Fiscal Policy and Crime Rate in Nigeria

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Abstract
The need to reduce the level of criminal activity has preoccupied the attention of policymakers which has led to the exploration of feasible, alternative routes to achieve United Nations' Sustainable Development Goal -16. This phenomenon has been the present practice of most developing countries such as Nigeria that is inundated with higher level of crime rate. This study examines the possibility of using fiscal policy tools for crime control by employing Dynamic Ordinary Least Square (DOLS) technique on Nigerian data over a period of 1986-2019. It also examines the causal links between the variables via the Toda-Yamamoto Granger causality. The following findings emerged: (1) Expansionary fiscal policy reduces crime behaviour in Nigeria. This result is robust when public spending is used as a proxy for fiscal policy. (2) There is a one-way causality moving from crime rate to fiscal deficit. (3) There is a one way causality moving from urbanization to crime rate. (4) We find a two-way causality between inflation and fiscal deficit. In terms of policy implications, these findings suggest that fiscal policy can be used to curb crime behaviour in the developing countries.

Keywords: Crime Activity; Fiscal Deficit; Unemployment; Causality.
JEL Classification Codes: H3, H5, H62, I38, J68, K14

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1. Introduction

After the seminal work of Becker (1968), economists have continued to apply economic tools to gain an understanding on why crime behaviour exists in the society. Not only because it distorts the effective functioning of economic policy, but also creates loophole in economic system (Draca & Machin, 2015; Ajide, 2021a; Ajide, 2021b). In this sense, tackling criminal activities have become one of the greatest concerns in economic debates. Since the beginning of new millennium, African countries have found themselves in a new context in which crime rate is at alarming and the fight against this abnormal behaviour has gone beyond the traditional approach. The willingness to reduce the crime rate has become the objective of most successive governments. However, several studies have suggested different approaches to reduce this phenomenon in the society ranging from deterrent techniques to incapacitation (Brabenec & Montag, 2017, Ajide et al. 2018; Ajide, 2019; Ajide, 2021b).

In respond to this development, Goulas and Karidis (2020) analyse how fiscal tools can be used to affect criminal activity. Expansionary fiscal policy may reduce the level of corruption and encourage productivity of public sector. This means that fiscal policy may, in addition, to traditional function, serve as a veritable tool for controlling crime behaviour in the society. Fiscal policy is a paramount tool for maintaining stability and development in the economy. By definition, it is the government decision in relation to revenue and expenditure taking as either government's surplus or deficit (Babalola, 2015). It is the manipulation of government operations in furthering certain economic policies (Stein, 1968). Fiscal policy affects growth and development through its effects on the incentives of individuals and firms. The specific tax breaks and subsidies availability may influence rent seeking behaviour in the society, most especially in connection with political allies, thereby reducing incentives to participate in the productive activities. In addition, excessive social programmes may create less incentives to engage in employment (Gupta et. al. 2002). This means that any changes to fiscal policy structure may influence violence and social unrest.

Furthermore, a reduction in public spending may affect government's effort at different levels in the fight against crime rate either through incapacitation or deterrent effects. The recent study of Goulas and Karidis (2020) suggests fiscal policy as one of the major determinant of crime rate in EU countries while the case of developing nations still remains unknown. Our study fills this knowledge gap. In this paper, we examine the case of a developing country (Nigeria) in Africa with high records of crime behaviour. Studying the case of Nigeria reveals a number of patterns that necessitate investigation. The fiscal deficit of the country has continued to increase in recent years. Running fiscal deficits have become normal trends in Nigeria (Aero & Ogundipe, 2016). The Central Bank of Nigeria (CBN, 2017) shows over the period of 1986-2016 that Nigerian economic system has been operating on fiscal deficits with the exception of 1995 and 1996. This implies that the country records a fiscal surplus in the two years. For further clarification, Nigerian fiscal deficit increases from ₦835,678 billion to the highest value of ₦2208,222 billion in 2016 (CBN, 2017). This trend still continues through 2019. The revenue components of Nigerian government have improved while the expenditure aspects are not only expanded but also increase dramatically. This situation creates an enigma in the nexus between crime rate and fiscal policy in Nigeria, warranting academic enquiries within a more refined framework. Therefore, this study

contributes to the development of theory and public policies on economics of crime on several fronts.

First, this is the first study that examines the role of fiscal policy in the control of crime rate for an African country (Nigeria). The existing policies aiming at reducing violence and other crime related activities have not been working as hoped. Our study brings to the attention of the policy makers that fiscal policy may be useful in the development of tools that can effectively tackle crime related offences in the economy. Crime and other related security issues are not only public safety problem, but also a real economic issue. The cost of crime is huge for the society to continue to bear. It accounts for more than 3.5 percent of GDP (NBS, 2018; Ajide, 2019). It is paramount for the policy makers to employ nonconventional approaches in curbing the crime rate in the country. Second, we complement the existing studies by examining the relationship between crime and fiscal policy using Dynamic Ordinary Least Squares (DOLS) as well as the Granger non-causality test of Toda and Yamamoto (1995) procedure. This is done in order to ascertain the causal direction among the variables in the model. The study uses Nigerian data based on the fact that the fiscal deficit of the country has increased over the year. In 1999 fiscal year, the recurrent expenditure was at increasing rate compared to capital expenditure. The margin between the two components of expenditure is very wide starting from 2000 after the return to democratic system of government (Babalola, 2015). The increase in the recurrent expenditure may be attributed to many factors including: social welfare programmes, issues of insecurity and crime related cases. In Nigeria, crime reported cases have increased over the year. Community riots, political protests, terrorist attacks, insurgent organisations among others are affecting citizens' standard of living. In 1994, Murder cases increase from 1,629 to 2,136 in year 2003 which is over 60 percent increment. Reported cases of robbery increases to 10,771 (for year 2006) from 5,210 in year 2005. By year 2011, it increases to 16,312. The issue of terrorist attacks and banditry also contributes to the problem (Igbinedion & Ebomoyi, 2017; Oyelade, 2019; Ajide, 2021b).

In this case, a good understanding of dynamic interaction between crime rate and fiscal policy may assist in formulating appropriate policy toolkits for peaceful socio-economic development in the country. Studies reveal that appropriate fiscal policy to indorse growth/development varies and depends on economic, institutional and security situations of the economy (Duruji et al. 2018). Fiscal expansion may be warranted in a developing country with solid macroeconomic position supporting higher public spending as a strategy for reducing poverty gaps. This expression supports the IMF policy advice (Boorman et al. 2000). Imran and Hosen (2018) confirm that poverty leads to crime while studies show that adequate welfare programme (fiscal policy tool) may be lunched by a country with high poverty profile (Ajide, 2020). This means that keeping fiscal balance to maintain sustainability may be suitable in some situations. However, this may not work effectively in a developing country like Nigeria. Substantial fiscal deficit and/ or fiscal expansion may be appropriate to achieve fiscal stability with control of severe insecurity situation through social welfare programmes. Ultimately, the question whether fiscal policy can be useful in crime controls is an empirical one that remains unanswered in African context. Therefore, this paper provides information for economists as well as policymakers as it tests aspects of economics of crime behaviour that have received limited attention so far. It explains why fiscal tools need to be re-directed to control the society which has been destabilized and derailed by crime attacks.

This study is organised into five sections. The next section discusses the theoretical framework and related literature. In section 3, we discuss the methodology of the paper while section 4 reveals the empirical results. Section 5 ends the study by revealing the concluding remarks and policy implications.

2. Theory and relevant literature

Crime is an exceptional problem of economic matters in which the costs it imposes on society may greatly higher than the private gains of the criminals (Becker, 1968; Fender 1999; Teles, 2004). In economics, the issues concerning crime punishment, enforcement and deterrence policy have a theoretical foundation in the rational theory of crime proposed by Becker (1968). This theory has been generally recognized as a baseline theory in answering the questions of why people engage in crime and what measures to be employed in curbing it (Brabenec & Montag, 2017). In the light of this, crime has continued to be properly dealt with by economic researchers in a bid to shed light on why economic agents take part in illegal deals. Literature on situational crime prevention seems to be more significant in which rational theory of crime is an important component of this school of thought that is more practical oriented in the crime control (Clarke & Cornish, 1985; Felson & Clarke, 1998; Cornish & Clarke, 2013). The focus of this school is based on the fundamental causes of crime which results in the design of policy tools aim at reducing crime (Clarke, 1997; Brabenec & Montag, 2017).

Originally, the rational theory midwives rational behaviour and cost-benefit analysis in which expected return is compared to expected costs within an optimization framework. Teles (2004) attempts to provide an extension in which macroeconomic policy is built on Becker's theory on the assumptions of intertemporal general equilibrium. This new version allows economic researchers to study the nexus between macroeconomic policies and crime rate in an economy. In relation to this, many studies have examined poverty, income level, unemployment and remittances among others as the determinants of crime (Fleisher, 1966; Ajide, et al. 2018; Imran et.al.2018, Ajide, 2019; Ajide, 2021b). It is an expectation that fiscal policy may also affect crime behaviour in some situations (Teles, 2004; Goulas & Karidis, 2020). For instance, if motive behind tax evasion, underground economy, political corruption and other forms of crime related activities are evaluated, then fiscal policy is expected to affect production and formal employment, leading to negative or positive impact on crime rate. Goulas and Karidis, (2020) empirically show that fiscal surplus affect the fight against criminal behaviour in EU economies over a period of 2000-2013. Their evidence proves that tight fiscal policy tools appear to encourage more crime related behaviour. The level of income and equality in the society are said to be associated with lower crime while larger welfare programme tend to reduce the level of engagement in criminal activities. This means that a fiscal policy that focuses on a redistributive income effect tends to be a crime-control policy (Newman & Howard, 1999; Farrell et al., 2001). Young unemployed adults, the poor and retirees are the beneficiaries and become net receivers. Bethencourt (2014) reveals that fiscal policy that considers crime control programmes may discourage the incentives to engage in crime related activities. The role of government spending is also documented by Akpom and Doss (2017) for the case of United States using cross-sectional state level data for 1990, 2000 and 2010. The authors explains that spending on welfares and education are more significant in 2000 and 2010. Furthermore, Gomes (2018) confirms in Brazil that increase in government spending on security reduces homicide rate by 0.6 per 100,000 persons. The study addresses endogeneity issues in the estimation of crime and spending via two stage least square instrumental variables. This is consistent with the study of Loureiro and Carvalho-Júnior (2007) in Brazilian economy.

Though previous studies document that unemployment, income level, inflation, urbanization rate among others influence crime rate in the society, the theory underlying crime and unemployment is clear. It is traditionally believed that unemployment affects opportunity cost of crime activities. However, the empirical evidences on the relationship remains mixed. Early studies show that there is a positive relationship between crime and unemployment (Ajide, 2021b). Unemployment rate increases criminals because the opportunity cost of crime has increased (Yildiz et al. 2013). On the other hands, it reduces crime rate as potential victims who are unemployed stay indoor thereby reducing the opportunity cost of crime (Melick, 2003). Fallahi et al. (2012) focus on the impact of unemployment in USA on crime rate over a period of 1978-2004. The study documents a negative relationship between the variables. Iyer and Topalova (2014) reveal that income changes and crime have a positive relationship while GDP per capita correlates with crime rate (Khan et al., 2015; Ajide, 2021a).

3. Methodology

3.1 Data and empirical model specification

In order to examine the impact of fiscal policy on crime rate and to investigate the dynamic relationship between the variables, this study utilizes annual time series data spanning over a period of 1986-2019. Based on theoretical literature reviewed and the empirical studies of Goulas and Karidis, (2020), Gomes (2018), Bethencourt (2014) among others, we specify the empirical model of our study as:

$$CR = f(FSD, IF, UN, GRR, URB) \quad (1)$$

In Dynamic Ordinary Least Square (DOLS) framework, the model becomes:

$$CR_t = \propto_0 + \alpha_1 FSD_t + \alpha_2 IF_t + \alpha_3 UN_t + \alpha_4 GRR_t + \alpha_5 URB_t + \sum_{j=-q}^{r} \partial_1 \Delta FSD_{t-j} + \sum_{j=-q}^{r} \partial_2 \Delta \mathrm{IF}_{\mathrm{t-j}} + \sum_{\mathrm{j=-q}}^{\mathrm{r}} \partial_3 \Delta UN_{t-j} + \sum_{j=-q}^{r} \partial_4 \Delta GRR_{t-j} + \sum_{j=-q}^{r} \partial_5 \Delta UBR_{t-j} + \epsilon_t \quad (2)$$

Where $\propto_0$ is the intercept; α_1 *to* α_5 and ∂_1 to∂_5 represent a vector of coefficient of co-integrating regressors, r is the optimum lag level as suggested by Akaike information criterion. *CR* is crime index which happens to be the dependent variable in the model. This is measured as the aggregate number of reported crime cases per 100,000 population. FSD is the independent variable of interest. *FSD* is fiscal deficit as a percentage of *GDP*. The study also employs Government expenditure (GVT) as a percentage of GDP for robustness check. As suggested in the literature reviewed, the study employs a number of control variables. They include: *IF* which is the rate of inflation, UN is total unemployment as a percentage of Total Labour force. *GRR* is the annual growth of GDP per capita. *URB* is annual rate of urban population as a percentage of total population. Table 1 summaries the structure and sources of the data.

Table 1: Variables, measurements and sources of data

Variables	Notation	Measurements	Data sources
Crime rate	CR	Total number of crime cases reported per 100,000 population	Nigeria Police Force and National Bureau of Statistics
Fiscal Deficit	FSD	Fiscal deficit is the excess of government revenue over expenditures expressed as a percentage of GDP	Budget office of the federation and CBN statistical Bulletin
Government expenditure	GVT	Government expenditure as a percentage of GDP	CBN statistical Bulletin
Inflation rate	IF	Inflation rate	World Development Indicators (World Bank)
Unemployment	UN	Total unemployment as a percentage of Total Labour force	World Development Indicators (World Bank)
Income per capita growth	*GRR*	The annual growth of GDP per capita	World Development Indicators (World Bank)
Urbanization	*URB*	Urban population as a percentage of total population	World Development Indicators (World Bank)

Source: Author's compilation

Furthermore, Table 2 and 3 present the descriptive statistics and correlation among the variables. The crime rate is 1.7 per 100000 person on average while the level of volatility is very low compared to others. The average value of fiscal deficit is -4.3 percent of GDP with maximum value of 1.2 percent. The minimum value is -15.8 percent revealing the extent of fiscal imbalance of Nigerian public finance. Unemployment rate is as high as 28 percent with an average value of 11.39 percent. This means that unemployment rate still one of the major problem and could probably influence crime behavior. The growth rate is 5.8 percent with a maximum value of 30.7 percent. The minimum is -1.79 percent. The rate of urbanization may also constitute another major problem if not properly control. For the case of Nigeria, the urbanization rate is 8.67 percent and has a maximum percentage of 51.1. The standard deviation is 13.17 percent.

Table 2: Descriptive statistics

	CR	GVT	FSD	IF	UN	GRR	URB
Mean	1.7953	8.3011	-4.3170	19.0604	11.3958	5.8760	8.6743
Median	1.6968	7.0690	-3.6550	11.4100	10.0945	6.2155	4.7525
Maximum	3.1131	17.9438	1.2000	72.8500	28.5000	30.7092	51.1570
Minimum	0.2280	4.8332	-15.8000	2.8636	1.9000	-1.7888	4.0538
Std. Dev.	0.6880	3.0702	3.9230	18.3701	7.8317	5.9097	13.1666
Observations	34	34	34	34	34	34	34

Source: Author's compilation

Table 3: Pairwise correlation

	CR	GVT	FSD	IF	UN	GRR	URB
CR	1.0000						
GVT	-0.0393	1.0000					
FSD	-0.4118	0.1385	1.0000				
IF	0.4290	0.2048	-0.2913	1.0000			
UN	-0.2263	-0.0158	0.4117	-0.4820	1.0000		
GRR	-0.0336	-0.1728	0.1758	-0.2116	0.2262	1.0000	
URB	-0.2044	-0.2345	-0.0459	-0.1492	-0.1279	-0.3529	1.0000

Source: Author's compilation

In Table 3, the correlation among the variables are presented revealing some interesting information. First, the relationship between crime and fiscal deficit is negative. The same applies to government expenditure and crime rate. This gives a clue of what the relationship between variables of interest would be. However, the main coefficients can be ascertained in the DOLS estimation and other relative techniques to be adopted. Other variables like unemployment and inflation also reveal some possible association with crime rate. The inflation is positive in relation to crime behaviour. This implies that inflation increases the level of crime rate in Nigeria. The next section shed more light on the econometric strategies to be adopted in order to achieve the main objective of the study.

3.2 Econometric strategies

3.2.1 Stationarity Test and Co-integration Test

Economic theories hint that most economic variables may move together and fluctuating around equilibrium in the long run which often happens in most times series dataset. This implies that it is necessary to confirm the cointegration of the variables before estimating long run equation of the model. In this study, we apply Johansen Procedure to confirm the long run equilibrium among the variables justifying the fact that the procedure does not require variables classification into endogenous or exogenous (Jelilov et. al. 2020). Meanwhile, it is important to note that this procedure of cointegration test requires some preliminary assumptions of integration order including the tests propose by Engle and Granger (1987); Johansen and Juselius (1990) and Phillips and Oualaris (1990). This implies that before implementing the tests, it is necessary to ascertain the unit root of the series so as to avoid misleading results. The study employs Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) Test to examine the unit roots while Kwaitkowski-Phillips-Schmidt-Shin (KPSS) Test is used for robustness and sensitivity of the estimate. This is because KPSS test has proven to be more accurate compared to the ADF and PP tests. In this case, the use of KPSS has advantages of overcoming the shortcomings of ADF and PP which may lead to wrong inferences of order of integration.

3.2.2 Estimation techniques

After confirming the presence of cointegration among the variables, this study examine the impact of fiscal policy on crime rate using Dynamic OLS (DOLS). The advantage of this technique over others is that it attaches leads and lags value of the variables, but integrated regressors and suitable for the case of small sample (Caballero, 1994). The study of Stock and Watson (1993) suggests the use of a parametric approach in the estimation of long run equilibria in a system of equations that involves integrated of different order with confirmation of co-integration among the variables (Masih & Masih, 1996). The technique also helps to solve the problem of autocorrelation and other internalities in the model (Esteve & Requena, 2006; Zhou et. al. 2020). The technique is also considered appropriate in the case of finite sample bias caused by endogeneity issues (Mansson et. al. 2018). The estimator is an efficient one and the associated test statistics have asymptotic distributions. To test for the robustness of the estimator, this study also employs Instrumental Variable estimator-generalized moment of estimation (IV-GMM).

3.2.3 Testing for direction of causality among the variables

We also investigate the causality between crime, fiscal policy and other variables via Toda-Yamamoto (TY) (1995) causality technique. This is necessary to ascertain the inherent policy implications from such analyses. We consider the use of TY technique due to its higher predictive power compared to others. The approach is a modified version of the Wald test which has been proven to be more powerful than the traditional causality (Ziramba, 2008). The technique can also be considered in the case of stationarity or non-stationarity series. The technique is structured via Vector Autoregressive (VAR) frame work with (K+ dmax) where, K is the optimal integration order in VAR and dmax is the maximum order of integration relating to all the series in a model (Zhou et. al. 2020). The VAR (K + dmax) for this study is specified in (3) to (8) below:

$$CR_t = \beta_0 + \left(\sum_{i=1}^{m} \beta_{1i}\, CR_{t-i} + \sum_{j=k+1}^{d_{max}} \beta_{2i}\, CR_{t-j}\right) + \left(\sum_{i=1}^{m} \partial_{1i}\, FSD_{t-i} + \sum_{j=k+1}^{d_{max}} \partial_{2i}\, FSD_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} IF_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} IF_{t-j}\right) + \left(\sum_{i=1}^{m} \delta_{1i}\, UN_{t-i} + \sum_{j=k+1}^{d_{max}} \delta_{2i}\, UN_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} GRR_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} GRR_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} URB_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} URB_{t-j}\right) \quad (3)$$

$$FSD_t = \beta_0 + \left(\sum_{i=1}^{m} \partial_{1i}\, FSD_{t-i} + \sum_{j=k+1}^{d_{max}} \partial_{2i}\, FSD_{t-j}\right) + \left(\sum_{i=1}^{m} \beta_{1i}\, CR_{t-i} + \sum_{j=k+1}^{d_{max}} \beta_{2i}\, CR_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} IF_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} IF_{t-j}\right) + \left(\sum_{i=1}^{m} \delta_{1i}\, UN_{t-i} + \sum_{j=k+1}^{d_{max}} \delta_{2i}\, UN_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} GRR_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} GRR_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} URB_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} URB_{t-j}\right) \quad (4)$$

$$IF_t = \beta_0 + \left(\sum_{i=1}^{m} \propto_{1i} IF_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} IF_{t-j}\right) + \left(\sum_{i=1}^{m} \partial_{1i}\, FSD_{t-i} + \sum_{j=k+1}^{d_{max}} \partial_{2i}\, FSD_{t-j}\right) + \left(\sum_{i=1}^{m} \beta_{1i}\, CR_{t-i} + \sum_{j=k+1}^{d_{max}} \beta_{2i}\, CR_{t-j}\right) + \left(\sum_{i=1}^{m} \delta_{1i}\, UN_{t-i} + \sum_{j=k+1}^{d_{max}} \delta_{2i}\, UN_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} GRR_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} GRR_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} URB_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} URB_{t-j}\right) \quad (5)$$

$$UN_t = \beta_0 + \left(\sum_{i=1}^{m} \delta_{1i}\, UN_{t-i} + \sum_{j=k+1}^{d_{max}} \delta_{2i}\, UN_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} IF_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} IF_{t-j}\right) + \left(\sum_{i=1}^{m} \partial_{1i}\, FSD_{t-i} + \sum_{j=k+1}^{d_{max}} \partial_{2i}\, FSD_{t-j}\right) + \left(\sum_{i=1}^{m} \beta_{1i}\, CR_{t-i} + \sum_{j=k+1}^{d_{max}} \beta_{2i}\, CR_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} GRR_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} GRR_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} URB_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} URB_{t-j}\right) \quad (6)$$

$$GRR_t = \beta_0 + \left(\sum_{i=1}^{m} \propto_{1i} GRR_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} GRR_{t-j}\right) + \left(\sum_{i=1}^{m} \delta_{1i}\, UN_{t-i} + \sum_{j=k+1}^{d_{max}} \delta_{2i}\, UN_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} IF_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} IF_{t-j}\right) + \left(\sum_{i=1}^{m} \partial_{1i}\, FSD_{t-i} + \sum_{j=k+1}^{d_{max}} \partial_{2i}\, FSD_{t-j}\right) + \left(\sum_{i=1}^{m} \beta_{1i}\, CR_{t-i} + \sum_{j=k+1}^{d_{max}} \beta_{2i}\, CR_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} URB_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} URB_{t-j}\right) \quad (7)$$

$$URB_t = \beta_0 + \left(\sum_{i=1}^{m} \propto_{1i} URB_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} URB_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} GRR_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} GRR_{t-j}\right) + \left(\sum_{i=1}^{m} \delta_{1i}\, UN_{t-i} + \sum_{j=k+1}^{d_{max}} \delta_{2i}\, UN_{t-j}\right) + \left(\sum_{i=1}^{m} \propto_{1i} IF_{t-i} + \sum_{j=k+1}^{d_{max}} \propto_{2i} IF_{t-j}\right) + \left(\sum_{i=1}^{m} \partial_{1i}\, FSD_{t-i} + \sum_{j=k+1}^{d_{max}} \partial_{2i}\, FSD_{t-j}\right) + \left(\sum_{i=1}^{m} \beta_{1i}\, CR_{t-i} + \sum_{j=k+1}^{d_{max}} \beta_{2i}\, CR_{t-j}\right) \quad (8)$$

4. Empirical results and discussion

4.1 Preliminary test

We present the results of the stationarity test of series in Table 4. Employing Augmented Dickey Fuller (ADF), Phillips-Perron (PP) and Kwaitkowski-Phillips-Schmidt-Shin (KPSS) Test, the results show that all series are stationarity at first difference. This means that we have integration of order one series, I(1).

Table 4: Unit tests

Variables	ADF	PP	KPSS	Remarks
FSD	-7.2274*** (0.0000)	-3.2687** (0.0247)	0.3178[a]	I(1)
CR	-5.8389*** (0.0000)	-6.2765*** (0.0000)	0.14071[a]	I(1)
GRR	-4.6492*** (0.0007)	-4.7124*** (0.0006)	0.14731[a]	I(1)
GVT	-3.9123*** (0.0057)	-3.5350** (0.0131)	0.1293[a]	I(1)
IF	-4.2507*** (0.0028)	-6.8603*** (0.0000)	0.2984[a]	I(1)
UN	-5.8003*** (0.0000)	-5.8529*** (0.0000)	0.12435[a]	I(1)
URB	-5.5607*** (0.0001)	-5.5607*** (0.0000)	0.29613[a]	I(1)

Source(s): Authors' computation. *** indicates significant at 1% for ADF and PP, while figures in ( ) are P-values. [a] significance at 1%level for KPSS, and KPSS 's asymptotic critical values are 0.73900 for 1%, 0.46300 for 5% and 0.34700 for 10% level

Table 5: Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-563.058	NA	3.55e+08	36.7134	36.9909	36.8039
1	-495.8099	104.1263	4950924	34.6974	36.6402	35.3307
2	-463.5101	37.5094	83430524	34.9361	38.5442	36.1122
3	-372.1056	70.7648*	5622277.*	31.3616*	36.6350*	33.0806*

*indicates lag order selected by the criterion,LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion. Endogenous variables: CR FSD IF UN GRR URB. Source: Author's computation

We further test the lag length as reported in Table 5 using AIC to determine the level of lag-length suitable for the causality test. The results confirm lag level of three (3). This means the optimal results can be ascertained by selecting order 3 for the Toda and Yamamoto approach. In addition, the study also employs Johansen's cointegration test to confirm the existence of long-run equilibrium relationship among the variables. Table 6 reveals that there is at least one cointegrating equation in the system.

Table 6: Johansen -Juselius Test for Co-integration

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
r=0	0.8974	153.3598*** (0.0000)	107.3466	72.86750*** (0.0000)	43.41977
r≤ 1	0.7139	80.49234** (0.0408)	79.34145	40.05018** (0.0227)	37.16359
r≤ 2	0.5162	40.44216 (0.4968)	55.24578	23.23598 (0.3152)	30.81507

Figures in ( ) donates Mackinnon-Haug-Michelis (1999) P-Value
*, **, *** donate significant at 10%, 5% and 1%
Source: Author's computation

4.2 Main results

In this section, we present the results of the impact of fiscal policy on crime rate in Nigeria as shown in Table 7 and 8. In Table 7, the impact of fiscal policy as measured by fiscal deficit on crime index is presented while Table 8 presents the robustness check when government expenditures(GVT) as percentage of GDP is used as a proxy for fiscal policy (Huynh, & Nguyen, 2020). There are many views on the issues of crime and public spending. Hannon and Defronzo (1988) argue that spending on welfare and other social programmes may reduce the possibility of committing crime. Worrall (2005) hints that public spending increase crime rate because it increases and creates sense of entitlement, thereby reducing motivations to seek legal employment. Our results show that expansionary fiscal policy proxied by fiscal deficit reduces the level of crime rate. In a related study conducted in Brazil, Gomes (2018) shows that government spending decreases the level of crime rate. A one percent increases in public spending reduces homicide rate by 0.6 per 100,000population. In the study of Loureiro and Carvalho-Júnior (2007) who use government spending as a proxy for fiscal policy, they show a negative coefficient of -0.25 percent reduction in homicide rate per 100,000 persons. However, this does not match the submission of Kolliasa et al. (2012) who find that public spending does not reduce crime in Greece. Even total spending on welfare does not significantly reduce presence of crime activity. In a more recent study of Goulas and Karidis (2020), it was documented that tight fiscal policy increases the level of crime rate in EU countries. They proxy fiscal policy as fiscal surplus over a period of 2000-2013. Our results also support their empirical results stating that fiscal deficit reduces the level of crime rate. In addition, we re-estimate our model using generalized method of moments (GMM). We proxy fiscal policy as government expenditure. The results remain the same showing that fiscal expansion reduces the crime rate in Nigeria. This further supports the view of Keynesian

economists. They are of the opinion that fiscal deficit can be used to stimulate the aggregate demand during economic downturn which is one of the causes of higher rate of unemployment (Awe & Olalere, 2012). This implies fiscal policy is a tool for curbing unemployment and hence crime behaviour.

Table 7: Results from Dynamic OLS, Dependent Variable: CR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FSD	-0.0944**	0.0402	-2.3441	0.0410
IF	0.0588***	0.0121	4.9401	0.0006
UN	0.1115***	0.0173	6.4425	0.0001
GRR	-0.0072	0.0286	-0.2536	0.8049
URB	0.5901***	0.1563	3.7753	0.0036
Constant	-3.8171***	0.7591	-5.0284	0.0005

R-Square 0.9023, Adj. R-Square 0.7068, Long-run variance 0.0798
Normality Test(Jarque-Bera) 0.2308(0.8910)
Wald Test: F-statistic 202.2641*** (0.0000)
Chi-Square 1213.585*** (0.0000)

***,**,* denote significant at 1%, 5%, 10%, Figures in ( ) are P-values
Source: Author's computation

Previous literature shows that inflation has an important impact on crime rate in an economy. In our results, we show that inflation increases the presence of crime rate. This is consistent with Hazra et al. (2018) who document that inflation has a significant impact on crime in India. The results of John et al. (2015) support our empirical analysis on inflation. In their submission, they show that contemporaneous inflation and lagged inflation have positive and statistical significance on property crime in USA. Inflation reduces the purchasing power and increases the cost of living. This justifies the reasons for high level of crime in the presence of high rate of inflation because an individual would be unable to maintain its standard of living (Tang & Lean, 2007).

Table 8: Results of impact of fiscal policy on crime
Dependent Variable: CR

Variables	DOLS	GMM
GVT	-0.1847**	-0.3168***
	(0.0398)	(0.0097)
IF	0.0481***	0.0594**
	(0.0031)	(0.0159)
UN	0.0855***	0.0556
	(0.0026)	(0.2291)
GRR	-0.1012**	-0.0789
	(0.0282)	(0.1579)
URB	0.5704**	-0.0202
	(0.0376)	(0.1943)
Constant	-0.6318	3.1857**
	(0.7141)	(0.0301)
	R-squared =0.8581, Adjusted R-squared=0.5744, Long-run variance=0.1629	J-Statistics=0.0282 Prob(J-statistic)=0.8665 Instrument rank=7
Wald Test:		
F-statistic	96.0854***	373.7811***
	(0.0000)	(0.0000)

Source: Author's computation, ***,**,* denote significant at 1%, 5%, 10%, Figures in ( ) are P-values

The estimated results confirm that unemployment rate increases the level of crime behaviour. In relation to this, Tarling and Dennis (2016) examining the same issue in England and find that unemployment increases crime rate. This implies an economy with high rate of unemployment will experience higher level of criminal activities which is highly supported theoretically and empirically (Ajide 2021a, Ajide, 2021b). This positive relationship indicates that in the presence of high level of unemployment rate individual would be unable to cope in maintaining a particular standard of living leading to crime behaviour. This means that unemployment has a shock impact which may increase participation rate in crime related activities (Tang & Lean, 2007). Furthermore, the estimated result reveals that the coefficient of urbanization is positive and significant meaning that in Nigeria, that is, urbanization increases crime behaviour. The studies of Sampson and Groves (1989); Tseloni (2006); and Higgins et al. (2010) hint that urbanization correlates with crime level of an economy. Pratt and Cullen (2005) document that urbanization

serves as a moderate predictor of crime level. The study of Hooghe *et al. (*2011) confirms that urbanization has a significant impact in Belgium. In support, Mayi (2014) documents after applying OLS on Indian data that unemployment and urbanisation significantly affect crime rate. This supports the view of Bunge, Johnson and Balde (2005) illustrates that crime rate and socio-economic indicators are moving in the same direction.

4.3 Toda-Yamamoto Causality between fiscal policy and crime rate

This paper also examines the causal direction of the variables in general, and with specific reference to the association between crime and fiscal policy employing Toda and Yamamoto approach. Table 9 reports the results from Modified Wald test as suggested by Toda and Yamamoto (1995). This technique is a major improvement over the conventional Granger causality test.

Table 9: Causality between Fiscal policy and Crime Rate

	Dependent variables					
Independent variables	CR	FSD	IF	UN	GRR	URB
CR		8.6920** (0.0337)	0.7542 (0.8604)	9.5203*** (0.0002)	12.1846*** (0.0068)	4.5041 (0.2119)
FSD	2.6969 (0.4407)		7.6184** (0.0546)	5.1652 (0.1601)	2.9272 (0.4030)	0.6503 (0.8848)
IF	3.0523 (0.3836)	9.8593** (0.0198)		5.1163 (0.1635)	2.3146 (0.5097)	0.7469 (0.8621)
UN	3.4408 (0.3285)	11.2333** (0.0105)	1.1247 (0.7711)		5.3987 (0.1448)	50.0566*** (0.0000)
GRR	1.4636 (0.6907)	2.1473 (0.5424)	1.4294 (0.6986)	0.8992 (0.8256)		0.9710 (0.8082)
URB	7.8992** (0.0481)	2.1546 (0.5409)	1.6356 (0.6513)	0.8626 (0.8344)	2.7240 (0.4362)	
Wald Test	13.3265 (0.5771)	27.4562** (0.0252)	19.3698 (0.1975)	31.4914*** (0.0075)	26.1798** (0.0362)	57.1360*** (0.0000)

Source: Author's Computation, ***,**,* denote significant at 1%, 5%, 10%, Figures in ( ) are P-values

Table 9 shows that there is a unidirectional causality from crime rate to fiscal deficit thereby supporting the assertion that criminal activities like corruption in public sector and rent seeking increase the level of fiscal deficit in the economy. Similarly, there is a unidirectional causal effect moving from urbanization to crime rate in Nigeria. This implies that urbanization rate is a driver of crime related activities and no evidence of reverse causality. Unemployment and inflation granger cause fiscal deficit. Furthermore, there is a one-way causality moving from crime to

unemployment and income per capita growth. This is inconsistent to the study of Tang and Lean (2007) whose results show that there is causality moving from inflation and unemployment to crime. However, we find that there is a two-way causality between inflation and fiscal deficit. This implies that inflation can be used to predict fiscal deficit while fiscal deficit also drives inflation. This submission is consistent with the previous studies (Chimobi & Igwe; 2010; Oseni & Sanni, 2016).

5. Conclusion and policy implications

A vast amount of studies have used rational choice theory of crime to explain the link between crime and monetary policy variables (e.g. Tang and Lean, 2007; John et al., 2015). However, the relationship between crime behaviour and fiscal policy is least understood (Goulas & Karidis, 2020). Unlike previous studies, this paper shows that the relationship between crime rate and fiscal policy in Nigeria can be largely understood within the time series framework. The whole study centers around the analysis between expansionary fiscal policy and crime rate which is studied along with a number of control variables such as unemployment, urbanization, income per capita and inflation. Before applying dynamic OLS (DOLS) and Toda-Yamamoto (T-Y) approach to causality on Nigerian data spanning over a period of 1986-2019, we examine the unit root of the series which shows that we have I(1) series. We also apply Johansen and Juselius cointegration test which shows there is at least one cointegrating equations. From the estimated results of DOLS and T-Y causality test, the following findings emerged: (1) there is a long run relationship among the variables. (2) Expansionary fiscal policy reduces crime behaviour in Nigeria. This result is robust when government expenditure is used as proxy. (2) There is a one-way causality between crime and fiscal deficit. (3) Inflation granger causes fiscal deficit. (4) There is a one way causality moving from urbanization to crime rate. (5) Finally, we find a two-way causality between inflation and fiscal deficit.

What are the policy implications to be derived from these findings? Our results provide policy directions to government and its agencies to focus on the use of public policies in reducing crime behaviour in the country. Income growth and government expenditure can be used as deterrence measures in the policy formulation in reducing crime rate in Nigeria. Our results reveal important caution when employing fiscal deficit to control crime, the inflationary pressure needs to be considered, so as not to further fuel inflationary spiral in the economy. Suitable measures need to be evaluated in order to stimulate income growth in the economy which is well supported by our empirical analysis due to its ability to reduce crime rate. Growth in key sectors suitable for the generation of viable income and employment should be considered. By doing this, adequate jobs can be created for the teaming unemployed youths in Nigeria and it will enhance income growth of the poor, thereby lifting them out of poverty. This study further suggests that adequate funding should be injected into the police and judicial system so as to improve the capability of the deterrent actions. This is only necessary if there are adequate accountability of public holders.

Our study should be viewed in the light of its limitations. We are unable to disaggregate crime data into property and violent crime; such data for a meaningful time series analysis are not available at present for Nigerian case. Future studies may overcome this shortcoming. Other scholars may consider the asymmetric structure in the causal link between crime and fiscal policy. Whenever data are available, future studies may consider state level analysis.

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