The Relationship Between Budget Deficits & Inflation: Empirical Evidence From African Countries

Abdikarim Bashir Jama[1] & Sabri Nayan[2] & Siti Nurazira Mohd Daud[3]

[1]Ph.D. Candidate School of Economics, Finance, and Banking (SEFB), College of Business (COB), Universiti Utara Malaysia
[2]Senior Lecturer School of Economics, Finance, and Banking (SEFB), College of Business (COB), Universiti Utara Malaysia
[3]Associate Professor School of Economics, Finance, and Banking (SEFB), College of Business (COB), Universiti Utara Malaysia
Correspondence: Abdikarim Bashir Jama, School of Economics, Finance, and Banking (SEFB), College of Business (COB), Universiti Utara Malaysia.

Abstract
This study aims to reveal the relationship between budget deficits and inflation in African countries in the period of 2001 to 2020. The study utilizes Pooled Mean Group Autoregressive Disturbed Lag (PMG, ARDL) model. It is found that budget deficits have a long-run positive and statistically significant influence on the inflation rate, which emphasizes its role in deciding the price level. Similar findings are revealed for the relationship between budget deficit and labor force in the long run. Meanwhile, broad money growth findings showed both short-run and long-run impacts on the inflation rate. The empirical findings support the existence of Fiscal Theory of Price Level (FTPL) hypothesis in African context. This study offers a novel theory on the relationship between budget deficits and inflation in Africa which is characterized by a persistent inflation rate. The result supports that fiscal and monetary policy are interdependent.

Keywords: Budget Deficit, Money Growth, Government Expenditure, Inflation, ARDL Model.

1. Introduction

A budget deficit can stabilize the economy by controlling government expenditure and income. Nevertheless, there has been a long debate about the relationship between budget deficits and inflation, since the government might finance budget deficits by borrowing money from within or outside the country, or even by printing which might result in even more budget deficits (Viera, 2000). Besides, most emerging nations have experienced increasing debt levels which increases the concerns

about macroeconomic steadiness and effectiveness of fiscal policy (Kassouri & Altintas, 2021). The exponents of the monetarist creed (e.g., McCallum, 2003; Niepelt, 2004) rejected the financial theory of price level initiated by Woodford (2001), Sims (1994), and Leeper (1991) which indicates that investments should be maintainable to ensure a steady price level in any conditions of frugality.

The financial outlook of inflation is a specific concern for emerging nations because it is commonly recognized that emerging countries have lower tax assortment effectiveness, political uncertainty, and inadequate admittance to external debt (Cukierman et al., 1992) which leads to a decrease in the comparative asking price of seigniorage and intensified reliance on price increase tax. Domac and Yucel (2005) in their empirical on developing economies, hypothesized that there is a significant relationship between budget deficits and price increases in high-price-increasing countries.

In the last couple of years, economists and policymakers have contended that government budget deficits influence the macroeconomic circumstances of the economy. The debate, particularly in a theoretical context, suggests that budget deficits have subsidized money growth enlargement, inflation, and greater interest rates, as well as crowded out private investment. Keynesian theories indicate that budget deficits influence interest rates, private investments, and inflation through funding approaches and aggregate demand and supply (Eichengreen & Gupta, 2013). Meanwhile, the monetarist's view argues that government budget deficits impact money supply and inflation through financing channels. Generally, in a great number of emerging nations, financial institutions finance their deficits by creating currency through the central bank, and therefore central banks are not autonomous in making budgetary policies.

Lastly, many the nations under investigation have huge debts which result in economic ambiguity and instability that enforces the government to execute monetarily repressive strategies to control the inflation to meet the fiscal needs with seigniorage (monetization of shortfall) and decrease government expenditure on interest paid debt (Mweni et al., 2016). However, this may involve the behavior of monetary policies and result in a high outlay that leads to great inflation, which can misrepresent the major purpose of the monetary policy.

Figure 1. Movement of inflation rate and budget deficit in selected African countries from 2000 to 2020
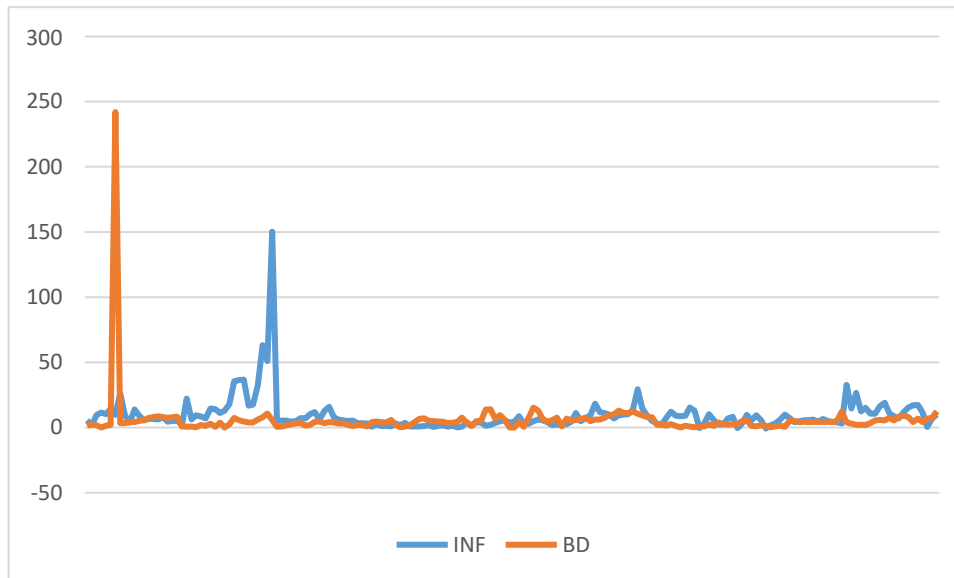
Source: Authors computation

Very limited empirical studies have been conducted in African countries in terms of the relationship between budget deficits and inflation, and their results were still inconclusive (Duodu et al., 2022; Chukwuani & Egiyi, 2020; Ssebulime & Edward, 2019; Myovella & Kisava, 2018). In addition, investigating the inflation determinants is significant since most African countries have experienced inflation that may tremendously harm the living standard and buying authority, particularly in the fragile segment of the population. Also, inflation involves a huge political expenditure cost. Therefore, this encourages the motive to discover the main causes behind higher prices in the region's economy and its consequence of the fiscal policy (Mawejje & Odhiambo, 2021).

The major aim of this paper is to postulate the influence of budget deficit on the inflation rate in African countries namely Kenya, Sudan, Tanzania, Morocco, Algeria, Egypt, Rwanda, South Africa, and Ghana over the period from 2001 to 2020. It is crucial to understand whether the persistent budget deficit has any effect on inflation for the sampled countries in the long run, as well as the significant factors that cause the inflation. It is important to highlight several issues when discussing the relationship between budget deficit and inflation in African countries. Firstly, most of the African countries rely on the Central Banks to finance their deficits i.e., by printing money, which will lead to higher excess aggregate demand than enlarged aggregate supply (Muzafar et al., 2011). Secondly, there has been inferior revenue mobilization compared to the growing disbursement necessities in the region.

The rest of the paper will be organized as follows. Section 2 is a literature review. Section 3 provides data descriptions and empirical methods. Section 4 analyzes empirical findings and Section 5 concludes the paper.

2. Literature Review

Friedman (1956) reported that inflation is a financial anomaly. However, Sims (1994) and Leeper (1991) offer the notion of the financial theory price level which indicates that price increases are a financial phenomenon. The fiscal theory price level indicates a characteristic relationship between financial and monetarist policies which impact price levels. It recommends that the government budget deficit should be maintainable and that intertemporal budget restrictions of the government should be equitable. Hence, the comparative dominance of monetary and fiscal specialists is essential in the inflationary effect of the deficit. Subsequently, Sims (1994) emphasized that in greater circumstances, inflation is more of a financial phenomenon and is reliant upon the anticipations that individuals have in terms of a financial plan and fiscal deficit. Contrarily, the financial theory price level has been investigated in various nations but had offered inconclusive findings (Rubio et al., 2009).

Recent empirical papers that investigated low emerging nations displayed a positive relationship between fiscal deficit and inflation. To illustrate, Duoda et al., (2022) indicated that the budget deficit has a significant positive impact on inflation in Ghana. Eita et al., (2021) revealed the presence of a long-run positive impact of fiscal deficit on inflation in Namibia. Likewise, there is unidirectional causation that runs from fiscal deficit to inflation. Ssebulime and Edward (2019) employed a co-integration test and reveal that the budget deficit and inflation have a positive and statistically significant long-run relationship. Meanwhile, the error correction term results displayed that fiscal deficit only causes inflation in the short run in Uganda.

Similarly, in Tanzania, the result indicated a positive and long-run relationship between budget deficit and inflation (Myovella & Kisava, 2018). Several studies found a positive influence of fiscal deficit on inflation in Nigeria, Zimbabwe, and Tanzania, respectively (Oladipo & Akinbobola, 2011; Makochekanwa, 2008). However, in a similar context, Chukwuani and Egiyi (2020) found no causal relationship between fiscal shortfall and price increases in Nigeria.

The supplementary recent remark is that fiscal deficit is robustly related to price rises in developing nations with a long antique of great price rises (Chu & Lin, 2013). In addition, a fiscal deficit influences is reported on

long-run price increases in nations with reasonable price rises; nonetheless, there is no long-run effect on price increases in developing states with a prolonged history of low solo-digit inflation. The fragile relationship in emerging nations is because of superior financial plans of self-sufficiency and reliability. However, the underdeveloped nations lack strong institutes and their approaches to funding the deficit are inflationary. As a result, the relationship between fiscal deficit and price increases is dynamic, non-linear, and heterogeneous (Lin & Chu, 2013).

Nevertheless, the criteria of fiscal deficit quantity can similarly be important while examining the impact of financial plan deficit on inflation. The budget deficit can be separated into segments whereby one leads to inflationary influence and the other does not (Pekarski, 2011). The consumption expenditure leads to fiscal deficit growth, and investment expense is highly correlated in the long run (Tiwari et. al., 2012).

In the current literature, however, we must keep in mind that the fiscal deficit is not the only factor that causes inflation. Rather, other factors including trade openness, exchange rate, and economic growth have a considerable impact on inflation levels. According to Durevall (1998), inflation rises once the level of depreciation of the exchange rate intensifies, and inflation decreases once the productivity development moves up in the context of Brazil. Furthermore, political instability concludes the difference in strategy regarding price increases and that the impact of political uncertainty is higher for an emerging nation which causes a greater inflation rate (Veiga & Aisen, 2008). Trade liberalization is also considered a respectable policy to control inflation, and therefore the following studies found a negative effect of trade openness on inflation in developing countries (Zakariya, 2010).

The financial deficits have resulted in higher inflation in the African economy, and therefore these deficits are putting financial pressure on governments. The present literature that concentrated on this matter has major contribution (see Eita et al., 2021; Chukwuani & Egiyi, 2020; Ssebulime & Edward, 2019). Therefore, there is a desire for some novel indication regarding persistent budget deficit and intensifying inflation in terms of Africa.

3. **Data Descriptions and Empirical Methods**
The data of this study is obtained from the World Development Indicators (WDI) data repository; however, the budget deficit data is obtained from the country's economic data center. The dependent variable is the consumer price index (cpi) which is a proxy of the inflation rate. While

budget deficit (bd) acts as an independent variable. However, the following variables are used as explanatory variables namely: gross domestic product (gdp), trade liberalization (trd), the labor force (lb), total government expenditure (tgexp), and broad money growth (bmg) which have a direct relationship with the dependent variable. Likewise, our study period is from 2000 to 2020.

The format of anticipations is well recognized in the inflation decisive theory. It indicates that the price enlargement contributes to the anticipations for the additional price scramble in the economy. Maintaining the price track in the future enables the prediction of greater pay and nominal salaries in the future for the reimbursement of price increases. The appreciation of industrial subdivisions detracts from the actual plantation and conventional marketplaces.

 Moreover, the yield pursuing representatives becomes more dynamic in the greater inflation condition to receive the return. Thus, an untargeted attempt has an overwhelming influence on the prices. These prospects can be apprehended through the lag value of a dependent variable which is inflation. Most of our sample countries experienced tremendous inflation in the last couple of years due to various reasons, and this inflation has a negative consequence on the food sector which resulted in a rapid increase in food prices since most of those nations are net importers.

The traditional quantity theory offers a clear clarification for the changes in prices. To illustrate, Fisher (1991) indicates that since swiftness of money dissemination is exogenously regulated, changes in currency supply causes change in values, and any enlargement in accumulated demand are deciphered into exaggerated prices. Subsequently, the main conclusion of inflation is deliberated to be that the monetary aspect and fiscal policy have no autonomous influence on the price level. Hence, the Keynesian hypothesis is suitable when it comes to the short-run analysis. Contrarily, classical concepts of the demand side policies are articulated to be efficient in changing the productivity level. Therefore, a financial deficit ascending from augmented expense or censored in taxes might result in an escalation in cumulative demand, and this augmented demand might rise production merely if the economy is under full employment, however, in cases where the economy is previously functioning at full employment level, the outcome might be the intensification in the price level. Based on the Keynesian concept, the government finances deficits through borrowing whilst the government finance deficit by monetizing what is obtained from the central bank.

Consequently, both scenarios display financial deficits that cause price rises.

The main theory in deciding price range highlights that value level is not self-sufficiently decided by the monetarist policy, yet somewhat the consequence of the interdependence between the monetary and fiscal policies (Sims, 1994; Leeper, 1991). Fiscal institutions attempt to gratify inter-temporal budget restrictions and therefore the procedure results in price increases. In financial prevailing governments, monetary policy performs consequently to funding the fiscal desires, hence impacting the price level. However, currently, in cases where there is a possibility of monetary dominance and the central bank is autonomous in constructing policies, it will make a great effort and put a restriction on government financing through money printing. Indeed, fiscal consolidation is imaginable and price increases can be directed.

As a result, the value range in the financial dominance of governments is frequently influenced by the monetary budget position. Therefore, the comparative domination of monetary and fiscal policy concludes the inflationary influence of fiscal deficit. In emerging nations, fiscal dominance, and relative comfort of financing by seigniorage price increase the additional cost of financial burden. Thus, the anticipations concerning price increases are established upon fiscal decisions of the government which similarly contribute to inflation.

Various alternative variables may influence the range of inflation in the African countries. For instance, the expenditure of financing investment, recognized as interest rate, is considered one of the essential factors that cause inflation, particularly on the cost-push side. Different researchers have also revealed that local interest rates are the determining factor of inflation (Kose et al., 2012; Boschi & Girardi, 2007). However, trade liberalization is also linked to price rises in emerging countries. To illustrate, the study by Bowdler and Nunziata (2006) indicated that higher trade liberalization diminishes the possibility of price increases in OECD countries. Meanwhile, Lin and Chu (2013) and Samimi et al., (2012) found a negative and positive impact of trade openness on inflation, respectively.

The capacity of trade might exist merely because of the rise in imports. Hence, import values are an essential element that may forecast the range of price increases. Studies investigating the empirical relationships between import charges and the magnitude of inflation found a positive relationship between the variables (Boujelbene & Boujelbene, 2010). Therefore, import price is important in our sample countries since most

of them are net import nations (Boujelbene & Boujelbene, 2010; Boschi & Girardi, 2007).

Furthermore, Jaliil et al., (2014) for Pakistan and Boujelben and Boujelbene (2010) for Tunisia have shown several major national concerns about inflation by providing empirical models that link the supply and demand-side components, as well as strategy variables and flexible expectations. As a result, we build our regression technique by monitoring the determinants that are highlighted in the works of literature, with a special focus on the impact of the fiscal deficit on the price increases for a sample of African countries.

$$Lcpi - \alpha_0 + \alpha_1 lbd_{it} + \alpha_2 lgdp_{it} + \alpha_3 ltrd_{it} + \alpha_4 ltgexp_{it} + \alpha_5 llf_{it} + \alpha_6 lbmg_{it} + \mu_{it} \ (\mathbf{1})$$

Where lcpi is a log of the customer price index utilized to quantify price increases, lbd is the log form of the budget deficit, lgdp is the log of gross domestic product, ltrd is the log of trade openness, ltexpt is the log of overall public spending, llf is the log of the labor force, lbmg is the log of extensive money growth, $_{it}$ is the time and μ_{it} is the error term.

Indeed, Eq. (1) can be estimated without any adjustments using the ordinary least square approach due to its panel data series and literature which indicated that those spurious findings will be absent once the variables are designated in the level or non-stationary procedure. Consequently, econometricians recommend that one should investigate the long-run relationship between variables in the model. Because of that, we utilize the PMG ARDL approach because of the various highly significant outcomes reported in the literature (see Laurenceson & Chai, 2003; Pesaran & Shin, 1995).

To illustrate, it can be employed the I (0) or I (1) data series in which it offers high persistent results in a slight fragment aspect, and endogeneity is no longer a supplementary issue while we stipulate the regression mathematical statement in the ARDL framework. Thus, the ARDL approach in Eq (1) can be displayed in the following format:

$$\Delta lcpi - B_0 + \sum_{t-1}^{p} \psi_i \Delta lcpi_{t-1} + \sum_{t-1}^{p} \phi_i \Delta lbd_{t-1} + \sum_{t-1}^{p} v_i \Delta lgdp_{t-1}$$

$$+ \sum_{t-1}^{p} Y_i \Delta ltrd_{t-1} + \sum_{t-1}^{p} \delta_i \Delta ltgexp_{t-1} + \sum_{t-1}^{p} \lambda_i \Delta llpf_{t-1}$$

$$+ \sum_{t-1}^{p} \sigma_i \Delta lbmg_{t-1} + \vartheta_1 lcpi_{t-1} + \vartheta_2 lbd_{t-1} + \vartheta_3 lgdp_{t-1}$$

$$+ \vartheta_4 ltrd_{t-1} + \vartheta_5 ltgexp_{t-1} + \vartheta_6 llpf_{t-1} + \vartheta_7 lbmg_{t-1}$$

$$+ \mu_{it} \quad (2)$$

Where β_0 is the float constituent and U_t is the white noise. Moreover, the terms with synopsis symbols represent error correction dynamics. Whereas the next segment of the equation with θ_i is equivalent to long-run affiliation.

Whereby this is an error correction depiction. Therefore, an upcoming ECM is forecasted in the final stage:

$$\Delta lcpi - B_0 + \sum_{t-1}^{p} \psi_i \Delta lcpi_{t-1} + \sum_{t-1}^{p} \phi_i \Delta lbd_{t-1} + \sum_{t-1}^{p} v_i \Delta lgdp_{t-1}$$

$$+ \sum_{t-1}^{p} Y_i \Delta ltrd_{t-1} + \sum_{t-1}^{p} \delta_i \Delta ltgexp_{t-1} + \sum_{t-1}^{p} \lambda_i \Delta llpf_{t-1}$$

$$+ \sum_{t-1}^{p} \sigma_i \Delta lbmg_{t-1} + \alpha ECM_{t-1} + \mu_{it} \quad (3)$$

Before the short-run shock, the ECM data demonstrate the speed of adjustment back to long-run equilibrium.

Most prior studies in Africa mainly focused on the one-time series data aspect, while our study utilizes a panel data framework. The following points highlight the superiority of the panel data technique. To begin with, the panel data method excels in recognizing the time-difference relationship between independent and dependent variables (Ashraf, 2017). From the underlying panel data, the panel data methodology extracts both cross-sectional and time-series variance, reducing issues like multicollinearity, heteroscedasticity, and estimate bias (Woorldridge, 2010).

To confirm the fitness of the model, the analytic and stability tests are similarly performed, whereby an analytical test investigates the serial correlation together with the functional form, heteroscedasticity, and normality relationship through the proposed model. Persan and Persan (1997) proposed utilizing the cumulative (CUSUM). Thus, the CUSUM figure is restructured recursively and schemed contrary to the contravention point. If the plots of CUSUM statistics stay inside a critical bond of a 5% level of significance, the null hypothesis of the steady coefficient in the specified regression cannot be rejected.

3.1 A Panel Unit Root Test

The instruction of incorporation (stationarity) in the data was analyzed utilizing the tests conducted by Lin, Levin, and Chu (LLC) as designed by Levin et al., (2002) namely the Im-Pesaran-Shin (IPS), ADF-Fisher, and PP-Fisher panel unit root test established by Im et al., (2003). The null hypothesis in the panel unit root testing is that the variables include a panel unit root, but the alternative hypothesis shows that the separate panel series is stationary. Thus, Baltagi (2008) described a major structure utilized by most panel unit root examining techniques in the following formats.

$$\Delta Y_{it} = \alpha_i + p_i Y_{i,t} + \sum_{j,i}^{p} \phi_{ij} \Delta Y_{it} 1 + \varepsilon_{i,t} \tag{4}$$

Where the $\gamma_{i,t}$ is the deterministic components and Δ are the first differences of variables γ_{it}. He described that $\rho_i = 0$ means the γ procedure has a unit root for individual i, while $\rho_i < 0$ indicates the procedure is stationary around the deterministic portion (Baltagi, 2008).

3.2 Panel Co-integration Test

The next stage of our practical investigation mainly focuses on Pedroni's co-integration test to investigate the probability of a long-run relationship between budget deficit and inflation for the panel of African economies. Pedroni (1999, 2004) proposed the heterogeneous panel co-integration test, which allows cross-section dependency with a range of individual influences. As a result, the empirical specification for the Pedroni co-integration in terms of the equation is given below in the following format:

$$Log\ CPi_{it} = \eta_i + \delta_{it} + \beta_{1i}logbd_{it} + \beta_{2i}loggdP_{it} + \beta_{3i}logtrd_{it}$$
$$+ \beta_{4i}logtgexP_{it} + \beta_{5i}loglPf_{it} + \beta_{6i}logbmg_{it}$$
$$+ \varepsilon_{it} \qquad\qquad (5)$$

i = 1, 2, N denotes every nation in the panel, and t = 1.2, T denotes the time, ηi δi is state and time immobile influences. Ɛit embodies the estimated residuals, whereby it denotes aberration from the long-run linkages.

Pedroni (1999) suggested seven types of measurements for co-integration. The initial four (Panel v-statistic, Panel PP-statistic, Panel p-statistic, and Panel ADF-statistic) are all established on pooling, which is assigned as "inside" measuring. The final three (cluster PP-statistic; group p-statistic, and group ADF-statistic) are established as the "among" element. As a result, the panel v-statistic is a one-sided test that rejects the null hypothesis of no co-integration with a big positive number. Huge negative standards, on the other hand, reject the null hypothesis of no co-integration in the remaining data.

4. Empirical Findings

Before proceeding with the empirical findings in our study, we decide to demonstrate both the descriptive statistics and variance inflation factor as analyzed in Table 1.

Table 1. Descriptive Statistics and Variance Inflation Factor Results

Items	Obs	Minimum	Maximum	Mean	Standard Deviation	VIF
INF	180	-0.6920	150.3227	9.4859	13.6869	
GDP	180	-8.2407	12.0140	2.5330	2.9393	1.13
LPF	180	44.7800	89.6500	63.4559	14.9422	1.14
TGEXP	180	5.9027	22.5655	14.0044	4.2238	1.56
TRD	180	9.9551	110.0459	53.9735	18.6661	1.19
BMG	180	-0.7575	111.8263	18.0694	14.1911	1.27
BD	180	-242.0000	13.9600	-5.1338	18.2157	1.00
Mean VIF						1.22

Source: Author's Computation

From the above statistical numbers, inflation displays the following figures: -0.69(minimum), 150.32(maximum), 9.48(mean), and 13.68(standard deviation). However, the budget deficit demonstrates the values of 242.00(maximum), 13.96(mean), and 18.21(Std). Based on the variance inflation factor, it is revealed that the multicollinearity issue

does not exist since most of the values are below 10 percent (Ferrar & Gluaber, 1967).

The beginning point in forecasting a panel data set is to examine the range of incorporation of the variables under investigation. Nonetheless, ARDL works regardless of the detail in case the data series are I (0) or I (1); however, ARDL does not operate in the situation of I (2) data series. Thus, the examination process of stationarity is motionless accurate. Because of that, we employed the Levin Lin and Chu (LLC) and Im-Pesaran Shin (IPS) tests. The outcomes are displayed in Table 2.

Table 2. Result of Panel Unit Root

Tests Variables	Levin, Lin and Chu (LLC) test at level	Levin, Lin and Chu (LLC) test at 1st difference	Im-Pesaran –Shin (IPS) test at level	Im-Pesaran –Shin (IPS) test at 1st difference	Inference
Log Y(INF)	-2.4241(0.0077) **	-6.3821(0000) ***	-2.9010(0.0063) ***	-8.2719(0.0000) ***	I(1)
Log BD	0.6289	-4.0669(0.0000) ***	-1.0172	-7.3233(0.0000)***	I(1)
Log GDP	-2.7021(0.0034)**	-8.3875(0.0000)***	-3.2705(0.0005)**	-9.1283(0.0000)***	I(1)
Log TRD	-0.5088	-4.8455(0.0000)***	0.9706	-4.9480(0.0000)***	I(1)
Log LPF	-3.7908(0.0001)**	-1.7393(0.0410)**	-0.8036	-1.6361(0.0509)**	I(1)
Log BMG	-3.3241(0.0004) **	-8.6585(0.0000) ***	-2.7513(0.0030) **	-9.3043(0.0000) ***	I(1)
Log TGEXP	0.0312	-2.6646(0.0039) **	0.5071	-3.8493(0.0001) **	I(1)

Notes: INF=inflation, BD=budget deficit, GDP=gross domestic product, TRD=trade, LPF=labor force, BMG=broad money growth, TGEXP=total government expenditure.

Source: Author's Computation. ***, ** and *indicate the significance level at 1%, 5% and 10% respectively.

The findings show that the overall variables are stationary and integrated of order one I (1). This indicates the robust justification for utilizing the PMG ARDL model to examine the existence of a long-run relationship between the variables. Before indicating the instruction of incorporation, we examined the long-run relationship between the variables. Earlier when examining the presence of co-integration, we selected the

optimum lag dimension. Nonetheless, Ang (2010) suggested the usage of the one lag dimension in the existence of short-period data. At this time, we employed the 1 lag length and found robust evidence for the long-run relationship when likened to Pesaran et al. (2001). Indeed, the results shown in Table 3 for the results of Pandora's panel co-integration confirmed the existence of a long-run relationship between the variables.

Table 3. The Panel Co-integration Test Result

Test	Test Statistic
Pedroni Test	
Within dimensions	
Panel v-stat	-1.9779
Panel rho-stat	2.2972
Panel PP-stat	-7.0578(0.0000) ***
Panel ADF-stat	-3.2056(0.0000) ***
Between dimensions	
Group ρ-stat	3.2548
Group PP-stat	-9.0268(0.0000) ***
Group ADF-stat	-2.6629(0.0039) **

Notes: ***, ** and *indicate the significance level at 1%, 5% and 10% respectively.

Subsequently, we forecasted Eq, (2) using the ARDL co-integration approach for the long-run estimations. Based on the long-run equation, the budget deficit coefficient is positive and statistically significant at 10 percent. Specifically, the coefficient level of 0.1243 indicates that a one percent increase in the budget deficit will lead to a 0.1243 rise in inflation. Our findings are consistent with (Duodu et al., 2022). The positive relationship between fiscal deficit and price increases is in line with the fiscal theory of price range which describes inflation as a financial marvel (Sims, 1994; Leeper, 1991). Our finding that budget deficit influences inflation positively, in the long run, was also reported in several prior studies in the African region (Eita, 2021; Myovella & Kisava, 2018; Bwire & Nampawo, 2014).

Furthermore, the broad money growth result based on the long-run equation demonstrated a positive and statistically significant influence on inflation at a one percent level. This reveals that a one percent increase in broad money growth will result in a 0.5066 rise in inflation. This finding is in line with prior studies that found a long-run positive relationship between money growth and inflation (e.g., Roffia & Zaghini, 2007; Grauwe & Polan, 2005). Likewise, the labor force variable was

found to have a positive coefficient of 4.2285 at a statistically significant level of 5 percent. This is consistent with previous empirical studies that found a positive relationship between budget deficit and labor force in the long run (e.g., Israel, 2015; Touny, 2013; Haq et al., 2012). Finally, the variables of gross domestic product, trade, and government expenditure were found to be insignificant in the long-run equation.

**Table 4. Findings of the PMG ARDL Model**

Variable	Coefficient	Std. Error	T-Statistics	Probability
		Long Run Equation		
LBD	0.1243	0.0665	1.8674	0.0647*
LBMG	0.5066	0.1119	4.5257	0.0000***
LGDP	-0.0082	0.0486	-0.1686	0.8664
LLPF	4.2285	1.4793	2.8584	0.0052**
LTEXP	-0.3839	0.4140	-0.9273	0.3560
LTRD	0.3532	0.3750	0.9420	0.3485
		Short Run Equation		
COINTEQ01	-0.8381	0.1062	-7.8908	0.0000***
D(LBD)	-0.1684	0.1062	-1.5899	0.1150
D(LBMG)	-0.4978	0.1578	-3.1543	0.0021**
D(LGDP)	-0.0746	0.0516	-1.4447	0.1516
D(LLPF)	-47.0185	63.2728	-0.7431	0.4591
D(LTGEXP)	-0.8693	1.1762	-0.7391	0.4661
D(LTRD)	0.5043	0.6815	0.7400	0.4610
C	-6.4472	0.8504	-7.5811	0.0000***
@TRAND	0.0065	0.0078	0.8343	0.4060
Diagnostic Test				
Normality	0.2143			
Functional Form	0.0172			
Heteroscedasticity	0.0721			
Serial Correlation	0.0362			
CUSUM	Stable			

Notes: ***, ** and *indicate the significance level at 1%, 5% and 10% respectively.

However, based on the short-run equation, only broad money growth exhibited a negative and statistically significant influence on inflation. This result is consistent with the study of Wu (2002) who found that money growth has an unusually negative impact on inflation.

The chi-square p-values for the null hypothesis of ordinary dissemination error, adequately described functional design, and no serial correlation and homoscedastic bias are reported in the lower section of Table 4. Furthermore, the p-values support the model's good description, as well as the null hypothesis of residual normality, serial interaction, and homoscedastic bias. Furthermore, the CUSUM figure's conspiracy is well within the crucial boundaries, showing that all the correction model's constants are stable.

Figure 2. CUSUM Test
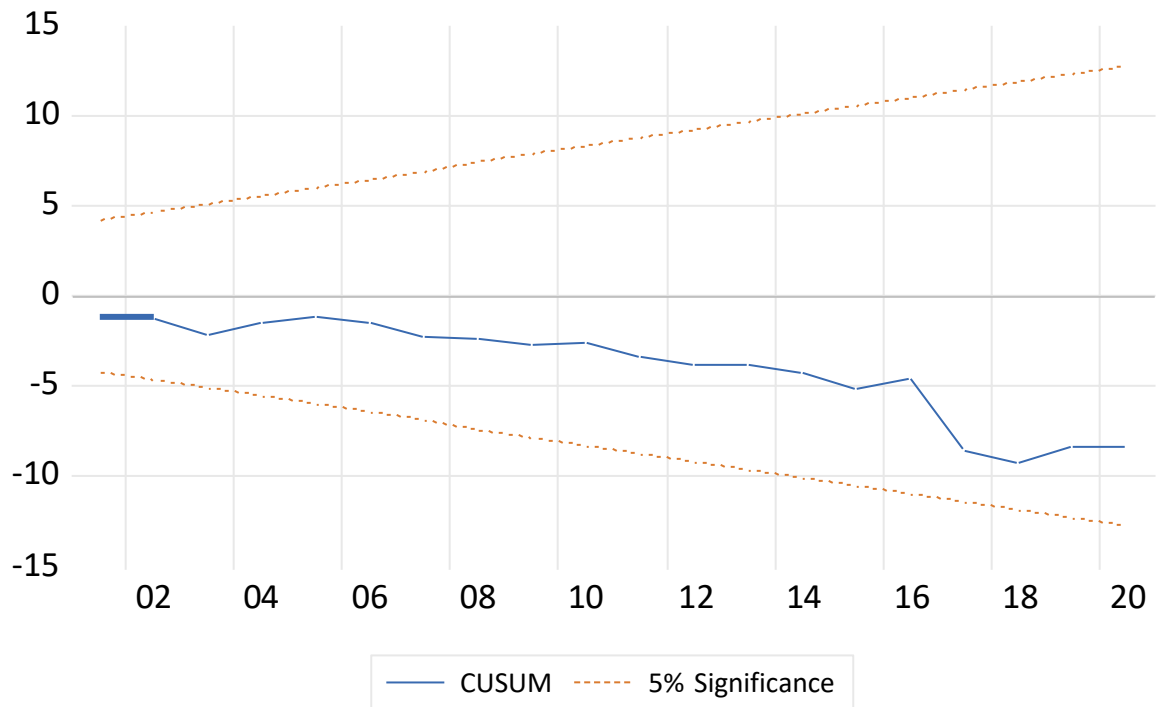
5. Conclusion and Policy Implications

This study clarifies the potential contributing factor of inflation with a special focus on budget deficit by employing the PMG ARDL method for the period from 2001 to 2020. The long-run estimations equation indicates that fiscal deficit has a positive influence on inflation in the long run. Likewise, the findings revealed the effects of broad money growth and labor force participation rate on inflation in the long run whereby the broad money growth can be related to fiscal domination. Conversely, regarding the short-run equation, only broad money growth has a negative coefficient and statistically significant effect on inflation in the short run. Therefore, our findings support the existence of Fiscal Theory of Price Level (FTPL) in African context as it capable to explain the relationship between budget deficit, money supply and inflation results.

It appears that both classical and monetarist hypothesis does not hold in African context.

The study's findings have policy implications for the sampled countries and other African nations with similar characteristics. Based on the positive effect of the budget deficit on inflation, the study suggests that a reduction in government spending is a surefire method for reducing inflation, as this minimizes government expenditure. Therefore, the study recommends government expenditure cuts. Specifically, this can be accomplished by reducing expenditure on unproductive sectors of the economy, shrinking the government, and implementing stringent measures to control the bureaucratic nature of government officials. In addition, the government should make a concerted effort to keep expenditure within the budgeted amount. This will ensure that government expenditures remain within the budget to prevent or reduce budget deficit. Another implication of the findings is that policymakers should focus more on the budget deficit than the money supply when attempting to control inflation. Overall, assuring a reduction in government expenditure, government size, and budget deficit is likely to result in stable and favorable inflation in the African economy, which is also likely to promote economic development and growth.

Conversely, there is a caveat in generalizing the current study's findings to other African countries because the data used is exclusive to certain African countries, which becomes a weakness of the study. Given this, future research should increase the number of countries to increase generalization and validate the current findings.

Acknowledgments

References

Aisen, A., & Veiga, F. J. (2008). The political economy of seigniorage. Journal of Development Economics, 87(1), 29-50.

Ang, J. B. (2010). Does foreign aid promote growth? Exploring the role of financial liberalization. Review of Development Economics, 14(2), 197-212.

Ashraf, B. N. (2017). Political institutions and bank risk-taking behavior. Journal of Financial Stability, 29, 13-35.

Bajo-Rubio, Ó, Díaz-Roldán, C., & Esteve, V. (2009). Deficit sustainability and inflation in EMU: An analysis from the Fiscal Theory of the Price Level. European Journal of Political Economy, 25(4), 525-539.

Baltagi, B. H. (2008). Forecasting with panel data. Journal of forecasting, 27(2), 153-173.

Boschi, M., & Girardi, A. (2007). Euro-area inflation: long-run determinants and short-run dynamics. Applied Financial Economics, 17(1), 9-24.

Boujelbene, T., & Boujelbene, Y. (2010). Long-run determinants and short-run dynamics of inflation in Tunisia. Applied Economics Letters, 17(13), 1255-1263.

Bwire, T., & Nampewo, D. (2014). Fiscal deficits financing: implications for monetary policy formulation in Uganda. Journal of Applied Finance and Banking, 4(2), 125.

Chukwuani, V. N., & Egiyi, M. A. (2020). Nexus between Budget Deficit and Inflation: Granger-causality Test Approach. International Journal of Academic Accounting, Financing & Management Research. Nexus, 4(10), 19-23.

Cukierman, A., Sebastian, E., & Guido, T. (1992). Seigniorage and political economy. Am Econ Rev, 82(3), 537-555?

Domaç, I., & Yücel, E. M. (2005). What triggers inflation in emerging market economies? Review of world economics, 141(1), 141-164.

Durevall, D. (1998). The dynamics of chronic inflation in Brazil, 1968–1985. Journal of Business & Economic Statistics, 16(4), 423-432.

Duodu, E., Baidoo, S. T., Yusif, H., & Frimpong, P. B. (2022). Money supply, budget deficit and inflation dynamics in Ghana: An empirical investigation. Cogent Business & Management, 9(1), 2043810.

Eichengreen, B., & Gupta, P. (2013). Tapering Talk: The Impact of Expectations of Reduced Federal Reserve Security Purchases on Emerging Markets", World Bank Working Paper.

Eita, J. H., Manuel, V., Naimhwaka, E., & Nakusera, F. (2021). The Impact of Fiscal Deficit on Inflation in Namibia. Journal of Central Banking Theory and Practice, 1, 141-164.

Farrar, D.E. and Glauber, R.R., (1967). Multicollinearity in regression analysis: the problem revisited. The Review of Economics and Statistics, pp.92-107.

Fisher, I. (1911). Recent changes in price levels and their causes. The American Economic Review, 1(2), 37-45.

Friedman, M. (Ed.). (1956). the Quantity Theory of Money: A Restatement. Studies in the Quantity Theory of Money.

Grauwe, P. D., & Polan, M. (2005). Is inflation always and everywhere a monetary phenomenon? Scandinavian Journal of Economics, 107(2), 239-259.

Habibullah, M. S., Cheah, C. K., & Baharom, A. H. (2011). Budget deficits and inflation in thirteen Asian developing countries. International Journal of Business and Social Science, 2(9).

Haq, I. U., Khan, A., & Ahmed, E. (2012). Phillips curve or locus critique: time series evidence from Pakistan. Journal of Economics and Behavioral Studies, 4(4), 190-193.

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. Journal of Econometrics, 115(1), 53-74.

Israel, K. F. (2015). Reconsidering the long-run relationship between inflation and unemployment (No. 1). Working Paper.

Jalil, A., Tariq, R., & Bibi, N. (2014). Fiscal deficit and inflation: new evidence from Pakistan using a bound testing approach. Economic Modelling, 37, 120-126.

Kassouri, Y., & Altıntaş, H. (2021). Cyclical drivers of fiscal policy in sub-Saharan Africa: New insights from the time-varying heterogeneity approach. Economic Analysis and Policy, 70, 51-67.

Kose, N., Emirmahmutoglu, F., & Aksoy, S. (2012). The interest rate–inflation relationship under an inflation targeting regime: The case of Turkey. Journal of Asian Economics, 23(4), 476-485.

Laurenceson, J., & Chai, J. C. (2003). Financial reform and economic development in China. Edward Elgar Publishing.

Leeper, E. M. (1991). Equilibria under 'active and 'passive monetary and fiscal policies. Journal of Monetary Economics, 27(1), 129-147.

Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. Journal of Econometrics, 108(1), 1-24.

Lin, H. Y., & Chu, H. P. (2013). Are fiscal deficits inflationary? Journal of International Money and Finance, 32, 214-233.
Mawejje, J., & Odhiambo, N. M. (2020). The determinants of fiscal deficits: a survey of literature. International Review of Economics, 67(3), 403-417.

McCallum, B. T. (2003). Is the fiscal theory of the price level learnable? Working Paper No.9961

Myovella, G. A., & Kisava, Z. S. (2018). Budget deficit and inflation in Tanzania: ARDL bound test approach. Journal of Business Economics and Finance, 7(1), 83-88.

Niepelt, D. (2004). The fiscal myth of the price level. The Quarterly Journal of Economics, 119(1), 277-300.

Okech, T. C., Mweni, F. T., & Njuguna, A. G. (2016). The effect of external debt on inflation rate in Kenya, 1972-2012.

Oladipo, S. O., & Akinbobola, T. O. (2011). Budget deficit and inflation in Nigeria: A causal relationship. Journal of Emerging Trends in Economics and Management Sciences, 2(1), 1-8.

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. Oxford Bulletin of Economics and Statistics, 61(S1), 653-670.

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. Econometric Theory, 20(3), 597-625.

Pekarski, S. (2011). Budget deficits and inflation feedback. Structural Change and Economic Dynamics, 22(1), 1-11.

Persan, M. H., & Pesaran, B. (1997). Microfit 4.0: an interactive econometric analysis. Oxford University Press.

Pesaran, M. H., & Shin, Y. (1995). An autoregressive distributed lag modeling approach to cointegration analysis. Working Paper.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches the analysis of level relationships. Journal of applied econometrics, 16(3), 289-326.

Roffia, B., & Zaghini, A. (2007). Excess money growth and inflation dynamics. International Finance, 10(3), 241-280.

Samimi, A. J., Ghaderi, S., Hosseinzadeh, R., & Nademi, Y. (2012). Openness and inflation: New empirical panel data evidence. Economics Letters, 117(3), 573-577.

Sims, C. A. (1994). A simple model for the study of the determination of the price level and the interaction of monetary and fiscal policy. Economic theory, 4(3), 381-399.

Ssebulime, K., & Edward, B. (2019). Budget deficit and inflation nexus in Uganda 1980–2016: a cointegration and error correction modeling approach. Journal of Economic Structures, 8(1), 1-14.

Tiwari, A. K., Tiwari, A. P., & Pandey, B. (2012). Fiscal deficit and inflation: What cause what? The case of India. Journal of International Business and Economy, 13(1), 57-81.

Touny, M. (2013). Investigate the long-run trade-off between inflation and unemployment in Egypt. MPRA Paper No.54561

Wooldridge, J. M. (2010). Econometric analysis of cross-section and panel data. MIT press.

Zakaria, M. (2010). Openness and inflation: evidence from time-series data. Dogus University Dergisi, 11,313-322.