, the political business cycle theory hypothesizes that an incumbent government uses expansionary fiscal policy before an election to influence re-election. Empirical evidence indicates that voters interpret such expenditure increases as an indicator of a government's competence, hence reward it through re-election (Rogoff, 1990; Alesina et al., 1997). Therefore, such actions tend to worsen the fiscal position by widening fiscal deficits. This study considers an election dummy to examine the effect of elections on primary balance.

3.2 Econometric Model Specification

The econometric model follows from equation (5). It is augmented by including the debt relief dummy, fiscal rules dummy, and the elections dummy, and specified as:

$$s_t = \alpha_0 + \alpha_1 d_t + \alpha_2 GVAR_t + \alpha_3 YVAR_t + \alpha_4 cab_t + \alpha_5 drelief_t + \alpha_6 frule_t + \alpha_7 elec_t + \varepsilon_t \quad (6)$$

The theory has the following expectations for the coefficients.

- 1) Coefficient α_1 is expected to be positive if a government is committed to maintaining a steady debt-GDP ratio conditional on non-debt determinants.
- 2) Coefficient α_2 is expected to be negative since temporary increases in noninterest government expenditure would induce a government to decrease its primary balance due to increases in debt-financed deficits.
- 3) Coefficient α_3 is expected to be negative since the primary balance would decrease during an economic downturn to boost the economy through deficit financing.
- 4) Coefficient α_4 is expected to be positive since an improvement in the current account balance leads to an improvement in the primary balance.
- 5) Coefficient α_5 is anticipated to be positive because debt relief is aimed at improving the primary balance.
- 6) Coefficient α_6 is expected to be positive since fiscal limits aim at improving the primary balance.
- 7) Coefficient α_7 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 variables because of the existing theoretical relationship between the dependent variable and independent variables, and 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 ($elect_t$).

Primary balance to GDP: A primary balance is the fiscal balance exclusive of interest payments on debt computed as revenue¹² minus noninterest government expenditure. A primary balance is scaled by real GDP. As a measure of the government's fiscal response, a primary balance is preferred to the cyclically adjusted primary balance because it shows the total fiscal reaction of a government to growing debts, and it is observable; hence making it less liable to ex-post amendments (Checherita-Westphal & Žďárek, 2017). Additionally, a government can easily control its primary expenditures, and using the primary balance facilitates the assessment of the effect of automatic stabilisers and discretionary policy actions. Previous studies that used this variable include Bohn (1998) and Checherita-Westphal and Žďárek (2017).

Debt to GDP ratio: The quantity of 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 primary balance's reaction to the level of public debt, which signifies whether a government is responsible enough to guarantee debt sustainability. Mauro et al. (2013) and Amankwah et al. (2018) have used this variable.

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 the noninterest government expenditure. An expenditure gap is the difference between noninterest government expenditure and the trend noninterest government expenditure. This variable is scaled by real GDP. 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 cyclical fluctuations in real GDP and it represents a business cycle. The Hodrick-Prescott filter is used 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 difference is divided by the potential real GDP and multiplied by the trend of noninterest expenditure (in real terms). This variable has been used by Bohn (1998) and Ghatak and Sánchez-Fung (2007).

Current account balance to GDP: The current account balance, a component of the balance of payments, consists of trade balance, net factor income, and net cash transfers. This study uses the current account balance inclusive of grants since

¹² 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.

Uganda is a recipient of grants, which play a key role in its fiscal policy. The current account balance is expressed as a ratio of real output. Studies like Checherita-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 primary balance. This dummy is equal to 1 from 1997/98–2016/17, and 0 from 1981/82–1996/97. Earlier studies that used this variable include Asiama et al. (2014).

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. Checherita-Westphal and Žďárek (2017) and Barbier-Gauchard and Mazuy (2018) have used this variable.

Election dummy: This dummy captures the effect of the political budget cycle (proxy by the presidential and parliamentary elections) on primary balance. This dummy is equal to 1 for the pre-election year, the election year, and the post-election year (1994/95–1996/97, 1999/00–2001/02, 2004/05–2006/07, 2009/10–2011/12 and 20014/15–2016/17); and 0 for the other years. Galli and Padovano (2008) and Pamungkas (2016) have used this variable.

3.4 Estimation Technique

3.4.1 Unit Root and Stationarity Tests

This study adopts the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to examine the stationarity properties of the data (Dickey & Fuller, 1979; Phillips & Perron, 1988). The study accounts for structural breaks in the data that might influence the ADF and PP test results. The study implements the Zivot and Andrews (1992) unit root test dealing with only one structural break, and the Clemente et al. (1998) test dealing with one or two structural breaks. The Zivot and Andrews (1992) test utilises the entire sample, using separate dummy variables for each break date, and 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: the innovation outlier model assumes that the structural break occurs gradually; while the additive outlier model assumes that structural break occurs immediately. This study uses the additive outlier approach that detects any sudden change in a time series.

3.4.2 Cointegration test

The standard economic theory suggests that some variables are linked by a long-run relationship, which implies that the variables may drift apart from each other in the short-run. Therefore, there is merit in examining the presence of a cointegrating relationship between the study variables. The key approaches for testing cointegration include the Engle and Granger (1987) two-step approach based on assessing whether single-equation estimates of equilibrium errors are stationary; 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 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 the following limitations. First, it is inapplicable in the presence of 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. Lastly, it carries a finite sample bias, which implies that superior estimates are obtainable by accounting for short-run dynamics. The Johansen (1991) method corrects for the first limitation because it is valid in the presence of multiple cointegrating vectors. Nonetheless, these two methods are inappropriate when the variables have different orders of integration (i.e., order 1, and order 0).

However, the Pesaran, Shin and Smith (2001) test is valid when variables have different orders of integration, but not in the case of I(2) variables. It also has other advantages including that it: (i) does not have an endogeneity problem; (ii) is usable in small samples; and (iii) is suitable for forecasting and for separating long-run relationships from short-run dynamics. However, it is only applicable in a single equation and on the assumption of one cointegration relationship, thereby making it less general than the Johansen (1991) approach.

ARDL Model

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

$$y_t = c_0 + \sum_{i=1}^p \phi_i y_{t-i} + \sum_{i=0}^q \beta_i' x_{t-i} + \varepsilon_t \quad (7)$$

where y_t is a vector and the variables in x_t are purely I (0) and I (1); the coefficients are ϕ_i and β_i' ; the constant is c_0 ; $i=1, \dots, k$, while p and q are the optimal lags.

The study assumes that $p \geq 1$, and $q \geq 0$. The lag order is chosen based on the Schwarz Bayesian information criterion (SBIC), which picks a more parsimonious model when compared to Akaike's information criterion, and final prediction error that overestimate the model. The vector of error terms is ε_t . The model shows that the dependent variable is a function of its lagged values: the current and lagged values of the exogenous variables.

Model 7 is re-parameterised in conditional error correction, yielding:

$$\Delta y_t = c_0 - \lambda(y_{t-i} - \vartheta x_t) + \sum_{i=1}^{p-1} \alpha_{yi} \Delta y_{t-i} + \sum_{i=0}^{q-1} \alpha'_{xi} \Delta x_{t-i} + \varepsilon_t \quad (8)$$

The speed of adjustment coefficient $\lambda = 1 - \sum_{j=1}^p \phi_j$ is an indicator of the strength of the response variable's reaction to a deviation from the long-run relationship in one period. The long-run coefficients $\vartheta = \frac{\sum_{j=0}^q \beta_j}{\lambda}$ show the long-

run effects of the independent variables on the dependent variable. The short-run coefficients α_{yi}, α_{xi} denote the short-run variations unexplained by distortions from the long-run equilibrium. The error correction term (ECT) is given by: $ECT = y_{t-1} - \vartheta_{xt}$.

In testing for cointegration, the Kripfganz and Schneider (2019) critical values and approximate p-values are used because they are superior to those obtained by Pesaran et al. (2001) and Narayan (2005).¹³ The null of no cointegration is not rejected if the F-statistic is closer to 0 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 cointegrating relationship, the fiscal reaction function, specified in an unrestricted error correction model form, will be estimated:

$$\Delta s_t = \alpha_0 + \sum_{i=1}^p \alpha_i \Delta s_{t-i} + \sum_{i=1}^q \alpha_d \Delta d_{t-i} + \sum_{i=1}^q \alpha_g \Delta GVAR_{t-i} + \sum_{i=1}^q \alpha_y \Delta YVAR_{t-i} + \sum_{i=1}^q \alpha_c \Delta cab_{t-i} + \alpha_r drelief_t + \alpha_f frule_t + \alpha_e elec_t + \varepsilon_t \quad (9)$$

3.4.3 Hodrick-Prescott Filter

The Hodrick and Prescott (1997) filter is used to acquire the trend components of real GDP and the noninterest government expenditure. This method is used to separate a time series into a trend and a cyclical component. A smoothing parameter determines the smoothness of the trend, and various studies have set the parameter to 400, 100, and 25. However, Ravn and Uhlig (2002) conclude that the parameter should be adjusted according to the fourth power of a change in the frequency of observations. Their value (6.25) was close to that proposed by Baxter and King (1999). This study sets the smoothing parameter to 100 for annual data.

3.4.4 Data and Data Sources

The data covers fiscal and other macroeconomic variables from 1981/82–2016/17. Data on government revenue, expenditure, and interest payments¹⁴ were accessed from MoFPED's background to the budget publications (MoFPED, 1983–2018), and it was used to calculate the primary balance and the expenditure gap. Data on domestic debt, external debt,¹⁵ end of the period exchange rate, and current account balance was collected from the Bank of Uganda annual reports (BOU, 1983–2018). End of period exchange rates (UGX/USD) were used to convert current account balance and external debt from US dollars to Ugandan shillings. The domestic debt

¹³Pesaran et al. (2001) propose the near-asymptotic critical values, and Narayan (2005) provides the finite sample critical values.

¹⁴The actual interest payments data for 1985/86 was missing, so the study considered the preliminary value for that fiscal year.

¹⁵The 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.

and external debt data were used to compute the total government debt.¹⁶ Real GDP data were from the World Bank Database for World Development Indicators (World Bank, 2018). The study wanted to preserve concept continuity and consistency by obtaining all variables from a single data source to minimise breaks in the data that would be attributed to changes in data sources. However, not all variables were available in a one-single source.

4. Presentation, Interpretation and Discussion of Results

4.1 Data Description

Table 1 provides a description of the main variables in this study.

Table 1: Descriptive Statistics

| Variables | Obs. | Mean | Standard Deviation | Minimum | Maximum |
|--------------------------------|------|----------|-----------------------|---------|---------|
| Primary balance to GDP | 36 | -0.01200 | 0.016 | -0.064 | 0.005 |
| Debt to GDP | 36 | 0.22800 | 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 | -0.03100 | 0.036 | -0.115 | 0.008 |

The number of observations of each variable shows that the data covers a period of 36 years. The mean and median values for all variables are good measures of central tendency because they lie between the minimum and maximum values. The debt to GDP ratio has the largest value (0.597), whereas the current account balance to GDP ratio has the smallest value (-0.115). The standard deviations are small and concentrated around the average, suggesting that there are no outliers. Over the study period, debt to GDP averaged at 22 percent; while the primary balance averaged at -1.2 percent.

4.2 Correlation Results

The study explored the correlation between pairs of variables, and the results are displayed in Table 2.

Table 2: Correlation Matrix

| Variables | s_t | d_t | $GVAR$ | $YVAR$ | cab_t |
|--------------------------------------------|----------|----------|--------|---------|---------|
| Primary balance to GDP (s_t) | 1.000 | | | | |
| Debt to GDP (d_t) | -0.304 | 1.000 | | | |
| Expenditure gap to GDP ($GVAR_t$) | -0.648** | 0.016 | 1.000 | | |
| Output gap to GDP ($YVAR_t$) | 0.016 | 0.121 | 0.129 | 1.000 | |
| Current account balance to GDP (cab_t) | 0.575** | -0.532** | 0.004 | 0.471** | 1.000 |

Note: ** $p < 0.05$

¹⁶ No statistical agency in the country tracked the total public debt for the period under study. We considered Bank of Uganda data since it tracked both domestic debt and external debt for the study period.

The findings provide evidence of a strong negative linear relationship between primary balance to GDP and the expenditure gap to GDP (-0.648), which suggests that primary balance tends to decrease with an increase in expenditure gap. The current account balance is significantly correlated with the primary balance (0.575), the debt to GDP ratio (-0.532), and the output gap (0.471). There is a weak negative relationship between the primary balance to GDP and the debt to GDP, which suggests that primary balance tends to increase with decreases in debt levels. The output gap is positively correlated with other variables, albeit weakly. All correlation coefficients are less than 0.700; within an acceptable band.

4.3 Unit Root and Stationarity Tests

The ADF and PP tests were carried out with one lag, along with the structural break tests, to examine the stationarity properties of the data. Table 3 shows the results for the ADF and PP tests at levels.

Table 3: Unit Root and Stationarity Tests 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 test results suggest that the primary balance to GDP and expenditure gap to GDP have no unit roots, hence stationary. On the other hand, debt to GDP and current account balance to GDP have unit roots, and are non-stationary. This necessitates testing the presence of unit roots at the first difference for debt to GDP and current account balance to GDP to find out whether they are stationary in the first difference. Table 4 shows the results of the ADF and PP tests at first difference.

Table 4: Unit Root and Stationarity Tests at First Difference

| Variables | ADF (1) | PP (1) | Verdict |
|-----------------------------|-----------|-----------|--------------|
| Debt to GDP | -3.038** | -4.381*** | 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 | |

The unit root tests for debt to GDP and current account balance to GDP indicate that they are difference stationary.

The results for the structural break unit root tests based on the Zivot and Andrews (1992) and the Clemente et al. (1998) allowing for one structural break (reported as Clemao1) and two structural breaks (reported as Clemao2) are reported in Table 5.

Table 5: Structural Break Unit Root Tests

| Variables | Zivot & 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 show that all the series have structural breaks, albeit significant only for the primary balance to GDP, expenditure gap to GDP, and the output gap to GDP. These results suggest that the primary balance to GDP, expenditure gap to GDP, and output gap to GDP have no unit roots. Despite having structural breaks, debt to GDP and current account balance to GDP variables have unit roots. Therefore, the ARDL approach is the ideal estimation method because the variables are integrated of different orders [I(0) and I(1)].

4.4 Selection of Optimal Lags

The optimal lags for the different study variables are chosen based on the two regressions that this study estimates. Regression 1 considers debt to GDP, expenditure gap to GDP, output gap to GDP, and current account balance to GDP as independent variables. Regression 2 augments regression 1 with debt relief, fiscal rule, and election dummies as independent variables. The optimal lag orders for the variables included in the ARDL model are chosen based on the SBIC using the maximum lag of three for regression model 1. However, for regression model 2, the maximum lag of two is chosen due to multicollinearity among the study variables. 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 bounds test for cointegration was conducted to examine the existence of a long-run relationship between the variables in the model as shown in Table 6. For model 1, the Pesaran et al. (2001) bounds test considered 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.

Table 6: Long-run Relationship

| | | Model 1 | Model 2 |
|--------------------|-------------------|----------------|----------------|
| Significance level | F-stat | 7.183 | 53.136 |
| | Integration-order | F(crit) | F(crit) |
| 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 |
| | I(0) | 4.772 | 4.038 |
| 1% | I(1) | 6.627 | 6.070 |

The null hypothesis of no long-run relationship is rejected for all models since the F statistic values are greater than critical values for I (1) variables at the 5 percent level of significance. Therefore, the ARDL model is estimated in error correction form.

4.6 Regression Estimates

The estimation results are presented in Table 7 with the error correction term, the long-run and the short-run coefficients for the two models. Regression 1 presents the results of Model 1, and regression 2 provides the results of Model 2.

Table 7: Determinants of the Primary Balance

| Dependent variable: Primary balance to GDP | | |
|--------------------------------------------|----------------------|-------------------------|
| | Model 1 | Model 2 |
| Error Correction Term | -0.573*** (0.120) | -0.944*** (0.0674) |
| Long-run | | |
| Debt to GDP | 0.0480** (0.0193) | 0.0526*** (0.0128) |
| Expenditure gap to GDP | -0.650*** (0.142) | -0.584*** (0.0665) |
| Output gap to GDP | -4.161*** (1.299) | -2.353*** (0.629) |
| Current account balance to GDP | 0.447*** (0.087) | 0.325*** (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* (0.0222) | -0.0568*** (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] |

- Notes:** (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.

4.6 Interpretation and Discussion of Results

4.6.1 Diagnostic Tests

The diagnostic tests results are presented in Table 8.

Table 8: Diagnostic tests

| 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

There is no serial correlation in both models because the p-values from the Breusch-Godfrey¹⁷ test are significant. The models are homoscedastic since the results of the Breusch-Pagan test have p-values of 0.7511 and 0.5723, which are higher than the usual threshold of 0.05. The results for the ARCH effects test indicate that the errors are not autoregressive conditional heteroskedastic for both models since the p-values are significant at the 5 percent level of significance.

The study shows that the error term is normally distributed at the usual 5 percent threshold level for the two models. The study provides more evidence for normality using Kernel density graphs in the appendix. The study also finds that there is no omitted variable bias 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 models 1 and 2 are 3.27 and 2.62, respectively. Similarly, the individual variable VIF's are less than 10 as shown in the Appendix. The study

¹⁷ The Durbin Watson test is not valid in ARDL models because the lagged dependent variable is not strictly exogenous by construction (Kripfganz & Schneider, 2018).

finds evidence for parameter stability since the test statistic values for the recursive CUSUM and OLS CUSUM tests do not exceed the 5 percent critical levels. The recursive CUSUM and OLS CUSUM plots 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 as shown in the Appendix.

4.6.2 Empirical Results

The previous subsection presented the diagnostic test results that provide evidence that the estimated models meet the linear regression assumptions to ensure that the results are meaningful and reliable. It is against that evidence that this subsection presents the interpretation and discussion of the results in Table 7.

Debt to GDP

In the long-run, debt to GDP has a significant positive effect on the primary balance in both regressions. The debt to GDP coefficients are 0.0480 and 0.0526 for models 1 and 2, respectively; and have the expected sign. On average, the government has increased the primary balance to GDP by 0.05 percent in response to a 1 percent increase in the debt-GDP ratio, holding other factors constant.

This result suggests that the government's reaction to the rise in debt has been responsive and systematic after controlling for other factors in the long-run. Therefore, the government is increasing the primary surplus, or reducing the primary deficit, to ensure 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.

The short-run coefficient of the debt-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 1 percent increase in the 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. This result is in line with Amankwah et al. (2018). However, it varies from Asiama et al. (2014) because the short-run coefficient for the debt-GDP ratio was influenced by the 80 percent debt-GDP limit.

Expenditure Gap to GDP

The long-run coefficients of the expenditure gap to GDP are significantly negative at 1 percent for all regressions, and the parameter estimates are -0.650 and -0.584 for models 1 and 2, respectively. On average, a marginal increase in the expenditure gap to GDP 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.¹⁸ Conversely, the short-run coefficient is significantly negative at 10 percent. For model 1, this implies that a marginal increase in the expenditure gap to GDP decreases the primary balance by 0.2 percent.

This finding demonstrates the government's commitment to meet temporary increases in noninterest expenditures to guarantee security and close infrastructure gaps (through increased spending on security and infrastructure) by running deficits to finance these expenses. This finding is consistent with Jeong (2014) and Shastri et al. (2017).

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; and the parameter estimates are -4.161 and -2.353 for models 1 and 2, respectively. This implies that, on average, a marginal increase in the output gap leads to a 3.3 percent decrease in the primary balance, holding other factors constant. This suggests that fiscal policy is countercyclical such that the government responds to a recession through expansionary fiscal policy to boost the economy out of a contraction.

This result is in line with Amankwah et al. (2018) who found a negative relationship between primary balance and the output gap in Ghana. However, it is inconsistent with Pamungkas (2016) and Shastri et al. (2017) who find that fiscal policy is procyclical. The difference of this study from that of Pamungkas (2016) could be explained by the fact that he used nominal GDP to compute the output gap.

Current Account Balance to GDP

The current account balance to GDP coefficients are 0.447 and 0.325 for models 1 and 2, which implies that there is a significantly positive relationship with the primary balance in the long-run. On average, a minimal improvement in the current account balance results in a 0.4 percent increase in primary balance, holding other factors constant. This finding validates the twin deficit hypothesis for Uganda; thereby suggesting that increases in current account balance could lead to increases in primary balance. This result is consistent with Makau et al. (2018) and Checherita-Westphal and Ždársek (2017).

However, the evidence suggests that there is a significantly negative relationship (at 5 percent) between the current account balance and primary balance in the short-run in regression (2), which invalidates the twin deficit hypothesis. On

¹⁸The government is assumed to finance its expenditures through current taxation and public debt issue. This analysis ignores currency issuance. For example, to finance the unusually high expenditures on infrastructure projects such as roads and dams, the government has resorted to borrowing to fund their construction, thereby avoiding abnormally high tax rates.

average, this implies that a 1 percent increase in current account balance results in a 0.15 deterioration in primary balance, holding other factors constant. A 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).

Fiscal Rule

The fiscal rule has a negative and statistically significant effect on primary balance in the long-run in model 2, albeit with the unexpected sign. This suggests that the fiscal rules have not contributed to the strengthening of primary balance in Uganda. For example, the gross public debt ceiling of 50 percent of GDP in NPV terms is 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 found that fiscal rules tend to improve primary balance in some European countries. This difference may be because fiscal rules in European countries are more binding, hence promoting stronger fiscal discipline.

4.6.3 Goodness of Fit and Overall Significance of the Model

The R-squared for models 1 and 2 are 0.92 and 0.95, respectively; which implies (for model 1) that the independent variables explain about 92 percent of the variation in the dependent variable. The adjusted coefficient of the determination of 0.89 also indicates a good fit. The overall F-statistic for models 1 and 2 are 38.5 and 43.30, respectively. The statistically significant probability values suggest the rejection of the null hypothesis; therefore, the independent variables jointly influence primary balance in Uganda.

4.6.4 Error Correction Term

The error correction term estimates the speed of adjustment of primary balance towards the long-run equilibrium after short-run deviations. The coefficients of the error correction term for regressions (1) and (2) are negative.¹⁹ For instance, for regression (1), a coefficient of -0.573 suggests 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 primary balance and its determinants is stable.

5. Summary, Conclusion and Policy Recommendations

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 from 1981/82 to 2016/17. This is because the Government has embarked on several fiscal actions to ensure that the growing debt remains sustainable, yet there is limited empirical evidence on such actions. Drawing on

¹⁹ It is expected to be negative in order to restore the equilibrium.

the fiscal reaction function method, this study used the ARDL estimation technique to provide evidence on the short-run and long-run reaction of the primary balance to the rising debt. The study also accounts for the other non-debt factors that influence primary balance such as expenditure gap, output gap, current account balance, debt relief, fiscal rules, and elections. The results indicate that the variables significantly influence the fiscal policy actions of fiscal authorities.

5.2 Conclusion

An understanding of the government's past fiscal response to variations in its growing debt is crucial for providing guidance on how to react to the mounting pressure to borrow (which increases debt) due to increased (and expected) investments in infrastructure and other development priorities. The key finding is that, on average, the Ugandan government has positively adjusted primary balance (by raising primary surplus or reducing primary deficit) in response to increases in debt in the long-run.

The estimated positive response of primary balance to debt to GDP suggests that Uganda's debt was sustainable in the long-run for the period from 1981/82 to 2016/17, despite recurrent primary deficits. However, the response is still weak because it lies between 4.8 and 5.3 percent. The estimated negative primary balance response to debt 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 to ensure debt sustainability, the government should improve the primary balance by reducing wasteful expenditures through curbing the creation of more administrative units, eliminating corruption, and reducing fiscal slippages and supplementary budgets. Similarly, to check occurrences of perpetual borrowing, further surges in expenditures need to be matched by growths in revenues, thus the need to strengthen domestic revenue mobilisation by minimising tax exemptions and improving tax collection efficiency.

The government should borrow smartly and invest in productive projects that will enable the economy to achieve its growth potential, thereby closing the output gap. Borrowing smartly entails ensuring that the country does not borrow beyond its ability to repay. Investing in productive projects that spur economic growth would translate into increased government revenue to repay debt. Similarly, to prevent potential short-run insolvency, borrowing that is more concessional is preferred to non-concessional borrowing.²⁰

Since the current account balance is positively associated with primary balance in the long-run, economic policies designed to improve current account balance would lead to an improvement of primary balance. Such policies might include increasing

²⁰ Non-concessional borrowing poses serious problems for debt repayment in the short-run.

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.

The 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 the 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 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. This would entail 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. A select committee of parliamentarians and technocrats can carry out such evaluations. A commitment to debt sustainability by fiscal authorities will guarantee that the current good fiscal record suggested by this study is maintained in the future.

5.4 Areas for Further Research

Future panel analysis examining the East African Community (EAC) governments' responses to growing public debt would be ideal because the EAC countries intend to fulfil the EAMU convergence criteria by 2024 through the implementation of fiscal rules. This detailed analysis could consider examining 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 our knowledge, none has considered all EAC countries in one panel.

Also, prospective studies could examine the relationship between fiscal (or primary) balance and current account balance (twin deficit hypothesis) in depth. Such studies could provide evidence on: (i) the various channels through which current account balance affects fiscal or primary balance; (ii) the various channels through which fiscal or primary balance affects 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 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.

References

- Alesina, A., N. Roubini, & G.D. Cohen. 1997. *Political Cycles and the Macroeconomy*. Cambridge, Massachusetts: The Massachusetts Institute of Technology Press.
- Amankwah, G., G. Ofori-Abebrese, & K. Kamasa. 2018. An Empirical Analysis of the Sustainability of Public Debt in Ghana. *Theoretical Economics Letters*, 8: 2038–54.
- Asiama, J., N. Akosah & E. Owusu-Afriyie. 2014. *An Assessment of Fiscal Sustainability in Ghana*. Accra: Bank of Ghana, Working Paper No.9.
- Azam, J.P., A. Fosu, & S.N. Ndung'u. 2002. *Explaining Slow Growth in Africa*. Oxford: Blackwell Publishers African Development Bank.
- Bakarr, T.A. 2014. Fiscal Deficits and Current Account Imbalances: Evidence from Sierra Leone. *International Journal of Business and Social Science*, 5(8).
- Baldi, G. & K. Staehr. 2013. The European Debt Crisis and Fiscal Reaction Functions in Europe 2000–2014. *International Economics and Economic Policy*, 13(2): 297–317.
- Barbier-Gauchard, A. & N. Mazuy. 2018. Country-Specific Fiscal Reaction Functions: What Lessons for EMU? *Document De Travail*(28).
- Barro, R. 1979. On the Determinants of the Public Debt. *Journal of Political Economy*, 85(5): 940–971.
- . 1986. U.S. Deficits Since World War 1. *Scandinavian Journal of Economics*, 88(1): 195–222.
- Baxter, M. & R.G. King, 1999. Measuring Business Cycles: Approximate Band-Pass Filters for Economic Time Series. *Review of Economics and Statistics*, 81: 575–593.
- Berti, K., E. Colesnic, C. Desponts, S. Pamies & E. Sail. 2016. *Fiscal Reaction Functions for European Union Countries*. Luxembourg: European Commission, Discussion Paper No.28.
- Blanchard, O. 2017. *Macroeconomics*. 7th Ed. Boston: Pearson Education Limited.
- Bohn, H. 1998. The Behaviour of U.S. Public Debt and Deficits. *Quarterly Journal of Economics*, 113(3): 949–63.
- . 2008. The Sustainability of Fiscal Policy in the United States. In R.Neck & J.-E. Sturm. *Sustainability of Public Debt*. Cambridge, Massachusetts: The Massachusetts Institute of Technology Press. Ch. 2, pp.15–49.
- . 2011. The Economic Consequences of Rising U.S. Government Debt: Privileges at Risk. *Public Finance Analysis*, 67(3): 282 - 302.
- Bank of Uganda (BoU). 1983 - 2018. *Annual Reports (Various Reports)*. Kampala: BoU.
- . 1999. *Annual Report 1998/99*. Kampala: Bank of Uganda.
- Breusch, T.S. & A.R. Pagan. 1979. A Simple Test for Heteroscedasticity and Random Coefficient Variation. *Econometrica*, 47: 1287–1294.
- Buiter, W.H. 1985. A Guide to Public Sector Debt and Deficits. *Economic Policy*, 1(1): 13–61.
- Burger, P., I. Stuart, C. Jooste, & A. Cuevas. 2012. Fiscal Sustainability and the Fiscal Reaction Function for South Africa: Assessment of the Past and Future Policy Applications. *South African Journal of Economics*, 80(2): 209–27.

- Burnside, C. 2005. *Fiscal Sustainability in Theory and Practice: A Handbook*. Washington, D.C: The World Bank.
- Celasun, O., X. Debrun & J.D. Ostry. 2006. *Primary Surplus Behaviour and Risks to Fiscal Sustainability in Emerging Market Countries: A "Fan-Chart" Approach*. Washington D.C: International Monetary Fund.
- Chatterjee, S. & A.S. Hadi. 2012. *Regression Analysis by Example*. 4th Ed. Hoboken, New Jersey: John Wiley. & Sons Inc.
- Checherita-Westphal, C. & V. Ždársek. 2017. *Fiscal Reaction Function and Fiscal Fatigue: Evidence for the Euro Area*. Frankfurt Am Main: European Central Bank, Working Paper No. 2036.
- Clemente, J., A. Montanes, & M. Reyes. 1998. Testing for a Unit Root in Variables With a Double Change in the Mean. *Economic Letters*, 59(2): 175–82.
- D'Agostino, R.B., A. Belanger & R.J. D'Agostino. 1990. A Suggestion for Using Powerful and Informative Tests of Normality. *American Statistician*, 44(4): 316–21.
- Debrun, X., O. Celasun & J.D. Ostry. 2006. Debt Sustainability in Emerging Market Economies: A "Fan-Chart Approach".
- D'Erasmo, P., E.G. Mendoza & J. Zhang, 2016. What Is a Sustainable Public Debt? *Handbook of Macroeconomics*, 2.
- Dickey, D.A. & W.A. Fuller, 1979. Distribution of the Estimators for Autoregressive Time Series With a Unit Root. *Journal of the American Statistical Association*, 74: 427–431.
- Diogo, L., N. Birdsall, N. Okonjo-Iweala, N. Woods & M. Robinson. 2017. *Reinvigorating African Concessional Finance*. Abidjan: African Development Bank Group's Policy Innovation Lab.
- Durbin, J. & G.S. Watson, 1971. Testing for Serial Correlation in Least Squares Regression. III. *Biometrika*, 58: 1–19.
- Ejalu, R. 2016. *Fiscal Sustainability and Monetary Policy in Uganda and Neighbouring Countries*. Tokyo: Faculty of National Graduate Institute for Policy Studies (GRIPS).
- Engle, R.F. 1982. Autoregressive Conditional Heteroskedasticity With Estimates of the Variance of United Kingdom Inflation. *Econometrica*, 50: 987–1007.
- Engle, R.F. & C.W.J. Granger. 1987. Cointegration and Error Correction Representation, Estimation and Testing. *Econometrica*, 55(2): 251–76.
- Ferda, H. & Kasim, E. 2013. Testing Twin Deficits and Savings-Investment Nexus in Turkey. In *15th Annual European Trade Study Group (ETSG) Conference*. Birmingham, UK. 2013.
- Galli, E. & F. Padovano. 2008. Sustainability and Determinants of Italian Public Deficits Before and After Maastricht. in Neck, R. & Sturm, J.-E. *Sustainability of Public Debt*. Cambridge, Massachusetts: The Massachusetts Institute of Technology Press. Pp.51–83.
- Ghatak, S. & J.R. Sanchez-Fung. 2007. Is Fiscal Policy Sustainable in Developing Countries? *Review of Development Economics*, 11(3): 518–530.
- Ghosh, A.R., J.I. Kim, E.G. Mendoza, J.D. Ostry & M.S. Qureshi. 2013. Fiscal Fatigue, Fiscal Space and Debt Sustainability in Advanced Economies. *Economic Journal, Royal Economic Society*, 0: F4–F30.

- Greiner, A. & B. Fincke. 2015. *Public Debt, Sustainability and Economic Growth*. Switzerland: Springer International Publishing.
- Hamilton, J.D. & M.A. Flavin. 1986. On the Limitation of Government Borrowing: A Framework for Empirical Testing. *American Economic Review*, 76: 808–19.
- Hisali, E. & A. Guloba. 2013. Fiscal Policy Consistency and Its Implications for Macroeconomic Aggregates: The Case of Uganda. *Journal of International Development*, 25: 474–501.
- Hodrick, R.J. & E.C. Prescott. 1997. Postwar U.S. Business Cycles: An Empirical Investigation. *Journal of Money, Credit, and Banking*, 29: 1–16.
- International Monetary Fund (IMF). 2015. *Fifth Review Under the Policy Support Instrument and Request for Waiver: An Assessment Criterion and Modification of Assessment Criteria - Debt Sustainability Analysis*. Washington, D.C: International Monetary Fund.
- . 2016a. *Seventh Review Under the Policy Support Instrument - Debt Sustainability Analysis*. Washington, D.C: International Monetary Fund.
- . 2016b. *IMF Fiscal Rules Dataset*. Washington, D.C: International Monetary Fund.
- . 2017. *Debt Sustainability Analysis*. [Online] Available at <https://www.imf.org/external/pubs/ft/dsa/> [accessed 20 July 2019].
- Jarque, C.M. & A.K. Bera. 1987. A Test for Normality of Observations and Regression Residuals. *International Statistical Review*, 55(2): 163–172.
- Jeong, J.K. 2014. *Analysing the Effects of Fiscal Policy and Assessing Its Sustainability* (Published PhD dissertation). Birmingham: University of Birmingham.
- Johansen, S. 1991. Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. *Econometrica*, 59: 1551–1580.
- Kripfganz, S. & D.C. Schneider. 2018. ARDL: Estimating Autoregressive Distributed Lag and Equilibrium Correction Models. in *London Stata Conference*. London. 2018.
- Kripfganz, S. & D.C. Schneider. 2019. *Response Surface Regressions for Critical Value Bounds and Approximate P-Values in Equilibrium Correction Models*. Exeter: University of Exeter.
- Kumar, M. & T. Ter-Minassian. 2007. Fiscal Discipline: Key Issues and Overview. In *Promoting Fiscal Discipline*. Washington, DC: International Monetary Fund.
- Kuteesa, F., E. Tumusiime-Mutebile, A. Whitworth & T. Williamson. 2010. *Uganda's Economic Reforms: Insider Accounts*. Oxford: Oxford University Press.
- Ley, E. 2010. *Fiscal (And External) Sustainability*. Munich: Munich Personal Repec Archive, Paper No. 13693.
- Luporini, V. 2013. Sustainability of Brazilian Fiscal Policy, Once Again: Corrective Policy Response Over Time. *Estud. Econ*, 45(2): 437–58.
- Makau, J., K. Ocharo & S. Njuru. 2018. Fiscal Policy and Public Debt in Kenya. *IOSR Journal of Economics and Finance*, 9(5): 12–24.
- Mauro, P., Romeu, R, Binder, A. & Zaman, A. 2013. *A Modern History of Fiscal Prudence and Profligacy*. Working Paper. IMF.
- Mendoza, E.G. & J.D. Ostry. 2008. International Evidence on Fiscal Solvency: Is Fiscal Policy Responsible? *Journal of Monetary Economics*, 55(6): 1081–93.

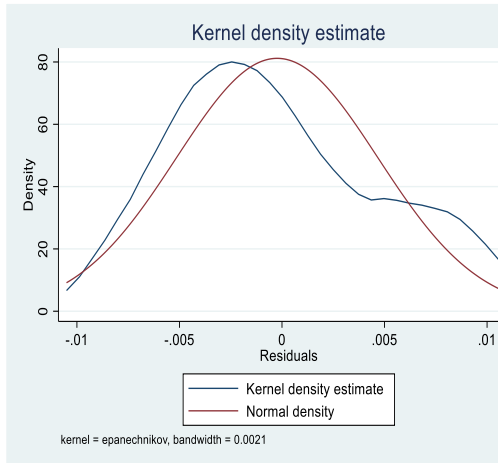
- Ministry of Finance, Planning and Economic Development (MoFPED). 1983-2018. *Background to the Budget (Various Reports)*. Kampala: Ministry of Finance Planning and Economic Development.
- . 2007. *Debt Strategy*. Kampala: Ministry of Finance, Planning and Economic Development.
- . 2013. *Public Debt Management Framework*. Kampala: Ministry of Finance, Planning and Economic Development.
- . 2016a. *National Budget Framework Paper: FY 2017/18 - 2021/22*. Kampala: Ministry of Finance Planning and Economic Development.
- . 2016b. *Debt Sustainability Analysis Report 2015/16*. Kampala: Ministry of Finance Planning and Economic Development.
- MoFPED. —. Planning and Economic Development.
- . 2017b. *Debt Sustainability Analysis Report 2016/17*. Kampala: Ministry of Finance Planning and Economic Development.
- . 2017c. *National Budget Framework Paper, FY 2018/19 - FY 2022/23*. Kampala: Ministry of Finance Planning and Economic Development.
- . 2018. *Medium Term Debt Management Strategy 2018/19 - 2021/22*. Kampala: Ministry of Finance Planning and Economic Development.
- Mugabi, J.B. 2004. Sustainability of Fiscal Deficits: A Case Study of Uganda, 1988 - 2003. Master's Dissertation, Makerere University.
- Mukhtar, T., M. Zakaria & M. Ahmed. 2007. An Empirical Investigation for the Twin Deficits Hypothesis in Pakistan. *Journal of Economics Cooperation*, 28(4): 63–80.
- Murandafu, C.N. 2007. The Impact of the HIPC Initiative on the Debt Crisis in Africa: A Case of Uganda. Dissertation. Nairobi: University of Nairobi.
- Mustapha, S. & P. Annalisa. 2018. Africa's Rising Debt: How to Avoid a New Crisis. *ODI Briefing Note*.
- Muvawala, J. 1998. Policies Towards External Debt Sustainability in Uganda. Master's dissertation, Makerere University.
- Narayan, K. 2005. The Saving and Investment Nexus for China: Evidence from Cointegration Tests. *Applied Economics*, 37(17): 1979–1990.
- Nickel, C. & I. Vansteenkiste. 2008. *Fiscal Policies, the Current Account and the Ricardian Equivalence*. Frankfurt am Main: European Central Bank Working Paper No. 935.
- Pamungkas, R.H. 2016. Estimation of Indonesia's Fiscal Reaction Function. *Kajian Ekonomi and Keuangan*, 2(1).
- Pesaran, M.H., Y. Shin & R. Smith. 2001. Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics*, 16(3): 289–326.
- Phillips, P.C.B. & P. Perron: 1988. Testing for a Unit Root in Time Series Regression. *Biometrika*, 75: 335–346.
- Ploberger, W. & W. Kramer. 1992. The CUSUM Test With OLS Residuals. *Econometrica*, 60(2): 271–85.
- Quintos, C.E. 1995. Sustainability of the Deficit Process With Structural Shifts. *Journal of Business. & Economic Statistics*, 13(4): 409–417.

- Ramsey, J.B. 1969. Tests for Specification Errors in Classical Linear Least-Squares Regression Analysis. *Journal of the Royal Statistical Society, Series B*, 31: 350–371.
- Ravn, M.O. & H. Uhlig. 2002. On Adjusting the Hodrick-Prescott Filter for the Frequency of Observations. *The Review of Economics and Statistics*, 84(2): 371–76.
- Reinhart, C.M. & K.S. Rogoff. 2011. The Forgotten History of Domestic Debt. *Economic Journal*, 121(552): 319–50.
- Rogoff, K. 1990. Equilibrium Political Budget Cycles. *American Economic Review*, 80: 21–36.
- Romer, D. 1996. *Advanced Macroeconomics*. Columbus-USA: McGraw Hill.
- Sakyi, D. & E.V.O. Opoku. 2016. *The Twin Deficits Hypothesis in Developing Countries: Empirical Evidence for Ghana*. International Growth Centre Working Paper.
- Shastri, S., A.K. Giri & G. Mohapatra. 2017. An Empirical Assessment of Fiscal Sustainability for Selected South Asian Economies. *Theoretical and Applied Economics*, XXIV (1(610)): 163–178.
- Sims, C. 1994. A Simple Model for Study of the Determination of the Price Level and The. *Economic Theory*, 4(3): 381–99.
- Sobrinho, C.R. 2013. The Twin Deficits Hypothesis and Reverse Causality: A Short-Run Analysis of Peru. *Journal of Economics, Finance and Administrative Science*, 18(34): 9–15.
- Summers, L.H. 1988. Tax Policy and International Competitiveness. in Frenkel, J.A. *International Aspects of Fiscal Policies*. Chicago: University of Chicago Press. Pp.349 - 386.
- Suruma, E.S. 2014. *Advancing the Ugandan Economy: A Personal Account*. Washington, DC: The Brookings Institution.
- Tanzi, V. & I.M. Blejer. 1988. Public Debt and Fiscal Policy in Developing Countries. In J. K. Arrow & J. M. Boskin. *The Economics of Public Debt: Proceedings of a Conference Held by the International Economic Association at Stanford*. Hampshire: The Macmillan Press LTD. pp.230 - 263.
- Teunissen, J.J. & A. Akkerman. 2004. *HIPC Debt Relief: Myths and Reality*. Hague: FONDAD.
- Trehan, B. & C. Walsh. 1988. Common Trends, the Government's Budget Constraint, and Revenue Smoothing. *Journal of Economic Dynamics and Control*, 12(2–3): 425–44.
- United Nations Economic Commission for Africa (UNECA). 2018. *The East African Monetary Union: Ready or Not?* Kigali: United Nations Economic Commission for Africa.
- Wamala, N.P. 1994. *The Sustainability of the Public Sector Deficit in Uganda. 1970 - 1993(Unpublished Master's Dissertation)*. Kampala: Makerere University.
- Wilcox, D.W. 1989. The Sustainability of Government Deficits: Implications of the Present-Value Borrowing Constraint. *Journal of Money, Credit and Banking*, 21: 291–306.
- World Bank. 2018. *World Development Indicators*. Washington, D.C: World Bank.
- Wyplasz, C. 2007. *Debt Sustainability Assessment: The IMF Approach and Alternatives*.
- Zivot, E. & D.W.K. Andrews. 1992. Further Evidence on the Great Crash, the Oil Price Shock, and the Unit-Root Hypothesis. *Journal of Business and Economic Statistics*, 10: 251–70.

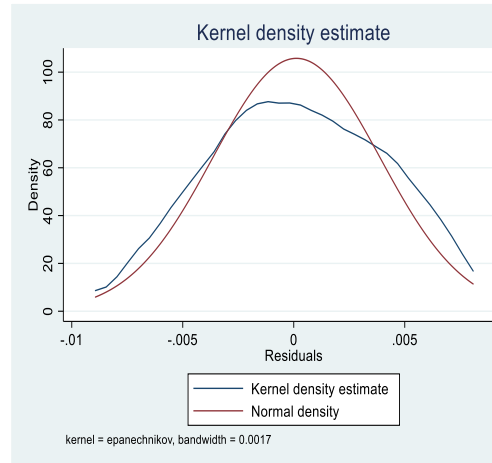
APPENDICES

Appendix 1: Kernel Density Graphs

Kernel Density graph (Model 1)



Kernel Density (Model 2)



Appendix 2: Variance Inflation Factors

Variance Inflation Factors (Model 1)

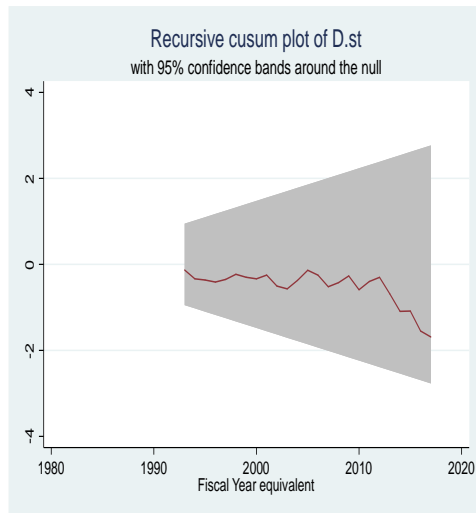
| Variable | VIF | 1/VIF |
|----------|------|----------|
| GVAR | | |
| D1. | 6.45 | 0.155131 |
| --. | 4.44 | 0.225332 |
| st | | |
| L1. | 3.73 | 0.268326 |
| cab | 3.26 | 0.306294 |
| YVAR | 1.87 | 0.536013 |
| dt | | |
| --. | 1.73 | 0.579415 |
| D1. | 1.41 | 0.711244 |
| Mean VIF | 3.27 | |

Variance Inflation Factors (Model 2)

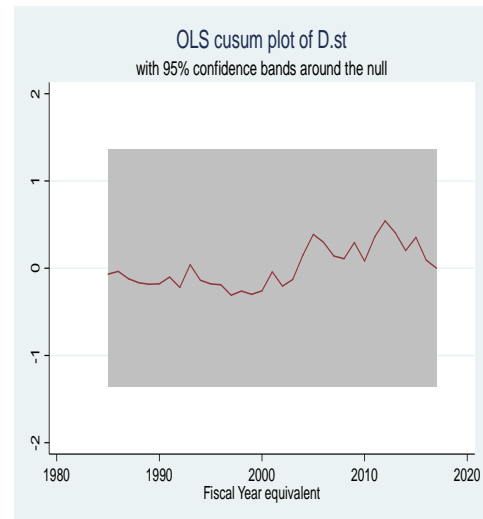
| Variable | VIF | 1/VIF |
|----------|------|----------|
| cab | 4.93 | 0.202891 |
| dt | 4.70 | 0.212863 |
| btrelief | 3.32 | 0.301302 |
| scalrule | 2.88 | 0.347030 |
| YVAR | 2.28 | 0.439422 |
| st | | |
| L1. | 1.85 | 0.539991 |
| dt | | |
| D1. | 1.81 | 0.553422 |
| cab | | |
| D1. | 1.65 | 0.606369 |
| election | 1.63 | 0.612183 |
| GVAR | 1.12 | 0.892980 |
| Mean VIF | 2.62 | |

Appendix 3: Recursive CUSUM Plots and OLS CUSUM Plots

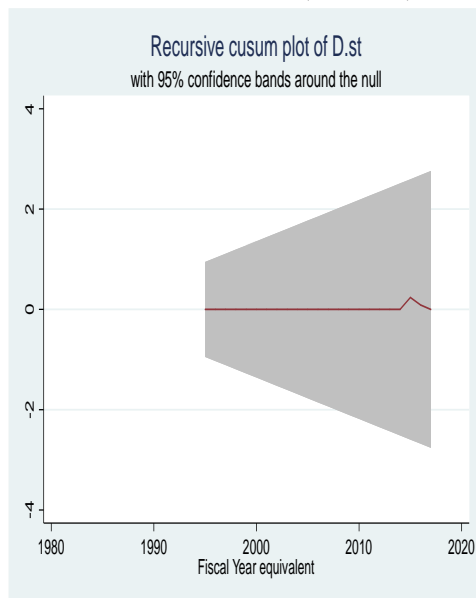
Recursive CUSUM plot (Model 1)



OLS CUSUM plot (Model 1)



Recursive CUSUM Plot (Model 2)



OLS CUSUM Plot (Model 2)

