Budget Deficit Financing in Tanzania: Implications for Price Stabilization

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Abstract

The study investigates whether budget deficit financing modes have differential implications on general price level in Tanzania. The study employs the co-integration and error correction modeling approach to examine the short-term and long-term effects of budget deficit financing on inflation. The study finds that the effects of budget deficit on general price level depends significantly on its financing modes. The results reveal that while domestic financing is inflationary foreign financing is deflationary. The results further show that seigniorage revenue financed budget deficit has no significant effect on price level whereas grants financed budget deficit has significant inflationary outcome. Moreover, the study finds that budget deficit financed by drawing down excess foreign reserves would mitigate inflation. Thus, to combat budget deficit oriented inflationary pressure, the government has to opt for external borrowing as opposed to internal borrowing and foreign aids in the nature of grants. In addition, the central bank has to control money supply and foreign reserves in such a way the additional money supply does not exceed expansion of the economy and excess foreign reserves could be used to finance budget deficit.

Key Words: Budget deficit; Financing; Co-integration; Error correction model; Inflation; Tanzania.

JEL Classification Codes: H62, E31

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1.0 Introduction

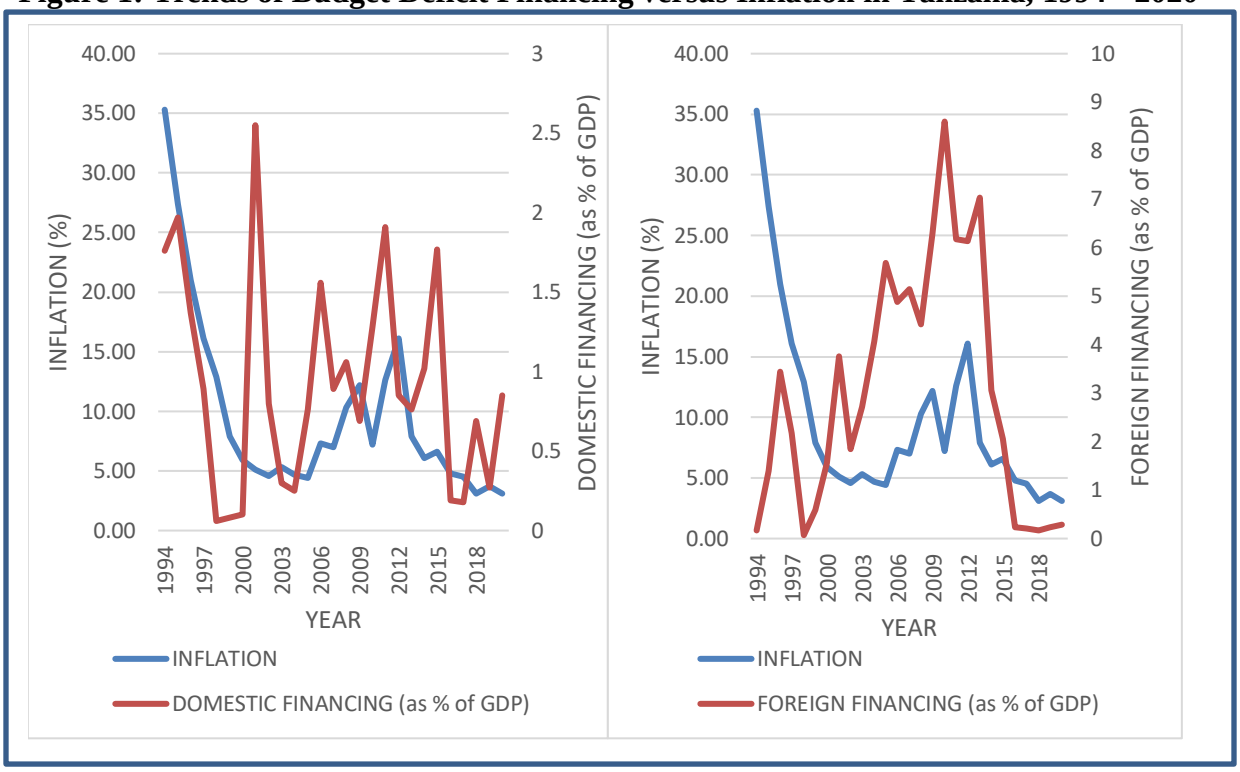
One of the principal goals of monetary policy pursued by central banks virtually in the entire world is price stability (Ekanayake, 2013). Thus, understanding the nature of inflation and its determinants is a critical issue and attracts interest from macroeconomic policy makers and analysts, and monetary authorities. The effect of budget deficit on price stability is examined because theoretically budget deficit could be a source of inflation especially with regard to how it is financed. In both the Keynesian and the Monetarist frameworks, budget deficit tends to be inflationary. This is because, in the former, budget deficits stimulate aggregate demand, while in the latter, when monetization takes place, it leads to an increase in money supply, and ceteris paribus, increases the rate of inflation in the long-run (Gupta 2013). Ideally, a positive shock to government expenditure should result in a supply-side response. But, if the increase in government expenditure generates demand pressure, this may cause inflation (Ssebulime and Edward, 2019). Likewise, a negative shock to government revenues may cause inflation because it often widens budget deficit.

There exists plethora studies pertaining the nexus between budget deficit and inflation in developing, emerging and developed countries: Viera (2000); Solomon and Wet (2004); Agha and Khan (2006); Luis and Marco (2006); Wolde-Rufael (2008); Ndanshau (2012); Chimobi and Igwe (2010); Mukhtar and Zakaria (2010); Muzafar et al. (2011); Nyasebwa (2011); Oladipo and Akinbobola (2011); Ekanayake (2013); Iyeli et al. (2013); Bwire and Nampewo (2014); Nguyen (2015); Myovella and Kisava (2018); Ssebulime and Edward (2019); and Mwamkemwa and Luvanda (2022). But these studies focused on the nature of causality between budget deficit and inflation to validate the *"*Olivera -Tanzi effect"; and thus yielded mixed conclusions. In addition, these studies ignored budget deficit financing modes, which may have differential implications for price stability in the economy. It is maintained that the causal effect of budget deficit on inflation is contingent upon sources of its financing (Ndanshau, 2012). This study, therefore, fills this gap in literature by analyzing whether budget deficit financing matters for price stabilization in Tanzania.

Analysis of whether budget deficit financing matters for price stability is important in Tanzania because government has experienced a persistent rise in budget deficit. This suggests that government own revenue has not been commensurate with public expenditure (Mwakalobo, 2015). For instance, from 1970 to 2015, on average 66% of the budget was financed by own revenues while the remaining 34% was financed through borrowing and grants (BOT, 2015). Therefore, the inflationary financing of budget deficits is caused by a combination of high government expenditure and poor domestic revenue mobilization. Budget deficit in Tanzania is financed by both domestic and foreign sources as in Figure 1; each may imply a different effect of a budget deficit on inflation. Solomon and Wet (2004) asserts that domestic financing is more inflationary than foreign financing in many developing countries because their economies are characterized by inefficient capital markets and high dependence on developed countries for foreign sources. This study is, therefore, essential in deciding the best budget deficit financing approaches for stable prices.

The rest of this paper is organized as follows: section 2 is literature review; section 3 methodology used; section 4 is presentation and discussion of results; and section 5 is conclusion and policy implications.

Figure 1: Trends of Budget Deficit Financing versus Inflation in Tanzania, 1994 - 2020



2.0 Literature Review

2.1 Theoretical Review

There is an extensive theoretical literature regarding the nexus between budget deficit and inflation. Throughout the Keynes era, the classical economists attached strong value to a balanced budget, even though they did not analyze its bearing on general price level. This traditional view is in conformity with the ideals of soundness of private budgets in which deficits should be avoided and if incurred at all, it must be wiped out. This argument is extended to public budgets because of the tendency of the governments to resort to wasteful and unnecessary expenditures. Apart from the classical economists, Keynes maintains that budgetary measures intended to balance the budget lead to subsequent budgetary deficits, and the measures intended to create deficits would subsequently, lead to balanced budget (Bhatia, 2008). Keynes saw fiscal imbalances and budget deficit mechanisms as amassed national demand (Levin et al. 2002). The underlying reason is that when government expenditures increase, aggregate demand curve shift to the right, leading to both high price and output (Gupta 2013). However, growing labor demand increase wages, which in turn, leads to downward shift in aggregate supply, which after sometimes, returns the economy back to the natural level of output. But this happens at the expense of permanent higher price levels.

The monetarists dominant view on the nature of causality between budget deficit and inflation is that, budget deficit has unidirectional causal effect on inflation. That is, monetization of budget deficits increases monetary base, given a stable money multiplier or money demand function, increase the level of money supply and finally drives inflation, as it is in quantity theory of money context.

The clearest exposition of Fisher's formulation of the quantity theory of money shows that monetary expansion leads to output expansion tied with inflationary pressures (Stieglitz *et al*, 2006; Mishkin, 2004). Friedman (1968), believe that inflation is always and everywhere a monetary phenomenon. That is persistent rise in general price level is necessarily preceded by a sustained increase in money supply. It is held that causal effect of budget deficit on inflation would only be obtained if it is financed by printing money, that is, money creation (Easterly and Schmidt-Hebbel, 1993:212). But even where money creation is used to finance budget deficit, the effect on inflation will depend on stability of money demand function. Implicitly, unstable money demand function would distort the causal effect of money creation financed budget deficit on general price levels.

Budget deficit and inflation exhibit a two-way interaction, i.e. not only does budget deficit through its impact on money supply and expectations produces inflation, high inflation also has a feedback effect on budget deficit. The process works due to lags in tax collection, i.e. the time of tax obligation's accrual and the time of actual tax payment do not coincide, with the payment usually made later. Thus, we may have the following self-strengthening phenomenon: persistence of budget deficit props inflation, which in turns lowers real tax revenues, a fall in real tax revenue then necessitate and further increases budget deficit and so on. In economic literature, this is referred as Olivera-Tanzi effect. Sargent and Wallace (1981) argue that inflationary finance aggravates budget deficits, whose monetization leads to monetary expansion that lead further to inflation. Aghevli and Khan (1978) argue that the implied reverse causality between inflation and budget deficit is a possibility that while persistent budget deficits would cause inflation, the prolonged inflation rates may potentially widen the budget deficit by increasing government expenditure.

Holding of public debt by the commercial banks can lead to addition aggregate demand and hence add to inflationary pressure in the economy. However, there is a traditional view that most of internal borrowing only diverts funds from the market into the hands of the government; as a results, there is no net addition to aggregate demand and hence no increased pressures on general price levels. Also, it is argued that when government borrows from the central bank, there is an addition in money supply in the economy, which in turn adds aggregate demand and pushes up prices (Bhatia, 2008). It is widely accepted that budget deficit financing by means of accumulating domestic debt seems to only postpone inflation tax. As Sachs and Larrain (1993) put it, "borrowing today might postpone inflation, but at the risk of even higher inflation in the future". Keynesians believe that public debt used to increase productivity in an economy is non-inflationary in nature. However, borrowing meant for war activities, for meeting natural calamities, and for other relief measures are most likely to be inflationary in their impact because they are consumption oriented (Bhatia, 2008).

2.2 Empirical Review

The empirical evidence on the relationship between budget deficit and inflation yield mixed conclusions. Muzafar et al. (2011) assessed the linkage between budget deficit and inflation in developing Asian countries using the annual time series data for the period 1950 – 1999. The results reveal that, in the long-run, budget deficits are inflationary in developing Asian countries. This is perhaps because many developing countries rely on the central banks to finance their budget deficits through printing money, which may result in greater excess aggregate demand than in

increased aggregate supply. Ekanayake (2013) analyzed the relationship between budget deficit and inflation in the presence and absence of public sector wage expenditure from 1959 to 2008 by using Autoregressive Distributed Lag model. The results reveal a weak relationship between budget deficits and inflation in the absence of public sector wage. However, the relationship becomes stronger as the proportion of public expenditures allocated to wages increases. This outcome implies that inflation–budget deficit relationship is not only a monetary phenomenon in Sri Lanka, but that public sector wage expenditure is also influential in linking inflation and budget deficit.

Ssebulime and Edward (2019) examined budget deficit and inflation nexus in Uganda from 1980 – 2016 using co-integration and error correction modeling approach. The results show that budget deficit causes inflation in Uganda. However, no feedback effect was observed. The co-integration results reveal a positive and significant long-run relationship between the series and ECM reveal that budget deficit causes inflation in Uganda only in the short run. Furthermore, in Uganda, budget deficit affects inflation indirectly through fluctuations in nominal exchange rate and money supply. Ndanshau (2012) analyzed nexus between budget deficits, money supply and inflation in Tanzania for the period 1967-2010. Pair-wise Granger causality test established a one-way causal effect, running from inflation to budget deficit and the monetary base. These research findings were supported by estimated results from vector error correction model. It is shown that there exist a significant inflation inertia and causal effect on budget deficit over the short-run. The results showed that a shift in monetary policy regime exerted a significant effect on inflation and budget deficits.

Luis and Marco (2006) tested the direction of causality between budget deficit and inflation. They found a strong linkage between inflation and budget deficits in emerging economies characterized by episodes of high inflation rates, but it holds less strongly in developed countries. They argue that budget deficits result in higher inflation for countries where the inflation tax base is smaller and that less impact is felt in countries that have greater levels of monetization. Hammed and Arawomo (2020) employed the structural vector autoregressive model to investigate impact of oil shocks on manufacturing output in Nigeria via fiscal variables using annual time series data from 1981 to 2019. They found that public expenditure is not explained by revenue; implying that budget deficit is financed largely through borrowing. In Addition, they established that inflation is weakly explained by public expenditure - indicating import-generating nature of inflation in Nigeria.

Iyeli *et al.* (2013) investigated relative effectiveness of monetary and fiscal policies, by focusing on the effects of money supply and budget deficits on output and price. The results revealed that the contemporaneous contribution of broad money supply to the inflationary cycle in Nigeria is weak, but its one year lagged value is strong, positive and significant. In addition, the study confirmed that the role of budget deficits although positive, is negligible and in some instances statistically insignificant in influencing cyclical inflation rate in Nigeria. Furthermore, the output model confirmed that money supply matters in Nigeria and that the appropriate monetary target is the broad money supply. The fiscal policy factor (budget deficit), although statistically insignificant, also has a negative effect on output. Thus, effect of monetary policy (money supply) on output growth has an edge over fiscal policy variable (fiscal deficit) as a measure of output stabilization.

Solomon and Wet (2004) examined the budget deficit – inflation relationship in Tanzanian economy for the period 1967 – 2001 using co-integration approach and some dynamic simulations. Due to monetarization of the budget deficit, the significant inflationary effects were found for increases in the budget deficit. Bwire and Nampewo (2014) also analyzed the relationship among budget deficit, money creation and inflation using a triangulation of Vector Error Correction model and pair-wise Engel-Granger non- causality test techniques over the period 1999Q4 - 2012Q3. The results suggest that fiscal deficits do not seem to necessarily trigger inflation in the short-run, but in the long-run. Moreover, 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 were found. Therefore, inflation needs to be contained to mitigate its effects on fiscal deficits in Uganda.

Mwankemwa and Luvanda (2022) analyzed fiscal deficit and its threshold effects on inflation in Tanzania using quarterly time series data spanning 2001 to 2019. The study used Autoregressive Distributed Lag model (ADL) and the quadratic regression equation to examine the threshold level of Tanzania's fiscal deficit and its impact on the country's inflation dynamics. The findings reveal a U-shaped relationship between inflation and fiscal deficit, with a fiscal deficit threshold at 2.69 percent of GDP, above which the deficit significantly contributes to the increase in inflation. But most of these previous studies did not rigorously consider budget deficit financing modes, which may have different impact on inflation. This study is, therefore, an attempt to fill this gap in literature by analyzing whether budget deficit financing modes matter for price stabilization in Tanzania.

3.0 Methodology

3.1 Data

This study used annual time series data collected from the Bank of Tanzania's (BOT) various *Economic Bulletin*. To avoid possible structural breaks due to economic reforms in 1980s the study used time series data covering the periods between 1994 and 2020. The time series analysis applies the statistical techniques to identify the behavior of one or more variables in terms of statistical regularities in their own past behavior in order to estimate a pattern, which is important for forecasting.

3.2 Description of Variables

Inflation is measured by consumer prices index (CPI). The core CPI, which excludes food and fuel, is the more useful measure of effectiveness of fiscal and monetary variables. Broad money supply (M2) is the summation of narrow money supply (M1) and other deposits such as saving and time deposits. Domestic financing entails both bank and non-bank borrowing from within the country. Bank borrowing includes borrowing from commercial banks and central bank while non-bank borrowing includes borrowing from pension funds, insurance companies, public and private institutions, and individuals. Foreign financing includes program loans, non-concessional borrowing, development project loans and basket support from other countries and / or bilateral and multilateral financial institutions. Grants entails foreign aids in development and/or social welfare projects, programs, and basket funds. Unlike loans, often grants are free from interest rates and need no direct repayments in future. Net foreign reserve is a difference between foreign assets and foreign liabilities. Alternatively, net foreign reserve is high-powered money less domestic assets.

3.3 Model

The empirical specification adopted in this study is borrowed from Solomon and Wet (2004) and Bwire and Nampewo (2014). This model, as developed by Aghevli and Khan (1977, 1978) and scrutinized by several scholars including Ssebulime and Edward (2019) shows that budget deficit must be financed through monetarization and /or borrowing, as summarized in the following equation:

$$G_t - T_t + \frac{D_{t-1}}{pt}(1 + r_{t-1}) = \frac{(M_t - M_{t-1})}{pt} + \frac{D_t}{pt} + \Delta R \quad (1)$$

Where: G_t is total government expenditure, T_t is tax revenue, and therefore $G_t - T_t$ is budget deficit at given time period t. $\frac{D_{t-1}}{pt}(1 + r_{t-1})$ is the discounted value of the real stock of accumulated government debt in the previous period with maturity value in the current period (t), i.e. the statutory external and domestic debt repayments and the outstanding real government debt. $\frac{(M_t - M_{t-1})}{pt}$ is the change in money supply (or seigniorage revenue), $\frac{D_t}{pt}$ captures domestic borrowing and external borrowing in the current period (t), while ΔR is the change in international or foreign reserves.

The Keynesians strongly believe that budget deficit financed through borrowing leads to inflation because it stimulates aggregate demand while maintaining or dampening aggregate supply. On the other hand, the monetarists argue that budget deficit financed through monetarization is inflationary when it increases money supply to the extent that outpaces expansion of the economy. Thus, budget deficits financed via monetarization and/or borrowing are expected to be inflationary, as indicated:

$$\frac{\Delta P}{P} = \frac{\Delta M}{M} - \frac{\Delta Y}{Y} + \frac{D_t}{pt} \quad (2)$$

Where: $\frac{\Delta M}{M}$ is change in money supply, $\frac{\Delta Y}{Y}$ is growth rate of the economy, $\frac{D_t}{pt}$ captures domestic and external borrowing in the current period (t), $\frac{\Delta P}{P}$ is change in general price levels. Given that in Tanzania, budget deficit is financed via internal borrowing, external borrowing, grants and money creation; and there is a potential of using excess foreign reserves, then our empirical specification reads:

$$INF = \beta_0 + \beta_1\left(\frac{M2}{GDP}\right) + \beta_2\left(\frac{DMF}{GDP}\right) + \beta_3\left(\frac{FNF}{GDP}\right) + \beta_4\left(\frac{GRA}{GDP}\right) + \beta_5\left(\frac{NFX}{GDP}\right) + \mu \quad (3)$$

Where: INF is Inflation; M2 is natural log of broad money supply; DMF is natural log of domestic financing; FNF is natural log of foreign financing; GRA is natural log of grants; NFX is natural log of net foreign reserve; GDP is gross domestic product; and μ is the error term. Though this empirical specification follows a conventional measure of scaling up budget deficit to GDP, it differs from most of previous studies as it shows implications of budget deficit financing on price levels.

3.4 Estimation

3.4.1 Unit Root Test

The study employed the Phillips-Perron (P-P) non-parametric test to examine the presence of the unit root. The unit root analysis is necessary to avoid possibility of spurious results that might exist with non-stationary series even if the sample size is large. The P-P test has an extra advantage over the standard Dickey-Fuller (DF) test because the DF test results are sensitive to different lag lengths of the dependent variable, therefore, biased towards non-rejection of the unit roots when the structural breaks are incorporated in the data set (Indraratna, 2003; Li, 2001). In addition, P-P test is adjusted to take into account serial correlations by using Newey-West (1994) covariance matrix.

3.4.2 Co-integration and Error Correction Model

To ascertain whether variables are bound together in the long-run, the study employed the Johansen's co-integration procedure. Within the Johansen co-integration approach, both the trace ($\lambda trace$) and the maximum Eigen-value (λmax) statistics were applied to ensure robustness of the results. Thereafter, error correction model was estimated to capture both short-run and long-run effects. The Johansen's approach is superior over the Engle and Granger two-step method because it enables testing for existence of multiple co-integrating vectors and thus it exploits all dynamic interactions of the variables included in the regression model and it gives a room for normalization (Verbeek, 2004).

4.0 Results and Discussion

4.1 Unit Root Test

The results of the P-P test presented in Table 1 reveal that at their levels INF, DMF and M2 were stationary while FNF, GRA and NFX were not stationary. However, after taking first difference all variables became stationary at 1% significance level, as supported by test statistics which are less than critical values. The variables that were stationary at their levels are integrated of order zero 1(0) whereas those variables became stationary after first differencing are integrated of order one 1(1). All variables integrated of order zero were used in co-integration after taking their first differences.

Table 1: Phillips – Perron Test Results

	Levels		**First Difference**		**Order of**
Variables	Test Statistics	Critical Value	Test Statistics	Critical Value	**Integration**
INF	-4.904	-3.750**	-4.223**	-3.750	1(0)
DMF	-3.897	-3.750**	-6.828**	-3.750	1(0)
M2	-3.593	-3.750**	-9.331**	-3.750	1(0)
FNF	-1.734	-3.750	-4.902***	-3.750	1(1)
GRA	-1.550	-3.750	-6.218***	-3.750	1(1)
NFX	-1.831	-3.750	-4.506***	-3.750	1(1)

Note:

INF: Inflation; DMF: natural log of domestic financing; FNF: natural log of foreign financing; GRA: natural log of grants; NFX: natural log of net foreign reserve; M2: natural log of broad money supply;*** rejects null hypothesis of non-stationary at 1% significant level.

4.2 Optimal Lag length

Next, the study employed the Akaike Information Criteria (AIC), Hannan - Quin Information Criteria (HQIC), and Schwarz Bayesian Information Criteria (SBIC) to establish the optimum lag length. The results in Table 2 demonstrate that AIC, HQIC, and SBIC select two (2) lags. Thus, the chosen two (2)-lag order was used for co-integration and error correcting modelling. Given our relatively small sample of the series, the selected two (2) lags can preserve degrees of freedom for estimation. The use of appropriate lag length is emphasized as precondition for robustness of the results.

Table 2: Lag Selection Results

Lag Order	AIC	HQIC	SBIC
0	5.37	5.51	5.62
1	5.36	5.42	5.65
2	4.97***	5.08***	5.38***
3	5.37	5.45	5.71
4	5.06	5.17	5.51

Note:

*** = indicates optimum lag length selected by respective criterion at 0.01 levels of significance.

4.3 Co-integration Test

Having confirmed that all variables are stationary after first differencing and established optimal lag order, the Johansen's test was performed. The results in Table 3 show that both $\lambda trace$ and λmax statistics rejected the null hypothesis of no co-integration against the alternative; as evidenced by test statistics, which are greater than critical values at 1% significance levels. This implies that there exists long-run relationship among variables included in the model. In addition, while $\lambda trace$ statistics suggest existence of at most three vectors, λmax statistics suggest existence of at most two vectors. We, therefore, conclude that there exist at most three (3) co-integrating vectors because $\lambda trace$ is more powerful than λmax as it takes into accounts all the smallest Eigen values.

Table 3: Johansen Co-integration Test Results

Null Hypotheses	Trace Statistics	Critical Value	Max-Eigen Statistics	Critical value
None	143.93	94.15	49.88	39.37
At most 1	94.05	68.52	44.35	33.46
At most 2	49.71	47.21	24.32**	27.07
At most 3	25.38**	29.68	16.75	20.97
At most 4	8.64	15.41	5.14	14.07
At most 5	3.49	3.75	3.49	3.76

Note:

If r represents number of co-integrating vectors and there are k stochastic variables in the equation, there can be up to k-1 co-integrating vectors, i.e. r = k-1. If 0 < r < k there are r independent linear combinations, but it may not be easily to give economic interpretation of all relationships. If r = k estimating ECM is not necessary; *** indicates accepted null hypothesis.

4.4 Error Correction Model Results

The results of the error correction model in Table 4 show that the speed of adjustment, i.e. error correction term is negative and statistically significant, – 0.1708. This outcome suggests that about 17% of the last period's disequilibrium is corrected for in the following period. Therefore, it takes about 1/0.17 = 5.9 times (over a year) to support equilibrium in the absence of other factors. Also, the negative and significant coefficient of the error correction term suggests that, in the long-run, budget deficit financing combination matters for price stability in Tanzania. That is to say, in the long-run, the effect of budget deficit on inflation depends greatly on the financing approaches used.

The results indicate that there are partial adjustments in general price level over time, as substantiated by positive significant coefficient of lagged dependent variable. This implies that past inflation predicts future inflation, other factors held constant. This outcome coincides recent study by Nyoni (2019) that inflation in Tanzania is likely to continue on an upward trajectory in the next decade. The study showed that with a forecast range 2018 - 2027, the annual inflation rate in Tanzania is expected to hover around 5.05%. However, 95% confidence interval indicates that inflation rate in Tanzania is capable of shouting to as high as 34.72% per annum by 2027, ceteris paribus.

The results also reveal that domestic financing has a positive effect on the general price levels. These results support preposition that a sustained government borrowing from the banking system to finance budget deficits increases interest rates, which in turns, lead to a decrease in private sector investment and consequently the volume of goods and services available in the economy. This restrained aggregate supply, given the existing volume of money balances in the economy, lead to an increase in inflationary pressures. In addition, the results favor the conventional wisdom that increasing central bank lending to government is conducive for higher inflation because as government borrows from central bank, there is an addition in money supply and hence high price levels.

A closer examination of the results demonstrate that, foreign financing has a negative and significant impact on the general price levels. That is, budget deficit financed through external borrowing has considerable effect in restraining inflationary pressure in Tanzania. This outcome suggests that over the study period most of foreign resources were meant for investments rather than consumptions. The resources meant for production increases total national output and hence reduces the inflationary pressure in the economy. Solomon and Wet (2004) found that increase in output eases aggregate demand pressure in the economy and slow down the level of inflation in Tanzania.

The results show that budget deficit financed through grants has positive effect on inflation. This reflects that most of the grants were meant for social welfare programs rather than productive investments. The consumption-oriented expenditures are inflationary in nature because they reduces productive capacity of the economy. Mwamkonko (2021) found that increasing consumption expenditures in the expenses of reducing investment expenditures is growth retarding in Tanzania. In addition, the results suggest that a reasonable share of grants were "tied-aids', i.e. were spent on imported goods and services from donor countries, therefore, generated imported inflation.

The results show that net foreign reserve has a positive and significant effect on general price level, i.e. increase in foreign reserves accumulation increases inflation in Tanzania, ceteris paribus. Given the fact that official foreign currency mix is constructed in such a way that it matches the currency composition of expected foreign debt service obligations, the import bill as well as non-import outflows (BOT, 2006). Then, this outcome suggests that budget deficit financed by drawing down excess foreign reserves would restrain inflationary pressure in the economy. This outcome is supported by previous findings by Nguyen et al. (2019) that increase in foreign reserves accumulation significantly increases inflation in Vietnam, thus reducing foreign reserve restrain inflation.

Moreover, the results reveal that broad money supply has a positive effect on general price level. However, in both short-run and long-run, this positive effect appears to be statistically insignificant. The results implicitly indicate that budget deficit financed through printing money has no effect on inflation; suggesting existence of unstable money demand function in Tanzania. In addition, this outcome reflects that, over the period under investigation, on average, the growth rate of broad money supply has not been significantly greater than the growth rate of the economy. These results are contrary to classical monetary theories including the Friedman's (1968) preposition that "inflation is always and everywhere a monetary phenomenon". But these results are consistent with findings by Ndanshau (2012) that money supply does not cause inflation in Tanzania.

Table 4: Error Correction Model Results

Variables	**INF**			
	Coefficient	**Std. Error**	**Z**	**P > Z**
INFL	0.4581	0.1969	2.33	0.020**
DMF	0.8446	0.4251	1.99	0.047**
FNF	-1.0241	0.3226	-3.17	0.002***
GRA	1.8124	0.5571	3.25	0.001***
NFX	1.0984	0.3099	3.54	0.000***
M2	0.2423	0.5562	0.44	0.663
ECT	-0.1708	0.0553	-3.09	0.002***
CON	0.0142			
Co-integrating Equation				
DMF	7.6322	1.9482	3.92	0.000***
FNF	-8.1541	0.9977	-8.17	0.000***
GRA	7.3706	2.1588	3.41	0.001***
NFX	7.6320	1.4612	5.22	0.000***
M2	2.5182	1.6993	1.48	0.138
CON	-11.8193			

Note:

INF: Inflation; INFL: lagged inflation; DMF: natural log of domestic financing; FNF: natural log of foreign financing; GRA: natural log of grants; NFX: natural log of net foreign reserve; M2: natural log of broad money supply; CON: is constant; ECT: error correction term or the speed of adjustment; and *** & ** means statistically significant at 1% & 5% respectively.

4.5 Granger Causality Test

The Granger causality test was used to examine the direction of causality between variables of interest. The results in Table 5 reveal that there is one-way causality running from domestic financing to inflation; foreign financing to inflation; grants financed budget deficit to inflation; and net foreign reserve to inflation. The results, however, show no evidence of causality running from money supply to inflation. Also, there is no feedback from inflation to budget deficit financing. This implies that there was no simultaneity problem in measuring impact of budget deficit financing on inflation; thus, our basic regression results do not suffer from endogeneity bias.

Table 5: Granger Causality Test Results

Null Hypothesis	Chi2	Prob > Chi2	Decision
DMF ≠ INF	3.95	0.0469	Rejected
INF ≠ DMF	0.30	0.5863	Accepted
FNF ≠ INF	10.08	0.0015	Rejected
INF ≠ FNF	0.79	0.3743	Accepted
GRA ≠ INF	10.58	0.0011	Rejected
INF ≠ GRA	2.65	0.1898	Accepted
NFX ≠ INF	12.56	0.0004	Rejected
INF ≠ NFX	2.01	0.1567	Accepted
M2 ≠ INF	0.19	0.6631	Accepted
INF ≠ M2	0.03	0.8630	Accepted

Note:

INF: Inflation; DMF: natural log of domestic financing; FNF: natural log of foreign financing; GRA: natural log of grants; NFX: natural log of net foreign reserve; M2: natural log of broad money supply; "X # Y" means X does not Granger cause Y at 0.05 levels of significance

4.6 Variance Decomposition

To analyze dynamic interactions among variables of interest in the post-sample period, the study used error variance decomposition. In various forecasting horizons, error variance decomposition for a given variable measures the proportions of its total variations due to a shock in the variable itself, and due to some shocks of all variables in the system. The results in Table 6 show that, in the short-run, say in year 3, fluctuations in inflation will be accounted for shock in itself (85.82%), shock to domestic financing (0.20%), shock to foreign financing (1.50%), shock to foreign aids in the form of grants (3.39%), shock to net foreign reserve (8.43%), and shock to broad money supply (0.66%).

The results also reveal that, in the long-run, say in year 10, fluctuations in inflation will be due to innovation in itself (81.97%), innovation to domestic financing (0.46%), innovation to foreign financing (2.21%), innovation to foreign aids in the nature of grants (5.06%), innovation to net foreign reserve (9.68%), and innovation to money supply (0.62%). In general, the variance decomposition results show that shocks to domestic financing, foreign financing, net foreign reserve, and grants do substantially account for fluctuations in inflation over time. But shocks to money supply do not explain variations in inflation because short-run and long-run effects are the same.

Table 6: Variance Decomposition Results

YEAR	INF	DMF	FNF	GRA	NFX	M2
1	100	0.00	0.00	0.00	0.00	0.00
2	96.75	0.28	0.07	2.29	0.54	0.06
3	85.82	0.20	1.50	3.39	8.43	0.66
4	84.46	0.75	1.72	4.03	8.49	0.54
5	85.77	0.54	1.67	4.22	7.29	0.49
6	83.37	0.51	1.87	4.49	9.20	0.56
7	82.69	0.58	2.06	4.78	9.29	0.58
8	82.97	0.46	2.06	4.82	9.09	0.59
9	82.34	0.47	2.12	4.94	9.54	0.59
10	81.97	0.46	2.21	5.06	9.68	0.62

Note:

INF: Inflation; DMF: natural log of domestic financing; FNF: natural log of foreign financing; GRA: natural log of grants; NFX: natural log of net foreign reserve; and M2: natural log of broad money supply.

4.7 Diagnostic Tests

As a last step, the diagnostic tests were used to substantiate research findings. The Lagrange Multiplier (LM) test results in Table 7 show that there is no serial autocorrelation at lag order. Likewise, Jarque-Bera (JB) test results show that residuals are normally distributed over the study period.

Table 7: Diagnostic Test Results

LM test				
lags	1		2	
	Ch2	Prob > Ch2	Ch2	Prob > Ch2
	31.6308	0.3112	45.9294	0.1242
JB test				
	Ch2		Prob > Ch2	
	0.373		0.8298	
	Skewness	- 0.2251	Kurtosis	2.5479

5.0 Conclusion

The study analyzed whether budget deficit financing modes have different implications on price stability by using co-integration and error correction modeling approach. The study confirmed that inflationary effects of budget deficit depends on financing modes chosen. The results reveal that while domestic financing is inflationary foreign financing is deflationary. Also, results show that budget deficit financed through grants is inflationary while budget deficit financed through seigniorage revenue has no significant effect on general price levels. Moreover, the study finds that budget deficit financed by drawing down excess foreign reserves would mitigate inflation. Thus, to restrain budget deficit oriented inflation, government has to opt for external borrowing as opposed to internal borrowing and foreign aids in the form of grants. In addition, the central bank has to control foreign reserves and money supply in such a way the excess foreign reserves can be used to finance budget deficit and additional money supply does not exceed expansion of the economy.

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