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Fiscal deficit and inflation rate in selected African Regional Blocs: A comparative analysis

By Ebenezer A. OLUBIYI [a†]
& Michael A. BOLARINWA [b]

Abstract. This study investigates the effect of fiscal deficit on inflation rate in selected African countries. The data collected spans 22 years from 1994 to 2015. The countries considered are Egypt, Kenya, Mali, Nigeria, and South Africa. The selection of these countries was based on the countries with highest fiscal deficit or inflation rate in each of the geo-political zones in Africa. Based on the nature of the data, an autoregressive distributed lag (ARDL) in the context of Keynesian model of aggregate expenditure was specified and estimated. The result shows that inflation effect of fiscal deficit is country specific and period specific. Out of the five countries considered, it is only in Nigeria and South Africa that inflation is affected positively by fiscal deficit in the short run. In the long run, Nigeria is the only country where inflation rate is affected positively by fiscal deficit. In Egypt, there was no short run effect of fiscal deficit while in Kenya, there was negative effect. Recommendations were proffered based on these results.
Keywords. Inflation, Fiscal deficit, Autoregressive distributed lag.
JEL. E24, F40, J30.

1. Introduction

The relationship between fiscal deficits and inflation has been a widely debated topic among economists and policy makers in both developed and developing countries. From the theoretical point of view, lower fiscal deficits should reduce real interest rates, increase investment, with resultant effect of increase in real income (Cebula, 2000). The reduction in real interest rate is as a result of increase in inflation rate, holding nominal interest rate constant. The reduction in real interest rate will increase incentive for demand for investment, mount pressure on money demand and hence inflation rate. This implies that although fiscal policy plays a key role in the sustenance of economic growth and achievement, it could also lead to increase in inflation rate.

The persistent government fiscal deficits have become a major concern across the Globe because of its concomitant macroeconomic effects (Olomola & Olagunju, 2004), In the developing countries and particularly Africa, much of the economic crises that were experienced by the region been blamed on huge fiscal deficits. This is because rather than spending the borrowed money on capital expenditure such as building roads and dams improving education and health sectors, which may improve standard of living of the people, and hence, their productivity which in turn, may improve the country's economic growth, this

[a†] Department of Economics, Federal University of Agriculture Abeokuta, Nigeria; Researcher: Africa Economic Research Consortium; Nairobi, Kenya; Associate Researcher: Trade Policy Research and Training Programme.
. +234803 218 4121
. olubiyiea@funaab.edu.ng
[b] Department of Economics, Covenant University, Sango Otta, Ogun State Nigeria.
. +adebolarinwa@yahoo.com
. qayyumdr@gmail.com

borrowed money was spent on pension, transfer payment and other nonproductive activity.

Although, it is hardly possible to achieve sustained growth financed by fiscal deficit without some amount of inflation, lack of efficient macroeconomic management could trigger the inflationary spiral of fiscal deficit with little or no real growth effect. Hence it important to explore further the situation in Africa. Specifically, this study seeks to examine the effect of fiscal deficit on inflation in SSA and to investigate when such effect is of concern,

Of course various attempts have been made by researchers concerning the effect of fiscal deficits on inflation. Most studies agreed that there exists a unidirectional relationship running from fiscal deficits to inflation (Olayungbo, 2013; Oladipo & Akinbobola, 2011). There're are few studies that argue that there is no significant relationship between fiscal deficit and inflation Ojarikre & Ezie (2015), and Dockey, Ezeabasili & Herbet (2012). This show clearly that the relationship between fiscal deficit and inflation is indecisive. Further, virtually all these studies examined the case of Nigeria and so, there is no possibility of comparing the case with other African countries. This study seeks to investigate a comparative analysis of the relationship between fiscal deficit and inflation in five countries (each selected from 5 geo-political zones in Africa) with highest fiscal deficit and inflation rate. Not only that, this study employs a new technique that is rarely used fiscal deficit-inflation literature in Africa, that is, the Autoregressive Distributed Lag (ARDL). Apart from the ability to deal with endogeneity problem, this method is also capable of estimating both short and long run effects of fiscal deficit on inflation rate

2. Literature review

Several papers have investigated the role of fiscal deficit in the behavior of inflation. Ayo, Ifeakachukawu & Ditimi (2012) examine a trivariate causality test among economic growth, government expenditure and inflation rate in Nigeria over the period 1970-2010. The study seeks to investigate the long run relationship between economic growth, government spending and inflation utilizing Vector Autoregressive (VAR). The a priori expectation in their study was based on Keynesian theory which postulates that public expenditure, financed through deficit is an exogenous factor and policy instrument for increasing economic growth without any seeming effect on inflation rate in the short run but continuous fiscal deficit in the medium run. The empirical result actually confirm this postulate as positive and significant effect of government spending on inflation was found in the face of increases economic growth.

However, the work of Ojarikre & Ezie (2015) provides a contrary evidence in Nigeria. The authors found no statistically significant effect of fiscal deficit on inflation rate.

The study of Olayungbo (2013) was based on the a symmetry causality test between government spending and inflation in Nigeria between 1970-2010, utilizing vector autoregressive method in the context of the neo-classical doctrine who are of the believe that government spending in terms of intervention result to high inflation. The study attempts to move beyond the outcomes of the classical causality test and allow asymmetry causal relationship. The result shows a uni-directional causality running from low or contractionary government spending to high inflation rate in Nigeria. The study argue that high inflation is state dependent, which means contractionary government spending strongly drives inflation rate in Nigeria. Reduction in government spending may lead to reduction in output and which may lead to rise in the prices of the few available goods.

Dockey, Ezeabasili & Herbet (2012) investigated the relationship between fiscal deficits and inflation in Nigeria for the period 1970-2006. The study employed vector error correction model in the context of both Classical and Keynesian theories. The vector error correction model was utilized because it helps in determining the short-run and long-run interdependence and the causal linkage

between fiscal deficits and inflation. The utility of this approach is that it eschews the spurious regression problem and, more importantly, offers a parsimonious time series approach based on a general model with a dynamic structure. The result from the VECM indicated that there exist a positive but insignificant relationship between inflation and fiscal deficit. There is however a positive long run relationship between money supply and inflation, suggesting that money supply is not only procyclical but also aids inflation rate.

Oladipo & Akinbobola (2011) examine the causal relationship between budget deficit and inflation in Nigeria and employed regression analysis in the study. The model adopted in this study, has its backing from the Neo-classical school of thought. The study revealed that there exist a unidirectional causality between inflation and budget deficit in Nigeria. Furthermore, the result in the study showed that budget deficit affects inflation directly and indirect rough fluctuations in exchange rate in the Nigerian economy. Awe & Shina (2012) examines the nexus between budget deficit and inflation in Nigerian economy from 1980-2009 by employing the vector error correction model. Vector error correction model is employed in the study in other to establish the relationship between variables and to know which of these variables causes the other. The model adopted in the study has its backing from the Keynesian hypothesis that government has to motivate the aggregate demand side of the economy in order to stimulate economic growth. Emperical evidence from the research of the study has shown that there is a positive relationship between budget deficits and inflation in the Nigerian economy. The study revealed that budget deficits affect inflation directly and indirectly through increase in money supply in the Nigerian economy.

Ezeabasili, Mojekwu & Hebert (2012) made an assessment on the empirical analysis of fiscal deficits and inflation in Nigeria using data over 1970-2006 and employed regression techniques in analyzing there result. Regression techniques was employed to determine whether past levels of fiscal deficits have any positive or significant role to play on inflation in the Nigeria economy. The study had its theoretical foundation from the monetarist proposition, who believe that money supply is procyclical and tends to grow at a faster rate than inflation rate. However, the study reported the existence of a positive long run relationship between money supply and inflation in the Nigerian economy, suggesting that money supply is procyclical and tends to grow at a faster rate than inflation rate.

Anfofum, Yahaya & Suleman (2015) empirically investigated the relationship between fiscal deficits and inflation in Nigeria using annual time series data spanning forty-two years. The study employed vector error correction model and reveals that fiscal deficits exert positive pressure on inflation. The model adopted in the study was based on the Keynesian hypothesis. In the study it was concluded that a fiscal management process that encourages increase revenue and reduction of external debt as well as a high practice of transparency in financial obligation will reduce the level of inflation. The conclusion in the study conformed with the a priori expectation that increase in government deficits cause key changes in the level of tangible macroeconomic variables. Because of this, fiscal deficits resulting from persistent increases in public spending or tax reductions increase aggregate demand and, in the process, result in a rise in the price level of goods and services which in turn increase the cost of investment.

Oseni (2015) examines the impact of fiscal policy on inflation volatility in Nigeria, using the framework of error correction mechanism. The results of the study show that discretionary fiscal policy has a transitory effect on inflation volatility in the short-run and a significant negative effect on inflation volatility in the long-run. The results further show that oil price volatility and exchange rate volatility have negative and significant effects on inflation volatility in the long-run while the fluctuations caused by the level of inflation to its volatility is minimal in the long-run compared to the short-run effect.

Oseni & Ogunmuyiwa (2016) examines the direction of causality between fiscal policy and inflation volatility in Nigeria using secondary quarterly time series data

from 1981:1-2013:3 and employed vector autoregressive model. The study adopted Keynesian theory of inflation for analyzing the direction of causality between fiscal deficit and inflation volatility in Nigeria. The Keynesian theory is a short run analysis theory. It is based on the assumption that there exist unemployed resources in the economy. The authors believe that fiscal deficit can be linked to inflation under the Keynesian theory since it supports the use of fiscal deficit to sustain the economy in periods of economic meltdown (recession), and if fiscal deficit is not properly channeled into productive activities in an economy, this could aggravate inflation. The main findings of the study are that fiscal deficits and inflation volatility have bidirectional causality.

Sekinat, Kabir & Bankole (2016) investigated the nature and direction of causality between budget deficit and inflation in Nigeria from 1980-2010 using regression analysis techniques. The model adopted in this study had its backing from the Neo-classical school of thought. Accordingly, if the budget deficit is monetized, it increases the money supply thereby increasing the price level. Based on the Neo-classical hypothesis, the researchers identified that the problem of multicollinearity will occur by using money supply and budget deficit as explanatory variable in regression analysis. Therefore, in order to estimate the effect of the budget deficit on inflation, the budget deficit is used as explanatory variable in the model. The result of the study revealed that there is a causal relationship between budget deficits and inflation. The study suggests that inflation has equilibrium condition with budget deficit, gross domestic product and exchange rate, which keep them in proportion with each other in the long run.

Makochekanwa (2008) examines the impact of budget deficit on inflation in Zimbabwe economy for the period 1980-2005. The result of the study revealed that government expenditures and economic growth both in the short run and in the long run. Also, it was revealed that in the short run a unidirectional causality existed from economic growth and government expenditure to inflation rate while no feedback from inflation rate was observed. Due to massive monetization of the budget deficit, significant inflationary effects are found for increases in the budget deficits.

Attari & Javed (2013) examine the causality between inflation, economic growth and government expenditure of Pakistan during the period 1980-2010. Auto regressive distributed lag model has been used to measure the long run and short run estimates. The findings are disagreeing to the new classical proposition (Ricardian equivalence), who are of the belief that a debt-finance government expenditure will not increase aggregate demand but will only make aggregate demand remain the same. According to the Ricardian equivalence, government expenditure will not increase aggregate demand because people will save the increase in their income in other to pay for future high tax that will be charged by government to offset their debt. The negative high coefficient of inflation had been found in the case of Pakistan. The study revealed that there exist a unidirectional causality between rate of inflation and economic growth and government expenditure which means that government expenditures yield positive externalities and linkages in the short run, the rate of inflation does not affect the economic growth but government expenditures do so.

Ozurumba (2012) examines the causal relationship between fiscal deficit and inflation in Nigeria for the period 1970-2009. The method of study adopted is both descriptive and analytical. The analytical tool used is the ordinary least square regression analysis employing autoregressive distributed lag model. The major findings of the study revealed that inflation is dependent on the performance of the budget deficit and there exist a uni-directional causality running from fiscal deficit to inflation, the findings in the study correlated with the Keynesian proposition of government expenditure stimulating aggregate demand used in the study.

Zonuzi, *et al* (2011) utilize bounds test approach to investigate the long run relationship between budget deficits and inflation in the Iran's economy utilizing quarterly data from 1990:1 to 2007:4, they found that inflation is significantly and

positively associated with budget deficit. Further, they obtain inflation volatility using the GARCH approach to test whether budget deficit influences inflation volatility. The estimation show a positive and significant effect. Thus, budget deficit affect not only the trend of inflation but also contribute to its volatility. Lozano (2008) analyzed the causal long-term relationship between budget deficit, money growth and inflation in Colombia using quarterly data over the last twenty-five years, period 1982Q1-2007Q4. The study revealed that the causal long-term relationship between budget deficit, money growth and inflation could vary depending on the degree of independence of the central bank and the type of monetary-policy regime.

Rotha (2004) presents panel estimations for a sample of OECD countries which suggest that fiscal policies may have an important impact on CPI inflation volatility. In particular, higher risk premia, hedging costs and unforeseen redistribution of wealth are some key factors that could impact negatively on inflation dynamics. Major results are robust for unconditional and conditional inflation volatility, the latter derived from country-specific GARCH models, and across different data frequencies, time periods and econometric methodologies. Ramona (2011) examined the impact of fiscal policy on inflation volatility in Romania during the economic crises context. The author found fiscal deficit to have strong effect on inflation volatility.

The review of empirical literature articulated is, no doubt, not exhaustive. However it represent several issues that have been raised about deficits-inflation nexus. In this respect, two related question have remained central. The first question is whether fiscal deficits and inflation has causal relationship; second question is whether the causality is direct or indirect. One consensus reached in these studies is the fact that in the long run, fiscal deficits reduce capital stocks, increase foreign debt and reduces the economic welfare of the citizens owing to an increase in the tax burden, Oladipo & Akinbobola (2011) revealed that relevant measures to enhance policy coordination among various arms of government will help in reducing inflation and stabilizing the economy. Therefore, there is need to identify the causal relationship between these two macroeconomic variables and also demonstrates whether policy instrument has been efficient in controlling inflation through deficits financing and vice-vers

3. Methodology and data

3.1. Model Specification and method of analysis

Using the Keynesian expenditure approach as a guide, inflation may influence be influenced by exogenous government spending (financed by external debt) in the medium to long run but in the short run, there will not be any effect of fiscal deficit on inflation. Hence, the relationship between inflation and fiscal deficit is specified in equation 1

$$INF = F(EXTD, X) \tag{1}$$

where INF is inflation rate, EXTD is external debt (a proxy for fiscal deficit) and X is the cathall variables in the inflation model. The prominent variables in X are money supply and exchange rate. Hence including these variables, equation 1 is modified to produce equation 2

$$INF = F(EXTD, BDM, REXR) \tag{2}$$

where BDM is broad money, that is M_2 while REXR is the effective exchange rate (nominal).

There are many methods that can be used to estimate equation 2. However, the choice of estimation method employed for this study is the autoregressive distributed lag (ARDL). Following Erkam & Cetinkaya (2014), ARDL is useful

when series are found to be alternative level of integration, say I(0) and I(1). ARDL is a standard least squares regression that include lags of both the dependent variable and explanatory variables as regressors and it also contains the short-run dynamics and long run effect. ARDL model is actually a new concept in econometrics but it has gained popularity in recent years as a method of examining co-integrating relationships between variables through the work Pesaran & Shin (1998) and Pesaran, Shin & Smith (2001). The Bounds testing methodology has some advantage over conventional co-integration testing approaches because it can be used with a mixture of I(0) and I(1) data, and again, it involves just a single-equation set-up, making it simple to implement and interpret.

After transforming the variables in equation 2 to their logarithmic form, the ARDL (parsimonious and long run) specification is provided in equation 3

$$\Delta INF_t = \beta_1 + \beta_2 extd_t + \beta_3 bdm_t + \beta_4 rexr + \phi_1 \sum_{i=1}^{p} \Delta INF_{t-i} + \phi_2 \sum_{i=o}^{q} \Delta extd_{t-i} + \phi_3 \sum_{i=0}^{r} \Delta bdm_{t-i} + \phi_4 \sum_{i=0}^{s} \Delta rexr_{t-i} + \varsigma_1 conit_{t-1} \quad (3)$$

where the lower case indicate the logarithmic transformation of the variables specified in equation The parameters β_i (I = 1, 2, 3, 4) are the long-run effects while ϕ_j (j = 1, 2, 3 ,4) and are the short-run dynamic and Δ is the first difference operator. The ς_1 is the coefficient that measures the speed of convergence to the long run, provided long run relationship exists. Equation 3 is estimated for each country, that is, Egypt, Kenya, Mali, Nigeria and South Africa.

3.3. Measurement issue, definition of variables and sources of data

The variables considered in for the estimation is as articulated in equation 3. The variables are inflation, effective exchange rate index (2010 = 100), broad money (% of GDP), and external debt which serves as proxy for fiscal deficits. The reason for using external debt to proxy fiscal deficit is that data are much more accessible across countries than any other proxy. Further, this variable is commonly. Inflation the persistent increase in the general price level over a period of time. In this study, consumer price index was used to compute inflation rate. The computation uses the log of difference of consumer price index.

Effective exchange rate is the weighted average of a country's currency relative to an index or basket of other major currencies, without adjusting for the effects of inflation. The weights are determined by comparing the relative trade balance of a country's currency against each country within the index. This exchange rate is used to determine an individual country's currency value relative to the major currencies in the index. Broad Money is the most inclusive method of calculating a given country's money supply. The money supply is the totality of assets that households and businesses can use to make payments or to hold as short-term investments, such as currency, fund in bank accounts and anything of value resembling money. External debt is the total debt a country owes to foreign creditors, complemented by internal debt owed to domestic lenders and they are in form of tied loans, meaning that these have to be used for a predefined and serve as a way in which government of a country embarks on deficit financing. Data were collected for all the variables from the World Development Indicator (WDI, 2018).

4. Results and discussions

4.1. Descriptive Statistics

Table 1 summarizes the properties of the variables in the countries under study. In Mali, the mean of the broad money was 22.3 compared to Kenya that had a mean growth of broad money being 38. Nigeria, Egypt and South Africa posted a mean of 22.3, 83.9 and 62.7 growth of broad money respectively. This suggest that the growth of broad money was the highest in Egypt followed by South Africa and then Kenya. Mali had the least average growth of broad money. The corresponding

means of external debt in Mali, Kenya, Nigeria, Egypt and South Africa are 2.9, 8.6, 23.3, 34.2 and 65.1. South Africa had the highest mean growth of external debt followed by Egypt and then Nigeria. The mean inflation rate was the highest in Nigeria, posting 20.6. The second country with highest mean of inflation rate was Egypt with 8.3. Again, Mali had the least average inflation rate. The mean, maximum and minimum values for each series in each country is accordingly presented in the Table.

The important property of the series is the normality distribution provided by the values of the Jaqu-Bera. These values across countries and series reveal that some of the variables are not normally distributed. Series that are not normally distributed are inflation rate in Mali, Kenya and Nigeria; external debt in Kenya and Egypt; exchange rate in Nigeria and broad money in Nigeria. The implication of this is that these series cannot be used as it is ordinary least square because it has violated the normality condition. The use of ARDL should be able to correct this anomaly and this is one of the justifications for utilizing the method.

Next is the result of the unit root test. This study employs both augmented Dickey-Fuller (ADF) and Phillip-Peron (PP) tests and the results are presented in Table 2a and 2b. The estimated results of ADF and PP test in the table indicate that all the variables are stationary at level and first difference. The justification that all series in the Tables are stationary at first difference and level is confirmed by the probability value (P.V) at level and at first difference for Fisher Chi-Square and Choi Z-Stat with the null hypothesis that the series has unit root test. If the value is significant then the null hypothesis is rejected in favour of the alternative hypothesis Looking at the ADF and the PP results, external debt is the only series that the null hypothesis cannot be rejected at levels, in all the countries other series were integrated of order one. Hence the series contain a mix of I(0) and I(1) and so, the use of OLS is irrelevant in favour of the ARDL.

Table 1. *Descriptive statistics of the Variables*

VARIABLES	MALI				KENYA				NIGERIA			
	BDM	EXTD	INF	REXR	BDM	EXTD	INF	REXR	BDM	EXTD	INF	REXR
Mean	22.319	2.869	3.777	545.758	38	8.628	9.942	57.367	22.3	25.521	20.618	116.478
Median	22.380	2.994	2.004	506.021	38	7.02	9.306	46.426	20.86	28.748	12.547	99.562
Maximum	28.127	3.668	23.177	725.528	42	19.148	28.81	135.66	43.266	39.898	72.836	272.344
Minimum	17.145	1.604	-3.1	437.771	35	5.496	1.554	18.629	13.231	9.617	5.382	69.869
Std. Dev.	2.953	0.531	5.814	83.973	2.3	3.61	6.618	34.232	7.010	8.699	19.193	55.151
Skewness	0.141	-0.943	1.862	0.867	0.4	1.799	1.611	0.825	1.650	-0.336	1.614	1.676
Kurtosis	2.440	3.125	6.818	2.664	1.9	5.158	5.452	2.5	5.490	1.912	4.248	4.795
Jarque-Bera	0.360	3.274	26.070	2.862	1.7	16.012	15.03	2.722	15.662	1.500	10.975	13.254
Probability	0.835	0.195	0.000002	0.239	0.4	0.0003	6E-04	0.256	0.0004	0.472	0.004	0.0013
Sum	491.027	63.122	83.096	12006.66	832	189.81	218.7	1262.1	490.665	561.452	453.602	2562.505
Sum Sq. Dev.	183.083	5.921	709.842	148079.0	109	273.65	919.8	24608	1031.982	1589.273	7736.193	63873.92
Observations	22	22	22	22	22	22	22	22	22	22	22	22

VARIABLES	EGYPT				SOUTH AFRICA			
	BDM	EXTD	INF	REXR	BDM	EXTD	INF	REXR
Mean	83.9	34.2	8.02	4.26	62.15	65.1	6.28	97.05
Median	82.8	32.4	7.9	3.79	59.44	44	5.81	96.35
Maximum	97.4	46.6	18.3	11.1	80.8	145	11.5	123.4
Minimum	70.5	28.3	2.27	1.57	45.5	21.7	1.39	69.45
Std. Dev.	8.42	5.22	4.28	2.67	11.63	45.4	2.22	13.61
Skewness	0.42	1.28	0.57	1.09	0.203	0.73	0.23	0.185
Kurtosis	1.96	3.66	2.86	3.33	1.572	1.96	3.31	2.656
Jarque-Bera	1.63	6.37	1.2	4.45	2.019	2.95	0.29	0.234
Probability	0.44	0.04	0.55	0.11	0.364	0.23	0.87	0.89
Sum	1847	752	176	93.6	1367	1431	138	2135
Sum Sq. Dev.	1490	572	385	150	2841	43260.50	104	3889
Observations	22	22	22	22	22	22	22	22

Note: BDM = Broad Money; EXTD = External Debt; INF = Inflation rate; REXR = Real Effective Exchange Rate.

Table 2a. *Result of Unit Root tests*

Nigeria

	ADF TEST				PP TEST			
METHOD	STAT. @ LEVEL	STAT.@ 1ST DIFF	P.V @ LEVEL	P.V @ 1ST DIFF	STAT. @ LEVEL	STAT. @ 1ST DIFF	P.V @ LEVEL	P.V @ 1ST DIFF
Fisher Chi-square	11.81	41.355	0.059	0	10.374	42.13	0.039	0
Choi Z-stat	-1.428	-4.98	0.076	0	-1.083	-5.01	0.0394	0
Variables	P.V@ level	P.V@1st Diff	Remark	Obs	P.V @ level	P.V@1st Difference	Remark	Obs
EXTD	0.0084	0.0519	I (0)	20	0.0023	0.073	I (0)	21
BDM	0.1364	0.0038	I (1)	20	0.1364	0.003	I (1)	21
REXR	0.2302	0.0019	I (1)	20	0.2003	0.001	I (1)	21
INF	0.4166	0.0028	I (1)	20	0.4072	0.003	I (1)	21

South Africa

	ADF TEST				PP TEST			
METHOD	STAT. @ LEVEL	STAT.@ 1ST DIFF	P.V @ LEVEL	P.V @ 1ST DIFF	STAT. @ LEVEL	STAT. @ 1ST DIFF	P.V @ LEVEL	P.V @ 1ST DIFF
Fisher Chi-square	11.81	41.355	0.059	0	10.374	42.132	0.039	0
Choi Z-stat	-1.428	-4.98	0.076	0	-1.083	-5.011	0.0394	0
Variables	P.V@ level	P.V@1st Diff	Remark	Obs	P.V @ level	P.V@1st Difference	Remark	Obs
EXTD	0.0084	0.0519	I (0)	20	0.0023	0.0726	I (0)	21
BDM	0.1364	0.0038	I (1)	20	0.1364	0.0029	I (1)	21
REXR	0.2302	0.0019	I (1)	20	0.2003	0.0013	I (1)	21
INF	0.4166	0.0028	I (1)	20	0.4072	0.0026	I (1)	21

Mali

	ADF TEST				PP TEST			
METHOD	STAT. @ LEVEL	STAT.@ 1ST DIFF	P.V @ LEVEL	P.V @ 1ST DIFF	STAT. @ LEVEL	STAT. @ 1ST DIFF	P.V @ LEVEL	P.V @ 1ST DIFF
Fisher Chi-square	11.81	41.355	0.059	0	10.374	42.132	0.039	0
Choi Z-stat	-1.428	-4.98	0.076	0	-1.083	-5.011	0.0394	0
Variables	P.V@ level	P.V@1st Diff	Remark	Obs	P.V @ level	P.V@1st Difference	Remark	Obs
EXTD	0.0084	0.0519	I (0)	20	0.0023	0.0726	I (0)	21
BDM	0.1364	0.0038	I (1)	20	0.1364	0.0029	I (1)	21
REXR	0.2302	0.0019	I (1)	20	0.2003	0.0013	I (1)	21
INF	0.4166	0.0028	I (1)	20	0.4072	0.0026	I (1)	21

Table 2b. *Results of Unit Root test*

Kenya

	ADF TEST				PP TEST			
METHOD	STAT. @ LEVEL	STAT.@ 1ST DIFF	P.V @ LEVEL	P.V @ 1ST DIFF	STAT. @ LEVEL	STAT. @ 1ST DIFF	P.V @ LEVEL	P.V @ 1ST DIFF
Fisher Chi-square	11.81	41.355	0.059	0	10.374	42.132	0.039	0
Choi Z-stat	-1.428	-4.98	0.076	0	-1.083	-5.011	0.0394	0
Variables	P.V@ level	P.V@1st Diff	Remark	Obs	P.V @ level	P.V@1st Difference	Remark	Obs
EXTD	0.0084	0.0519	I (0)	20	0.0023	0.0726	I (0)	21
BDM	0.1364	0.0038	I (1)	20	0.1364	0.0029	I (1)	21
REXR	0.2302	0.0019	I (1)	20	0.2003	0.0013	I (1)	21
INF	0.4166	0.0028	I (1)	20	0.4072	0.0026	I (1)	21

Egypt

	ADF TEST				PP TEST			
METHOD	STAT. @ LEVEL	STAT.@ 1ST DIFF	P.V @ LEVEL	P.V @ 1ST DIFF	STAT. @ LEVEL	STAT. @ 1ST DIFF	P.V @ LEVEL	P.V @ 1ST DIFF
Fisher Chi-square	11.81	41.355	0.059	0	10.374	42.132	0.039	0
Choi Z-stat	-1.428	-4.98	0.076	0	-1.083	-5.011	0.0394	0
Variables	P.V@ level	P.V@1st Diff	Remark	Obs	P.V @ level	P.V@1st Difference	Remark	Obs
EXTD	0.0084	0.0519	I (0)	20	0.0023	0.0726	I (0)	21
BDM	0.1364	0.0038	I (1)	20	0.1364	0.0029	I (1)	21
REXR	0.2302	0.0019	I (1)	20	0.2003	0.0013	I (1)	21
INF	0.4166	0.0028	I (1)	20	0.4072	0.0026	I (1)	21

Table 3. *Results of the Bounds Test*

Nigeria			South Africa			Mali			Kenya			Egypt		
Null Hypothesis: No long-run relationships exist			Null Hypothesis: No long-run relationships exist			Null Hypothesis: No long-run relationships exist			Null Hypothesis: No long-run relationships exist			Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k	Test Statistic	Value	k	Test Statistic	Value	k	Test Statistic	Value	k	Test Statistic	Value	k
F-statistic	3.33	3	F-statistic	3.92	3	F-statistic	3.87	3	F-statistic	2.84	3	F-statistic	8.00	3
Critical Value Bounds			Critical Value Bounds			Critical Value Bounds			Critical Value Bounds			Critical Value Bounds		
Significance	I0 Bound	I1 Bound	Significance	I0 Bound	I1 Bound	Significance	I0 Bound	I1 Bound	Significance	I0 Bound	I1 Bound	Significance	I0 Bound	I1 Bound
10%	2.72	3.77	10%	2.72	3.77	10%	2.72	3.77	10%	2.72	3.77	10%	2.72	3.77
5%	3.23	4.35	5%	3.23	4.35	5%	3.23	4.35	5%	3.23	4.35	5%	3.23	4.35
2.50%	3.69	4.89	2.50%	3.69	4.89	2.50%	3.69	4.89	2.50%	3.69	4.89	2.50%	3.69	4.89
1%	4.29	5.61	1%	4.29	5.61	1%	4.29	5.61	1%	4.29	5.61	1%	4.29	5.61

4.2. Results of the model estimation

Following the result of the unit root test, a bounds test for cointegrating equation was performed and the result is presented in Table 3. The result suggests that there is long run relationship among the series in each country. The result of

the bounds test validates the use of ARDL and the result of the short run dynamic and long run effect of external debt on inflation is presented subsequently.

Table 4. *Result of the dynamic effects of fiscal deficits on inflation rate acros selected SSA countries*

Cointegrating Form					
Variable	Nigeria	South Africa	Mali	Kenya	Egypt
D(INF-1)	-1.985***	0.645**	0.310**	-0.243	-0.116**
	(-4.22)	(2.581)	(3.118)	(-1.511)	(-2.915)
D(EXTD)	0.92**	0.16*	0.19**	-2.945**	-1.214
	(2.136)	(1.868)	(2.151)	(-1.481)	(-0.568)
D(EXTD(-1))		-0.023	-0.0116	5.599***	6.656
		(-1.263)	(-0.951)	(2.616)	(1.121)
D(BDM)	-1.37***	0.053	0.183*	0.967**	2.412*
	(-3.404)	(0.912)	(1.947)	(2.531)	(1.846)
D(REXR)	0.219**	-0.124	-0.334	0.039**	0.937***
	(2.298)	(-1.741)	(-1.551)	(2.603)	(3.817)
D(REXR(-1))	0.243***				
	(3.743)				
CointEq(-1)	-0.653*	-0.486***	-0.385***	-0.829***	-0.136***
	(-1.828)	(-4.094)	(-4.059)	(-4.245)	(-5.767)
Long run Coefficients					
Variable	Nigeria	South Africa	Mali	Kenya	Egypt
EXTD	0.893*	-0.015	-0.018	-9.871**	-4.895***
	(1.914)	(-1.321)	(-1.406)	(-2.42)	(-3.541)
BDM	2.097*	0.107**	0.271**	1.167*	2.359**
	(1.892)	(2.099)	(2.510)	(1.836)	(3.033)
REXR	0.675***	0.119***	0.230***	0.048*	0.129
	(3.438)	(3.814)	(4.281)	(1.946)	(1.603)
C	-119.66**	-11.158**	-8.511*	-22.598	-53.884**
	(-2.376)	(-2.267)	(-1.918)	(-1.256)	(-2.222)

Note: values in brackets are t-statistics; *,**,*** mean significant at 10%, 5% and 1% respectively

The short run dynamic and long run effect of external debt on inflation rate in selected African countries is presented in Table 4. The first panel is the short run dynamic result while the bottom panel shows the long run form. Colon 2 contains the result of how inflation is affected by external debt and other variables in Nigeria. Colon 3, 4, 5 and 6 is the result in the case of South Africa, Mali, Kenya and Egypt respectively.

There are five variables, namely, lagged values of inflation rate, broad money, effective exchange rate and its lag that affected inflation rate in Nigeria in the short run. Lagged period of inflation rate and broad money impacted negatively on inflation rate while external debt and exchange rate (both contemporaneous and lagged period) positively affect inflation rate in the country. A 1% increase in external debt leads to 0.9% increase in inflation rate, that is, external debt leads to almost one-for-one effect on inflation rate in Nigeria. Exchange rate movement is also an important effect on inflation rate. Depreciation of exchange rate to the tune of 1% will increase inflation rate by 0.2%. Depreciation increases exports which increases income and hence more demand. Depreciation that influences export demand could increase demand for factor input will may likely push cost of production up and then lead to increase in inflation rate. Further, depreciation that favours export could shift more resources to the production of exports leaving limited resources for the production of domestic goods, reduce its production, with demand being constant price level will have to go up thereby leading to inflation.

In South Africa, previous inflation and fiscal deficit (external debt) positively and significantly associated with inflation rate. Meanwhile, the degree of response to external debt of inflation was 0.2% for a 1% increase. Previous inflation rate, external debt and money supply are significant in influencing inflation rate in Mali. As shown in the Table, a 1% increase in external debt in Mali will raise inflation rate by 0.2%. Money supply increase in the country to the tune of 1% will increase inflation rate by approximately 0.1%. This suggests that inflation rate is more sensitive to eternal debt than money supply. If previous inflation increases by 1%, current inflation rate will increase by 0.3%. An interpretation of this is that people form expectation about inflation rate in this country such that if they expect

inflation to increase in the previous year, then inflation will naturally increase this year.

Kenya's inflation rate is significantly determined by fiscal deficit and its lag period, money supply and exchange rate. Unlike other countries, increase in fiscal deficit reduces inflation rate in Kenya. In particular, a 1% increase in contemporaneous fiscal deficit leads to 2.9% decrease in inflation rate while the same percentage increase in previous fiscal deficit reduced inflation rates by more than 5%. Reduction in inflation rate following increase in external debt could be a sign of productive use of the debt. Monetary policy tends to stabilize Kenyan economy as a decrease in money supply will reduce inflation rate. In particular, a 1% decrease in money supply leads to decrease in inflation rate by 0.9%. In the case of exchange rate, inflation rate will be affected by 0.04% for a 1% increase in the variable. It must be observed that Kenya's inflation rate was more driven positively by money supply than any other variables, suggesting that money supply is key to economic stabilization in the country.

Like the case of Nigeria, lagged period of inflation rate have negative effect on current inflation in Egypt. Unlike other countries fiscal deficit had no significant effect on inflation rate in the country even though it shows a sign of negative effect. This implies that the fiscal deficit is still not as much as it can reduce inflation rate. Meanwhile, inflation rate is highly sensitive to money supply in the sense that a 1% increase in money supply raises inflation rate by 2.4%. This effect is significant and so, it can be conjectured that inflation rate is a monetary phenomenon in Egypt and that monetary policy is key to economic stabilization in the country. Further, exchange rate, a key instrument of monetary policy is also positively and significantly associated with inflation rate. The result shows that inflation rate have almost one-for-one change with contemporaneous exchange rate.

From the above analysis, it is clear that the short run dynamic of inflation rate varies across countries. For instance, previous inflation rate matter for current inflation rate in Nigeria and Egypt but the direction of effect go against the rational expectation theory. This is because previous inflation is associated negatively with current inflation. In South Africa and Mali, the rational expectation theory holds because the increase in previous inflation tends to raise current inflation rate. However previous inflation does not have any role to play in current inflation dynamic in Kenya. Money supply had positive and significant effects on inflation rate in Mali, Kenya and Egypt while the effect was positive for Nigeria and South Africa. This indicates that inflation rate is a monetary phenomenon in the first three countries. Interestingly, monetary policy tend not to have any role to play in inflation dynamic in South Africa. Exchange rate did not influence inflation rate in South Africa and Mali. It is only in Nigeria that previous exchange rate influences current inflation rate.

Fiscal deficit is key to inflation dynamic in Nigeria, South Africa and Mali. The positive and significant sign suggests that inflation is a fiscal phenomenon in these countries. Kenya's fiscal deficit had negative effect on inflation while Egypt's fiscal deficit had no effect on inflation in the country. The negative effect in Kenya is could be a sign that the country is still operating in the short run and the debt is productively put to use. The insignificant effect in the case of Egypt suggests that fiscal deficit is still not so much as to influence inflation rate.

The speed of convergence also differ across countries. Kenya had the fastest convergence rate, followed by Nigeria, South Africa, Mali and lastly Egypt in that order. It will take approximately 2 months after the current year for the model to adjust to its long run equilibrium due to a shock in the system in Kenya. In Nigeria, it will take approximately one and a half year from the current period while in South Africa, it will be around 15 months after the current period. In the case of Egypt, the adjustment rate is very low to the extent that it will take up to 9 years before the system will be fully adjusted following any shock.

In the long run, all the variables, that is fiscal deficit, money supply and exchange rate had significant and positive effect on inflation rate in Nigeria. South Africa and Mali show no effect on fiscal deficit while Kenya and Egypt show negative effect. Of importance is the effect of fiscal deficit on inflation in Nigeria. As revealed in the Table, inflation is strongly driven by external debt as a 1% increase in fiscal deficit in the country will generate additional 0.9% increase in the long run. No country (in the sample) have such effect. Although Kenya may experience increase in inflation rate following increase in fiscal deficit in the short run, the eventual negative effect emerge in the long run. In Egypt, the negative effect was stronger in the long run than in the short run, indicating that external debt is important for driving down inflation rate in the country.

4.3. Post-estimation tests

Table 5 presents the statistical properties of the models in order to guarantee it prediction power. The probability (p-values) are in the bracket. The diagnostic test for the coefficient of the Jarque-Bera statistics for all countries under consideration suggests that the test for the residual normality assumption was adequate and as such not violated, that is the Jarque-Bera statistics for all countries under consideration indicates that the study cannot reject the null hypothesis that the true error terms in the fiscal deficit and inflation regression are normally distributed when judging through the probability value, this in essence indicates that the functional normality of the ARDL model is appropriate for the study.

Table 5. *Post estimation result*

	Diagnostic Test Result				
	NIGERIA	SOUTH AFRICA	MALI	KENYA	EGYPT
Jarque-Bera	1.156 (0.305)	0.134 (0.293)	0.883 (0.664)	0.584 (0.174)	1.438 (0.349)
Serial Breuch-Goldfrey LM Test	4.615 (0.447)	0.393 (0.168)	0.690 (0.354)	0.917 (0.144)	2.174 (0.115)
Heteroskedasticity Test	4.912 (0.994)	1.665 (0.212)	1.577 (0.265)	0.422 (0.903)	0.649 (0.593)
Ramsey Reset	34.742 (0.734)	0.524 (0.486)	0.154 (0.707)	0.009 (0.927)	0.557 (0.466)

The coefficient of the Breush-Godfrey LM estimated statistics conforms to the absence of serial correlation. Similarly, the probability values of the heteroskedasticity test shows that the variance is not time-dependent and so, it ishomoscedasticity for all the counties. The lag length of 2 was employed for the Breuch-Godfrey LM test while the Ramsey Reset test model specification revealed that the model functional form was adequately specified and robust for policy analysis.

4. Conclusion and recommendations

This study investigated the relationship between fiscal deficit and inflation for African countries between the years 1994-2015. Five countries were selected across the geo-political blocs of Africa which are Nigeria (West), South Africa (South), Mali (East), Egypt (North) and Kenya from the central Africa. As the data series are found to be stationary at level and first difference, Auto Regressive Distributed Lag Model (ARD) was utilized to determine the direction and the magnitude of effect of fiscal deficits on inflation in each country.

The result from the ARDL was diverse across countries. In Egypt, fiscal deficit does not affect inflation in the short run but had long run positive effect. In Kenya, inflation was negatively influenced by fiscal deficit both in the short and long run. No effect of fiscal deficit on inflation in the short run in Mali but there was long run negative effect. South Africa experienced increase in inflation as a result of increase in fiscal deficit but this occur only I. The short run. In Nigeria, there was positive effect of fiscal deficit on inflation both in the short and long run. What this

suggest is that Nigerian government should worry over increase in fiscal deficit while Mali need not worry. Egypt need to be conscious of fiscal deficit because of its negative effect in the long run while in South Africa, the authorities need to be careful in the way fiscal deficit is utilized, particularly in the short run.

Apart from fiscal deficit effect, exchange rate positively influenced inflation in all the countries except South Africa in the short run. In the long run, no significant effect of exchange rate on inflation was found in Kenya. In Egypt, there was long run negative effect of exchange rate on inflation. The rest three countries show positive effect. Inflation was a monetary phenomenon in Egypt, Kenya and Mali, in the short run. It in the long run, all the countries show that monetary policy play important role in inflation control

Based on the findings of this study, there should be appropriate policies should to check the use of fiscal deficit in Nigeria and South Africa. The government of Egypt should reduce or even ignore further fiscal deficit in the long run, only to note that fiscal deficit is effective during economic down-turn. Due to the significant role of monetary policy in inflation dynamic, it is imperative that appropriate combination of the monetary and fiscal policies should be used in other to regulate all unnecessary money supply and channel expenditures to capital projects that would increase investment opportunities and generate economic growth in the long run. A fiscal management process that does not encourage increase revenue and reduce fiscal deficits in African countries will further worsen the level of inflation.

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