

Fiscal Deficits Financing: Implications for Monetary Policy Formulation in Uganda

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Abstract

The relationship among budget deficit, money creation and inflation in Uganda is analyzed using a triangulation of Vector Error Correction model (VECM) and pair-wise Engel-Granger non-causality test techniques over the period 1999Q4 - 2012Q3. Results suggest that fiscal deficits do not seem to necessarily trigger inflation in the short-run, but in the long-run. Also, unidirectional causality running from inflation to the fiscal deficit, from money supply to the fiscal deficit, and a feedback causal effect between money supply and inflation in the short-run are found. Thus, in the short-term, contractionary monetary policy to reduce inflation in Uganda need not focus on budget deficit reduction, but rather on other macroeconomic determinants of inflation, and inflation should be contained to mitigate its effect on the budget deficit.

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1 Introduction

Understanding the inter-relations among fiscal deficits, money supply and inflation has been a subject of continuous debate in both developed and developing countries. However, results of empirical evidence on the linkages between fiscal deficit and inflation seems to be mixed, particularly evidence pertaining to whether or not fiscal deficits are inflationary remains an important question for many developing countries.

Over the years, Uganda has run a budget deficit as a result of low revenue mobilization compared to the increasing expenditure requirements. In 2012, total revenue was at 17.2

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percent of GDP compared to the expenditure requirements of 20.6 percent of GDP in the same period (Background to the budget, 2011/12). Until recently, following a drastic reduction in external grants—a consequence of the global financial crisis, this budget deficit has mainly been financed by externally mobilised funds. Table 1 highlights the trend of a few selected indicators of fiscal operations.

Table 1: A summary of Selected Indicators of Central Government Operations (% of GDP)

	2005	2006	2007	2008	2009	2010	2011	2012
Total Revenue	19.5	17.6	18.5	15.6	15.1	14.6	16.5	17.2
Domestic Revenue	11.7	11.6	12.5	12.7	12.4	12.0	13.5	14.8
Total Expenditure	20.5	19.4	18.6	18.1	17.4	16.0	22.7	20.6
Total Financing	1.0	1.8	0.1	2.4	2.3	1.4	6.2	3.4
External Financing (Net)	1.7	1.2	1.7	3.4	1.3	2.4	2.4	1.4
Domestic Financing (Net)	-1.3	1.6	-1.7	-1.2	1.5	-1.3	3.9	2.1
Overall Fiscal Bal. (excl. Grants)	-8.8	-7.8	-6.1	-5.4	-5.0	-4.1	-9.2	-5.7
Overall Fiscal Bal. (incl. Grants)	-1.0	-1.8	-0.1	-2.5	-2.3	-1.4	-6.2	-3.4

Source: Ministry of finance planning and economic development and author's calculations

The challenge of a widening fiscal deficit (excluding grants) is expected to increase in the current fiscal year (2013/14), with a projection of close to 6.5 per cent of GDP, up from 5.7 per cent of GDP in the previous fiscal year (Background to the budget, 2013/14: 76). Simultaneously, the government has planned massive investments to meet the requirements underlying the National Development Plan to take advantage of the oil discoveries through constructing an oil refinery. High expenditure requirements alongside a constrained resource envelope, following anticipated sharp decline in donor budget support grants³, has compelled the government to resort to non-traditional sources to finance the budget deficit: the issuance of government securities in domestic markets and a government drawdown of its savings with the central bank (Background to the budget, 2013/14).

Macroeconomic theory suggests that persistently high budget deficits give rise to inflation. In both the Keynesian and Monetarist frameworks, deficits tend to be inflationary. This is because, in the former, fiscal deficits stimulate aggregate demand, while in the latter, when monetization takes place, it will lead to an increase in money supply, and *ceteris paribus*, increase the rate of inflation in the long-run (Gupta, 1992). Whether the aforementioned financing options will trigger inflation remains a subject of speculation. Ideally, a positive shock to government expenditure should result in a supply side response. However, if the increase in government expenditure generates demand pressure, this may cause inflationary tendencies. Thus, the question we address, using a

³Budget support grants are estimated to decline by 84 per cent during FY2013/14 as a result of a lack of willingness by most development partners to commit to budget support in the wake of various governance challenges.

triangulation of Vector Error Correction model (VECM) and Granger non-causality approaches, is whether high deficits are invariably associated with inflation in Uganda. More specifically, the paper examines the long-run relationship between the budget deficits, and inflation, money supply and the nominal exchange rate, and detects the direction of causality between these variables. Our empirical results for the sample period analyzed suggest that fiscal deficits do not seem to necessarily trigger inflation in the short-run, but in the long-run.

The rest of the paper is organised as follows; Section 2 discusses the theoretical model while the empirical literature is reviewed in Section 3. The econometric methodology is presented in Section 4, while the estimation results and conclusion are drawn in Sections 5 and 6 respectively.

2 Theoretical Model

The theory behind the linkages between budget deficits and inflation may be explained based on the Keynesian and the monetarism approaches. Whereas the Keynesian view states that budget deficits are inflationary because they stimulate aggregate demand, Monetarists argue that budget deficits are inflationary because they cause money supply growth. Thus, how fiscal deficits are financed is likely to be crucial in determining the deficit-inflation nexus. For the case of a developing country like Uganda, the main sources of budget financing, excluding grants, are summarized in equation (2.1). Grants are excluded because they are not reliable sources of government revenue; grants solely depend on donor discretion, and may, as a result, present potential risks of financial vulnerability.

$$g_t + \frac{D_{t-1}}{p_t}(1 + r_{t-1}) = \tau_t + \frac{m_t - m_{t-1}}{p_t} + \frac{D_t}{p_t} + \Delta R \quad (2.1)$$

Where, g_t is total government expenditure, $\frac{D_{t-1}}{p_t}(1 + r_{t-1})$ is the discounted value of the real stock of accumulated government debt in the previous period with maturity value in the current period (t), τ_t is tax revenue, $\frac{m_t - m_{t-1}}{p_t}$ is the change in money supply (or seigniorage revenue), $\frac{D_t}{p_t}$ captures domestic and external borrowing in the current period, while ΔR is the change in reserves.

Given the purpose at hand, it is reasonable to re-arrange equation (1.1) in terms of the fiscal deficit to become:

$$g_t - \tau_t + \frac{D_{t-1}}{p_t}(1 + r_{t-1}) = \left(\frac{m_t - m_{t-1}}{p_t}\right) + \frac{D_t}{p_t} + \Delta R \quad (2.2)$$

Where the L.H.S is the total fiscal deficit; it comprises the budget deficit ($g_t - \tau_t$), excluding statutory external and domestic debt repayments and the outstanding real government debt:

$$\frac{D_{t-1}}{p_t}(1 + r_{t-1}).$$

The R.H.S comprises, in part, non-traditional approaches to financing the fiscal deficit, i.e. the issuance of government debt instruments in domestic markets and the drawdown of reserves, and changes in the money supply.

From the R.H.S of Equation (2.2) we may adopt Fisher's definition of seigniorage (S): as the amount of new money created in the economy by the government (Fischer, 1989). Therefore, based on this definition,

$$S = \left(\frac{m_t - m_{t-1}}{p_t}\right) \quad (2.3)$$

Expanding S and introducing the term $\left(-\frac{m_{t-1}}{p_{t-1}} + \frac{m_{t-1}}{p_{t-1}}\right)$, equation (2.3) can be re-written as

$$S = \Delta m + \frac{p_t(m_{t-1}) - p_{t-1}(m_{t-1})}{p_t(p_{t-1})} \quad (2.4)$$

If we define $\pi = \frac{(p_t - p_{t-1})}{p_{t-1}}$ and $m = \frac{M_{t-1}}{p_t}$, then equation (2.4) can be decomposed into pure seigniorage and the inflation tax base:

$$S = \Delta m + \pi m \quad (2.5)$$

Where, Δm is pure seigniorage and πm is the inflation tax base.

Substituting equation (2.5) into (2.2), we derived equation (2.6)

$$\pi = \left\{ \frac{\left[g_t - \tau_t + \frac{D_{t-1}}{p_t}(1 + r_{t-1}) \right] - \left[\frac{D_t}{p_t} + \Delta m + \Delta R \right]}{m} \right\} \quad (2.6)$$

Letting the numerator be denominated by FD, i.e. the fiscal deficit, we can easily express inflation as a function of the fiscal deficit:

$$\pi = f\left(\frac{FD}{m}\right) \quad (2.7)$$

This specification follows the one used by Catao and Terrones (2003), and is widely supported in the literature over the conventional scaling of the fiscal deficit to GDP. According to Catao and Terrones (2003), scaling the fiscal deficit by money supply is theoretically sound, and would measure the inflation tax base and capture the non-linearity factor in the specification shown in equation (2.7). However, the Ndanshau (2010) application on Tanzanian data suggests that there is little to be gained by scaling the fiscal deficit by money supply when compared to the scaling fiscal deficit by GDP, as this yields more-or-less similar results. We have adopted a conventional measure, scaling the fiscal deficit by GDP.

3 Empirical Literature

There has been a great army of literature on the relationship between budget deficits and inflation for both developed and developing countries. However, evidence from the empirical literature is mixed. Catao and Terrones (2003) find a strong linkage between inflation and fiscal deficits in emerging economies (i.e. economies characterized by episodes of high inflation rates), which holds less strongly in developed countries. They argue that budget deficits result in higher inflation rates for countries where the inflation tax base is smaller and that less impact is felt in countries that have higher levels of monetization (a larger inflation tax base). A similar result is found by Lin and Chu (2013), in their most recent study on a panel of 91 countries. They found a strong relationship between the budget deficit and inflation in countries that experienced high inflation and weak relationship in countries that experienced lower inflation. A study by Cheah and Baharom (2011) on developing Asian countries reveals that, in the long run, budget deficits are inflationary in developing countries. This is considered to be because many developing countries rely on the Central Banks to finance their deficits through printing money, which may result in greater excess aggregate demand than in increased aggregate supply (Ekanayake, 2012)

In Sri-Lanka, Ekanayake (2012) uncovered a weak relationship between the budget deficits and inflation. Interestingly, the relationship becomes stronger as the proportion of public expenditures allotted to wages increases. This implies that the inflation–deficit relationship is not only a monetary phenomenon, but that public sector wage expenditure is also influential in linking inflation and fiscal deficits. He further suggests that in line with the existing literature, the relationship between budget deficits and inflation is strongest in high income countries and that there also exists a significant relationship between budget deficits and inflation in countries that experience moderately high-inflation.

The empirical evidence in Pakistan is mixed; studies by Shabbir and Ahmed (1994) and Agha and Khan (2006) reveal a positive and significant relationship between budget deficits and inflation, and an indirect relationship between budget deficits and money supply. They further argue that inflation is not only linked to budget deficits, but that the deficit is primarily funded through bank borrowing and ultimately seigniorage. However, more recent findings by Mukhtar and Zakaria (2010) reveal a different picture for Pakistan; they find no significant long-run relationship between inflation and budget deficits. Instead, inflation is related to the money supply, yet no causal relationship is found between the money supply and budget deficits. This is in line with Tiwari *et al*, (2011) finding that there is no significant relationship between fiscal deficits and inflation apart from the indirect relationship stemming from the money supply.

Furthermore, evidence surrounding the direction of causation between budget deficits and inflation is also mixed. In Tanzania, Ndanshau (2012) found no causal effect from budget deficits upon inflation; instead he uncovered Granger causality from inflation to budget deficits. On the other hand, in Nigeria Oladipo and Akimbobola (2011) found a unidirectional causation from budget deficits to inflation. Their results further showed that budget deficits affect inflation both directly and indirectly through fluctuations in the exchange rate.

This paper contributes to the literature examining the budget deficit-inflation relationship on one country, Uganda, using quarterly data for the period 1999Q3 – 2012Q3. The choice of the study period reflects data availability. A triangulation of Vector Error

Correction model (VECM) and Granger non-causality approaches are employed to investigate the dynamic interrelationship between the budget deficit and inflation; and to address the questions of direction of causality between budget deficits and inflation; money supply and inflation; and money supply and budget deficits in Uganda. A main novelty of this paper, in the context of the budget deficit-inflation nexus literature is in the use of a rich dynamic approach that allows the short-run adjustments and long-run equilibrium relationships to differ. As noted in Catao and Terrones (2003), this is crucial because fiscal deficits need not lead to higher seigniorage in the short-run as governments can temporarily finance budget deficits with borrowing.

4 Econometric Model

4.1 Vector Autoregressive Framework

Based on the Johansen (1988) approach, Vector autoregressive (VAR) methods have become the 'tool of choice' for estimation and testing of multivariate relationships among non-stationary data in much of time series macro-econometrics. Accordingly, in the current application, we allow for a rich dynamics in the way inflation adjusts to changes in the fiscal deficit or to any other variable by nesting the empirical analysis in a VAR frame-work (Hendry and Doornik, 2001: 129). In its unrestricted error correction representation, the VAR is of the form:

$$\Delta \mathbf{x}_t = \Pi \mathbf{x}_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta \mathbf{x}_{t-i} + \Phi \mathbf{d}_t + \boldsymbol{\varepsilon}_t \quad (4.1)$$

Where \mathbf{x}_t is a vector of endogenous variables $\Gamma_i = (\mathbf{I} - \mathbf{A}_1 - \mathbf{A}_2 - \dots - \mathbf{A}_i)$ and $\Pi = -(\mathbf{I} - \mathbf{A}_1 - \mathbf{A}_2 - \dots - \mathbf{A}_k)$ comprise coefficients to be estimated by Johansen's (1988) maximum likelihood procedure using a $(t = 1, \dots, T)$ sample of data. $i = 1, \dots, k - 1$ is the number of lags included in the system, Δ is a first difference operator, \mathbf{d}_t is a $(m \times 1)$ vector of m deterministic terms (constants and linear trends), Φ is a $(p \times p)$ matrix of coefficients, and $\boldsymbol{\varepsilon}_t \sim \text{iidN}(\mathbf{0}, \Sigma)$ is a $(p \times 1)$ vector of errors with zero mean, i.e. $E(\boldsymbol{\varepsilon}_t) = 0$, a time-invariant positive definite covariance matrix Σ , and are serially uncorrelated, i.e. $E(\boldsymbol{\varepsilon}_t \boldsymbol{\varepsilon}'_{t-k}) = 0$ for $k \neq 0$.

If at least some of the variables in \mathbf{x}_t are unit-root non-stationary then Π in (4.1) has reduced rank, which can be formulated as the hypothesis of cointegration:

$$\Pi = \boldsymbol{\alpha} \boldsymbol{\beta}' \quad (4.2)$$

where $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$ are $n \times r$ coefficient matrices and r is the rank of Π corresponding to the number of linearly independent relationships among the variables in \mathbf{x}_t . The advantage of this parameterization is in the interpretation of the coefficients. The effect of levels is isolated in the matrix $\boldsymbol{\alpha} \boldsymbol{\beta}'$ while Γ_i describes the short-run dynamics of the process, delivering a neat economic interpretation to the vector error correction model of (4.1).

The r columns of β represents the co-integrating vectors that quantify the ‘long-run’ (or equilibrium) relationships among the variables in the system and the r columns of error correction coefficients of α load deviations from equilibrium into Δx_t for correction, denoting the speed of adjustment from disequilibrium to ensure equilibrium is maintained. Finding the existence of cointegration is the same as finding the rank (r) of the Π matrix. If it has full rank, $r = n$, and there are n cointegrating relationships, that is, all variables are potentially $I(0)$.

4.2 Granger Non-causality Test

Determining in the above that variables are cointegrated implies there must be Granger causality in at least one direction. On this account, and following Granger (1969), y is said to be Granger-caused by x if x helps in the prediction of y or if the coefficients on the lagged x 's are statistically significant in y and vice versa. Thus, the Granger-causality model is specified as follows:

$$\Delta y_t = \vartheta_1 + \sum_{i=1}^n \alpha_{11} \Delta y_{t-n} + \sum_{i=1}^n \beta_{12} \Delta x_{t-n} + \varepsilon_{1t} \tag{4.3}$$

$$\Delta x_t = \vartheta_2 + \sum_{i=1}^n \alpha_{21} \Delta y_{t-n} + \sum_{i=1}^n \beta_{22} \Delta x_{t-n} + \varepsilon_{2t} \tag{4.4}$$

Where n is the maximum lag-length; and ε_{1t} and ε_{2t} are additive stochastic error terms, which are by assumption normally distributed with a zero mean and a constant variance. In light of equations (4.3) and (4.4), we can deduce two testable hypotheses:

- i) that $\sum \beta_{12} = 0$ while $\sum \alpha_{11} \neq 0$, i.e. x does not Granger-cause y (no causality from x to y)
- ii) that $\sum \beta_{22} \neq 0$ while $\sum \alpha_{21} = 0$, i.e. y does not Granger-cause x (no causality from y to x)

Acceptance of either hypotheses would suggest the existence of unidirectional causality between x and y , and feedback between x and y may be understood to exist if $\sum \beta_{i2} \neq 0$ and $\sum \alpha_{i1} \neq 0$. Alternatively, no causality between x and y exists if $\sum \beta_{i2} = 0$ and $\sum \alpha_{i1} = 0$.

4.3 Variables, Data Measurement and Transformations

Quarterly time series data for the period 1999Q3-2012Q3 is used for the four variables (inflation rate, budget deficit (BD), money supply (M2) and nominal exchange rates (EXR) in the economic specification used in this paper. Inflation rate is measured as the quarterly change of the logarithm of the consumer price index (CPI). M2, which includes currency outside the Central Bank plus demand, savings and time deposits, is used as a

measure of broad money. BD is measured as cash based government expenditure net of total revenue, excluding grants. Both BD and M2 are scaled by real GDP to yield the conventional measure of the budget deficit and the size of the inflation tax base, respectively (Catao and Terrones, 2001). Deficits are important in this discussion because they carry implications for future government policy, including spending, taxation and money creation. The nominal exchange rate used is the average rate of Ushs/US dollar. The data are adjusted for seasonal effects (save for the nominal exchange rate), are expressed in logarithms and have been collected from Bank of Uganda data base, and are shown in levels and differences in Figure 1, in the Appendix.

5 Empirical Results

As a precursor to cointegration analysis, it is customary to begin with the graphical expositions of the level and first difference of the series to reveal important data features. Visual inspection of the data in figure 1 reveals that all variables (except for the BD) follow the same pattern, i.e. are not stationary as they are not mean-reverting in levels. However, in first differences, they seem to be mean-reverting and therefore stationary. More formally, the series are tested for the order of integration or non-stationarity using the Augmented Dickey Fuller (ADF) unit root test (Dickey and Fuller, 1979).

Mindful of the fact that critical values of the t-statistic do depend on whether an intercept and/or time trend is included in the regression equation and on the sample size (Enders 2010: 206), the τ_{τ} - statistic, scaled by the 5 per cent critical value for $n=50$ usable observations is used. The statistic critical values are obtained from Table A in Enders (2010: 488). Results of unit root test are provided in Table 1, and as expected, indicate that only BD is I(0) or stationary, while the rest of the variables are non-stationary. All I(1) variables are I(0) in first differences.

On the basis of unit root testing, we treat CPI_t , $M2_t$ and EXR_t as unit root non-stationary, and including BD_t could be cointegrated. The unrestricted 4-dimensional model is estimated with a restricted constant. The choice of the lag-length was determined as the minimum number of lags that meets the crucial assumption of time independence of the residuals, based on a Lagrange Multiplier (LM) test. We began with $k=5$ lags. Although SC and H-Q chose 2 lags, AIC favored 4 lags. However, with $k=3$, the LM test could not reject the null hypothesis of no serial correlation in the residuals. Thus, the underlying model is estimated using 3 lags.

Table1: The Augmented Dickey-Fuller (ADF) Unit root test

Var.	Levels			1 st Difference	
	Lag-Length	ADF τ -stat.	Inference	ADF τ -stat.	Inference
LCPI _t	4	0.091(-3.509)	I(1)	-5.573(-3.509)	I(0)
LM2 _t	0	-2.086(-3.500)	I(1)	-6.299(-3.502)	I(0)
LEXR _t	1	-2.203(-3.504)	I(1)	-5.197(-3.504)	I(0)
LBD _t	0	-8.504(-3.500)	I(0)		

Notes: L=log; CPI = consumer price index; M2 = ratio of broad money to GDP and DEFICIT = ratio of fiscal deficit to GDP; Akaike Information criterion [AIC], Schwarz Bayesian criterion [SC] and Hannan-Quinn Criterion [HQ] were used (maximum set anywhere between 6 and 2 lags). An unrestricted intercept and restricted linear trend were included in the ADF equation when conducting unit root test of all the series in levels. Numbers in parenthesis are the 5 per cent critical values, unless otherwise stated. All unit-root non-stationary variables are stationary in first differences.

Having determined the appropriate specification of the data generating process, existence of long-run equilibrium relation (s) was determined using the Johansen (1988) trace statistic test for cointegration.⁴ However, the trace-test has been shown to have a finite sample bias, with the implication that it often indicates too many cointegrating relations, i.e. the test is over-sized (Juselius, 2006: 140-2; Cheung and Lai, 1993b; Reimers, 1992). Hence, for a small sample like ours, the results shown in Table 2 are adjusted for finite-sample bias using the correcting procedure suggested by Reimers (1992) (see Harris and Sollis, 2005: 122-24 for the application). Based on the results, the presence of one equilibrium (stationary) relation, even after correcting for small sample bias among the variables at the conventional 5 percent level of significance cannot be rejected.

Table 2: Johansen’s Cointegration test and Long-run Analysis

Null	Alternative	$\hat{\lambda}_i$	$\hat{\lambda}_{trace}$	C.V. 95%
$r = 0$	$r = 1$	0.593768	52.24981	47.85613
$r \leq 1$	$r = 2$	0.317129	19.8199	29.79707
$r \leq 2$	$r = 3$	0.155526	6.08772	15.49471
$r \leq 3$	$r = 4$	6.20E-05	0.002232	3.841466

Normalized Cointegrating Equation:

$$LCPI = 3.378 + 0.091LBD + 0.368LM2 + 0.225LEXR \tag{5}$$

(3.408) (7.698) (2.087)

Notes: Trace test indicates 1 cointegrating eqn(s) at the 0.05 level and constant/trend assumption: Restricted constant. The underlying model uses 3 lags, and in parentheses are t-values.

⁴In the test, the determination of the cointegrating rank, r relies on a top-to-bottom sequential procedure. This is asymptotically more correct than the bottom-to-top alternative (i.e. Max-Eigen statistic) [Juselius, 2006: 131-134].

Unless otherwise noted, the only existing cointegrating relation, as shown in (5), is normalized for the quarterly change of CPI in order to interpret the estimated coefficients. Results of the long-run analysis reveal that all variables, including the budget deficit, have a positive significant long-run correlation with inflation. *Ceteris paribus*, the estimated coefficient to BD indicates that a 1 percentage point increase in the ratio of the budget deficit to GDP should lead to a long-term increase in inflation by about 0.09 percentage points, or equivalently, 11 per cent increase in the long-run general price level. This is consistent with the findings in similar studies by Solomon and Wet (2004), Catao and Terrones (2001) and Chaudhary and Ahmad (1995), amongst others. It is also consistent with the hypothesis that increases in the fiscal deficits are associated with increases in seigniorage in the long-run. The results also imply that a 1 percentage point increase in M2/GDP is associated with a 0.37 percentage point (or equivalently 2.7 percent) increase in inflation, holding other factors constant.

The VECM estimation results are given in Table 3 and shows that the estimated coefficients of the error correction terms in all equations (except for the CPI) have the expected signs (negative). However, the error correction term is statistically significant in the money supply equation only, albeit boundary significant so in the fiscal deficit equation. In the case of the former, money supply is adjusted by about 44 per cent of the previous quarter's deviation from equilibrium, suggesting that money supply Granger causes inflation over the short-run period. The magnitude of the reaction (in absolute terms) in the fiscal deficit equation is unexplainably very large, suggesting that the adjustment of short-run equilibrium is over cleared in the long-run. Its boundary significance indicates that causality running from budget deficit to inflation may be weak.

Table 3: Summary Results from VECM

	D(LCPI)	D(LBD)	D(LM2)	D(LEXR)
Constant	0.006 (0.929)	0.362 (1.715)	0.064 (7.541)	-0.010 (-0.547)
ECT(-1)	0.007 (0.133)	-3.041 (-1.785)	-0.435 (-6.292)	-0.062 (-0.422)
R-squared	0.52	0.60	0.67	0.38
Adj. R-squared	0.34	0.45	0.54	0.14

Notes: t-values are in parentheses.

Turning to the question of direction of causality, three elements are of our interest: i) Does the budget deficits Granger-cause inflation, or does inflation Granger-cause the Budget deficit?; ii) does money supply Granger-cause the fiscal deficit or it is the fiscal deficit that Granger-causes money supply; and iii) does money supply Granger-causes inflation or does inflation Granger cause an increase in the money supply. Results of granger non-causality in Table 4 reveal unidirectional causality running from (i) inflation to the fiscal deficit; (ii) money supply to fiscal deficit; and (iii) a feedback causal effect from money supply to inflation and vice versa. The first result is consistent with the famous "Olivera-Tanzi effect" (Olivera, 1967, Tanzi, 1977), that high inflation tends to reduce tax revenue.

The second result depicts the revenue and public debt effects of tight monetary policy on the fiscal stance (Dahan, 1998). It is argued that in the short-run, tight monetary policy leads to lower output growth which may reduce tax revenue. Tight monetary policy also results in higher interest rates, which renders public debt expensive to service, i.e. the Fischer effect above. A combined effect of lesser tax revenue and increases in interest payments is a rise in the budget deficit.

The third result contradicts the quantity theorists’ view of a unidirectional causal effect from money supply to inflation, and presents a causal feedback effect and is consistent with Aghevli and Khan (1977: 390). According to Aghevli and Khan (1977), an increase in money supply creates inflationary pressures that increase government expenditure faster than government revenue, so that there is need for a further expansion in money supply to monetize the resultant budget deficit. This however is more likely in the hyper-inflation countries, of which Uganda is not at least for the sample period considered here.

Table 4: Granger Non-Causality Tests

Null Hypothesis	Obs	F-Stat.	Prob.	Decision
1. Inflation does not Granger Cause Budget Deficit	49	2.485	0.074	Reject
Budget Deficit does not Granger Cause Inflation		2.059	0.120	Accept
2. Money Supply does not Granger Cause Budget Deficit	49	2.475	0.075	Reject
Budget Deficit does not Granger Cause Money Supply		0.300	0.825	Accept
3. Money Supply does not Granger Cause Inflation	49	2.883	0.047	Reject
Inflation does not Granger Cause Money Supply		3.394	0.027	Reject

No statistically significant causation running from the budget deficit to inflation or from the budget deficit to money supply is found in the short-run. This need not necessarily be interpreted that high deficits never cause inflation; rather, the lack of causation is likely to be a consequence of BoU’s sound monetary policy in supporting a stable fiscal regime. Moreover, the current government’s resolve to finance the deficit through non-traditional sources of financing, in light of dwindling budget support, can easily reverse the unidirectional relationship uncovered here, i.e. budget deficits could easily present an upside risk to Uganda’s inflationary pressures in the short-run. Causality concerning exchange rate relationships has not been analyzed, because according to the Ricardian equivalence theory the effect of budget deficits on the exchange rate and inflation should be neutral (Barro, 1989). Overall, our empirical results for the sample period analyzed suggests that fiscal deficits do not seem to necessarily trigger inflation in the short-run, but in the long-run. Thus, short-term policies geared at reducing inflation in Uganda need not focus on budget deficit reduction, but rather on other macroeconomic determinants of inflation.

6 Conclusions and Policy Implications

This paper analyses the relationship between budget deficits, money creation and inflation in Uganda over the period 1999Q4 to 2012Q3. It uses a triangulation of VECM and pair-

wise Engel-Granger non-causality test techniques. A summary of the key results is as follows:

A long-run stationary relationship between the budget deficit, money supply, inflation and the nominal exchange rate has been found to hold for Uganda. Normalizing the only relation for the quarterly change of CPI reveals that all variables in the model have a positive and significant long-run association with inflation. It implies that increases in the ratios of the fiscal deficit to GDP, M2/GDP, and depreciation in the exchange rate should each lead to a long-term increase in inflation. However, VECM results show only money supply Granger causes inflation in the short-run. Results of Granger non-causality tests reveal unidirectional causality running from inflation to the fiscal deficit, from money supply to the fiscal deficit, and a feedback causal effect between money supply and inflation in the short-run. No statistically significant causation is found from the budget deficit to inflation or from the budget deficit to money supply in the short-run. However, fiscal expansion could easily present an upside risk to Uganda's inflationary pressures in the short-run if the current government's resolve to use non-traditional sources of financing the deficit in light of dwindling budget support generates demand pressures. In terms of policy, our empirical results suggest that contractionary monetary policy to reduce inflation in Uganda need not focus on budget deficit reduction, but rather on other macroeconomic determinants of inflation. Furthermore, the results emphasize the importance of containing inflation to mitigate its effect on the budget deficit over the short-run.

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Appendix

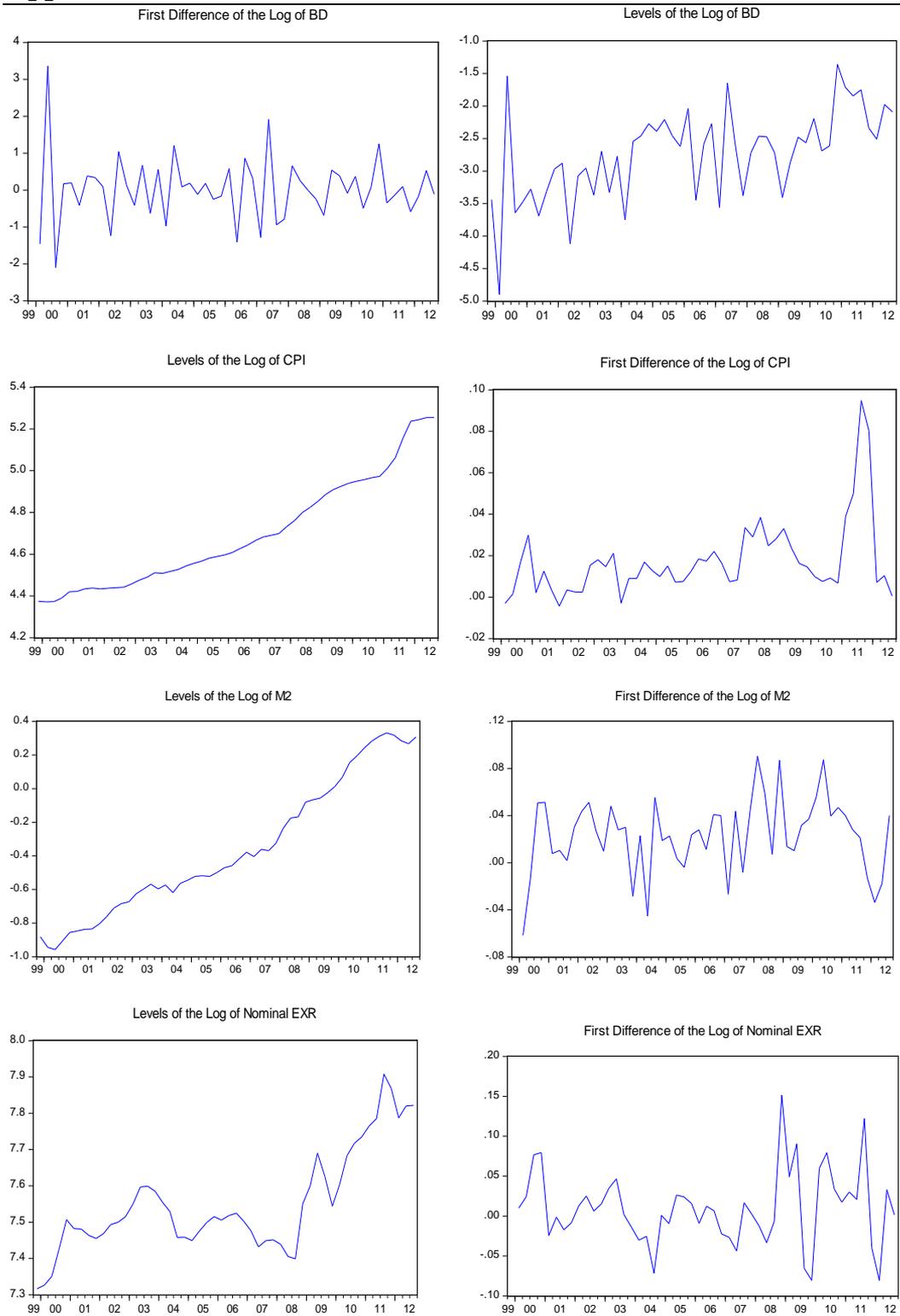


Figure 1: Series Plots in Levels and First Differences