

Socio-Economic Determinants of Crime in Nigeria

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Abstract: The study estimates the dynamics of socio-economic determinants of crime in Nigeria from 1981-2005 using an error-correction model. The exclusive socio-economic determinants are population, literacy, unemployment, inflation and income. The study analysed the long-run causality between security or crime and discomfort applying the error-correction based, Granger causality technique and dynamic error-correction method. The results revealed that unemployment is the most important determinant of crime in Nigeria. The evidence that insecurity Granger causes discomfort is also established.

Key words: Causality, cointegration, crime, error-correction, unemployment, Nigeria

INTRODUCTION

Crime is an offence against the values system of a society. The cost and effects of crime vary among the various segments of the population and touch almost everyone by some degree and in general as the economic growth and development of countries increase, it would be expected that crime level reduces. This may not necessarily be. The socio-economic effects of crime have been well articulated in the literature (Odumosu, 1999; ESEC, 2008a, b; Akpotu and Jike, 2004; Egunjobi, 2007). The various costs of crime to victims and society or the economy include; loss of income, property losses, loss in community productivity, etc. Some other costs of crime, which are less tangible include psychological trauma on victims and their family and friends, pain and suffering and a lower quality of life. In all of these and other associated losses, the ultimate cost is loss of life.

In the philosophy of the social sciences, there exists no clear-cut theory of crime in respect to human behaviour that is uniquely exemplified. However, an implicit reference that links society's dysfunctionality to criminal actions is the anomie theory. Anomie is knightly associated with the researches of Emile (1893, 1897) and Merton (1938). According to Emile (1897), anomie is a morally deregulated condition. A breakdown in either the rules of society or the amoral norms. As such, when there are no clear rules to guide members of the society, individuals find it difficult to adjust to the changing conditions of life. This in turn, leads to frustration, conflict, dissatisfaction and deviance (Odumosu, 1999).

Though Merton (1938) anomie theory did not focus on criminality, it emphasizes the fact that the existence of inequality, due to the way society is structured, may make it anomic. Evidence exists about the several segments of

society that are severely restricted from legitimate avenues to success. Thus, in a society where much emphasis is placed on achievements, especially wealth, without recourse to the sources and legitimacy; individuals, who are caught in anomic conditions will be faced with the strain of inability to reconcile their aspirations with their disadvantaged situations. In this wise, legitimate means do not necessarily become the most efficient way of gaining success. Other means, though de-emphasised by society as perhaps illegitimate, become available and more efficient. By this, the Nigerian society may be adequately placed as being in a state of perpetual anomie (Odumosu, 1999).

One lesson that can be learnt from the theory of anomie, is that deprived persons may be led to take illegitimate actions (crime for instance), because of their relative deprivation and acute sense of want or greed. In this sense, the social environment surpasses the physical environment in the determination of crime. In a society like Nigeria where success in life is measured by a person's wealth; corrupt practices and criminality would hold sway.

Some studies exist on crime and its attendant effects or costs and determinants. Egunjobi (2007) on Nigeria, Odumosu (1999) and Akpotu and Jike (2004) also on Nigeria. Andres (2002) on Spain, Pyle and Deadman (1994) on Britain and Fougere *et al.* (2006) on France. On the Nigerian scenario, Odumosu (1999) study stressed the seriousness of poverty among the social problems that afflict Nigerians. The study noted that poverty in Nigeria is mostly produced by increases in unemployment and inflation and that the longer people remain unemployed, the more they are tempted to commit crimes to satisfy their needs. The assertions of Odumodu's (1999) research though based on the descriptive behaviour of the data on unemployment, inflation,

poverty and crime rates, the study lacked the rigour of empirical estimation that is expected in establishing functional relationships between and among variables. Akpotu and Jike (2004) used primary data drawn from prison inmates in 5 federal prisons located in Delta State, Nigeria via an administration of questionnaire. The findings of the study support the view that there exists a strong link between low levels of education and high crime rates and that crime control is more expensive in monetary terms than education. One limitation of the study is the spread of the prisons studied. The prisons were all located in only one of the 36 states of Nigeria. In addition, the use of simple percentage in empirical studies neither determines effects of variables in relationship, nor establishes causation.

One study that may have overcome the identified gaps in Odumosu (1999) and Akpotu and Jike (2004) studies of Nigeria is Egunjobi (2007). Egunjobi (2007) study sought to establish determination and causation between unemployment and crime in Nigeria for the period 1981-1998. The method of analysis was the error-correction mechanism and the conventional Granger causality. The results of the study revealed that a positive long-run equilibrium relationship exists between unemployment and crime series. In addition, unemployment unidirectionally Granger (1988) causes crime in Nigeria.

This study on Nigeria differs from Egunjobi (2007) in several ways. Firstly, it uses the error-correction based causality, which allows for the inclusion of the Granger lagged error-correction term derived from the cointegration equation as opposed to the conventional Granger causality method. By including, the lagged error-correction term, the long-run information lost through differencing is reduced in a statistically acceptable way (Odhiambo, 2007). In this wise, the application of the conventional Granger method (Egunjobi, 2007) on variables that are cointegrated, which by extension also implied incorporating differenced variable tantamount to miss-specification unless the lagged error-correction is included (Granger, 1988).

Secondly, the present study, in addition to unemployment as in Egunjobi (2007), includes other socio-economic factors such as inflation, population, literacy and income as determinants of crime in Nigeria. Thirdly, this study period is 1980-2005.

OVERVIEW OF PEACE INDICATORS AND CRIME TREND IN NIGERIA

The Vision of Humanity (2008) is a collaborative enterprise, which brings together a group of initiatives that enjoys the support of philanthropists, business

people, religious leaders and intellectuals. Since its establishment, the Vision of Humanity (2008) has also been involved in the measurement of global peace among countries.

Table 1 provides the Global Peace Index (GPI) rankings of Nigeria among 140 countries analysed in 2008 and the 121 countries analysed in 2007. Nigeria ranked 129 in 2008 and 117 in 2007 with a GPI score of 2.898 and 2.724 in 2007 and 2008, respectively. The peace index scores measured on a scale of 1-5, where rank 1 is most peaceful; implies that Nigeria is a fairly peaceful country and has enjoyed a marginal improvement in its peace efforts since 2007. More worrisome in the detailed information by the Vision of Humanity (2008) report is the qualitative assessment of the level of violent crime. On a ranking scale of 1-5 (very low-very high), Nigeria's rank using a level of violent crime is 5. Despite this predicament, Nigeria military deployments score to the United Nations' peacekeeping missions worldwide (2006-2007) of 4.717 is very high on a scale of 1-5. The implication is that Nigeria is not only a peace loving country; Nigeria is equally a peace maker. In Nigeria, the main causes of death due to public violence are, in order of importance; accidents, crime, economic issues, political clashes and ethno-religious fighting (Marc Antonine Perouse de Montclos, 2007). Crime, according to the data, accounted for the highest absolute number of deaths when compared with other 13 causes (Fig. 1).

Table 1: Global peace index rankings of Nigeria

Years	No. countries analysed	2007 rank	2008 rank	GDI
2007	121	117	-	2.898
2008	140	-	118	2.724

Source: Vision of Humanity (2008), Global Peace Index Ranking. www.visionofhumanity.org/gpi/results/rankings.php

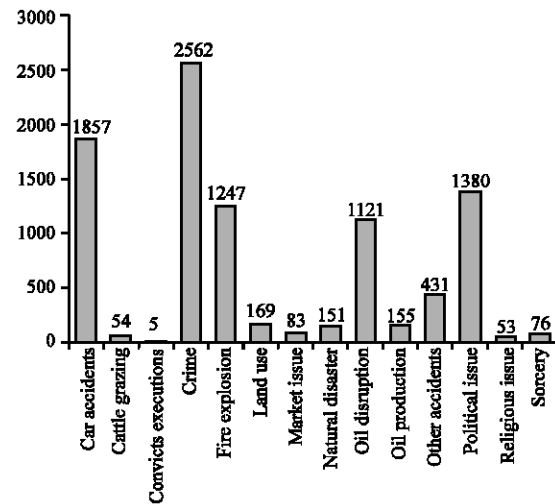


Fig. 1: Absolute number of deaths by causes of violence. Source: www.nigeriawatch.org/media/html/file/NGA_Watch_Report_2007.pdf

At present, domestic and international data on crime in Nigeria is mute and where it exists, it is inadequate. Locally obtained information however, shows that acquisitive crime (including armed robberies, thefts/stealing, burglaries and house/store breaking) and the offences of violence (including murders, assault and rape) constitute an average of 73.05% of all crimes reported to the police between 1994 and 1997. Acquisitive crimes during this period, which averaged 39.75% were higher than offences of violence with an average of 33.29% (UNODC, 2007). While between 2000 and 2005, an average of 171.901 cases of crime were recorded as against 93.981 cases reported between 1992 and 1999.

MODEL SPECIFICATION AND ESTIMATION TECHNIQUE

In this study, the cointegration and error-correction model is used to examine the relationships between crime and its socio-economic correlates. As opposed to the conventional Granger causality method, the error-correction based causality test is used to examine the direction of causality between crime and discomfort (unemployment plus inflation).

No standard economic theory exists in the specification of the relationship between crime and its socio-economic correlates. However, for the particular aim of this study, it could be reasonably assumed that inflation, income, literacy level, unemployment and population level explain the crime rate in Nigeria. The variables entering the model can be specified as follows:

$$CR_t = f(lcpi, lgdp, litsec, unemp, lpop) \quad (1)$$

where:

- CR_t = Crime Rate (CR_t)
- lcpi = Inflation
- lgdp = Income
- litsec = Literacy rate
- unemp = Unemployment rate
- lpop = Population

Data sources: The data used in the study is obtained from publications of the Central Bank of Nigeria (2006) (various issues of its Statistical Bulletin) and the National Bureau of Statistics (Annual Abstract of Statistics, 2006).

Measurement of variables: All variables are in natural logarithm. The sample period (1981-2005) provided continuous time series data of the variables considered in the modelling process. Inflation is obtained from the country level Consumer Price Index (CPI 2000 = 100).

Income is proxied by real Gross Domestic Price (GDP). Literacy level was captured by secondary school enrolment as supported by the literature. Unemployment variable is national employment rate; while population is Nigeria’s total population. Crime is proxied by expenditure on internal security which involves the Police. Although, some crime data exists, comparative analysis of crime rate statistics around the world remains complicated. Different definitions of what constitutes a crime make official crime statistics undependable (ESEC, 2008a). Consequent upon this, expenditure on internal security (including the Police) was used as a proxy for crime rather than the crime rate.

The conventional Granger causality relates to the lagged values of a variable, say Y, having an explanatory power on another variable X. In this wise, if Y Granger causes X, the prediction error of current X declines when lagged values of Y are used (Ciarreta and Zarraga, 2007). In order to test for linear Granger causality, for example, between crime and discomfort (inflation + unemployment), the estimation involves testing the null hypothesis that Crime (CR_t) does not cause discomfort (DCF_t) and vice versa, by simply running the following Eq. 2 and 3 regressions:

$$CR_t = \alpha_0 + \sum_{i=1}^m \alpha_{1i} \Delta CR_{t-i} + \sum_{j=1}^n \alpha_{2j} \Delta DCF_{t-j} + \pi_1 \quad (2)$$

$$DCF_t \beta_0 + \sum_{i=1}^m \beta_{1i} \Delta DCF_{t-i} + \sum_{j=2}^n \beta_{2j} \Delta CR_{t-j} + \pi_2 \quad (3)$$

where:

- CR_t = Crime Rate
- DCF_t = Discomfort index
- π₁, π₂ = White noise error process
- m, n = Number of lagged variables

The tests of causality can be conducted by testing whether some parameters of the lagged polynomials in Eq. 1 and 2 are jointly significant, for which a simple F test can be applied. This conventional approach suffers from 2 basic methodological flaws. First, such traditional tests do not examine the basic time series properties of the variables. Thus, if the series are non-stationary and are used in the tests, the results will be spurious (Sims *et al.*, 1990; Toda and Phillips, 1993; Granger, 1988). Secondly, the conventional Granger causality tests inherently turn the series stationary mechanically, by differencing the variables. This, consequently, eliminates the long-run information in the original form of the series (Odhiambo, 2007).

To overcome the methodological deficiencies of the conventional Granger causality as stated above, one alternative approach will be to apply an error-correction

based causality test that allows for the inclusion of the lagged error-correction term derived from cointegration Eq. 2. In this sense, the long-run information that would have been eliminated through differencing is reintroduced into the estimated causality equations. In this current study, the error correction model used is based on the following:

$$\Delta CR_t = a_0 + \sum_{i=1}^m a_{1i} \Delta CR_{t-1} + \sum_{j=1}^n a_{2j} \Delta DCF_{t-j} + a_3 EC_{t-1} + v_t \quad (4)$$

$$\Delta DCF_t = b_0 + \sum_{i=1}^m b_{1i} \Delta DCF_{t-1} + \sum_{j=1}^n b_{2j} \Delta CR_{t-j} + b_3 EC_{t-1} + \zeta_t \quad (5)$$

where:

- Δ = The difference operator
- CR_t = Crime Rate
- DCF_t = Discomfort index
- ECM_{t-1} = One period lagged Error Correction term obtained by the cointegration equation

From Eq. 4 and 5, the causal inference is obtained through the significance of a_3 and b_3 . If a_3 is significantly different from 0, the null hypothesis that DCF_t does not Granger-cause CR_t is rejected. Conversely, the null hypothesis that CR_t does not Granger cause DCF_t is rejected if b_3 is significantly different from 0².

RESULTS AND DISCUSSION

Stationarity tests: In line with some other time series data, the variables for this study were tested for stationarity and cointegration before running the error correction model and causality tests. The Augmented Dickey-Fuller (ADF) test which is a parametric approach is applied in the test for unit roots. The results of the stationarity tests (Table 2) at levels show that all the variables are non-stationary at level. Due to their non-stationarity, the variables were differenced once and the tests were re-performed. The results of the stationarity tests on the differenced variables are also presented in Table 3.

The ADF tests applied to the first difference of the data series rejects the null hypothesis of non-stationarity for all the variables. It thus can be concluded that all the variables used in this study are integrated of order 1.

Cointegration analysis: Having confirmed that all the variables used in the study are integrated of order one, the next step was to test for the existence of cointegrated relationship among the variables (Litsec, Lgdp, Icp, Ip, Isec and Iunemp). For this aim, the study applied the Johansen cointegration test. If the variables are cointegrated, then there exists Granger causality between

Table 2: Stationarity tests of the variables

Variable	ADF	Stationarity status
Lcr	-0.425090	Non-stationarity
Lcpi	-0.340969	Non-stationarity
Uemp	-1.374040	Non-stationarity
Ldcf	0.927400	Non-stationarity
Δlcr	-6.443300	Stationarity
Δlcpi	-3.341053	Stationarity
Δunemp	-5.146303	Stationarity
Δgdp	-5.899170	Stationarity

Critical values: 1% = -3.6394; 5% = -2.9511; 10% = -2.6143

the series in at least one direction. The results of the Johansen-Juselius cointegration tests are presented in Table 3. The cointegration results indicate the existence of a stable long-run relationship among the variables.

Empirical results: Confirming the existence of cointegration relationships among the variables provides evidence to proceed with the estimation of first, an Error-Correction Model by including error correction term (ECM_{t-1}) variable lagged once in order to obtain a parsimonious long and short run results and secondly, an error-correction model which also includes a one lagged error-correction terms of the bivariate causality model. The parsimonious error-correction model of the short-and long-run relationship and that of the causality test based on error-correction model are reported in Table 4 and 5, respectively.

Dynamic error correction model: The cointegration results indicate only 1 cointegration equation at the 0.05 level, this is suggestive of at least one direction of causality between the variables. Cointegration of variables is inadequate for addressing whether insecurity or the rate of crime is responsive to inflation, income, literacy, unemployment and population. Therefore, we need to obtain a parsimonious estimate of the regressions to determine the influence of each category individually on crime.

From the parsimonious results, unemployment is properly signed and statistically different from zero. This is according to the t-statistic for the coefficient and the probability value. The results indicated further that crime is not significantly responsive to population, literacy, inflation and income given that these variants are statistically insignificant at 5% level. However, the speed of adjustment is high as indicated by the error-correction term (0.64). It is symptomatic that the determinants would adjust rapidly to handling crime. It can be stated with some caution as implied by the signing of most of the determinants that firstly, high unemployment rate induces crime in the long run but not in the short-run. Secondly, the relative large population of the Nigerian state is not responsible for the crime rate. Thirdly, low literacy rate

Table 3: Johansen-Juselius cointegration tests series: Lcr Igdg IcpI Ipop Isec Iuemp

Hypothesised No. CE (s)	Trace statistic	0.05 critical value	Max-eigen statistic	0.05 critical value
None*	135.26390 (0.0000)**	95.75366	66.16440 (0.0000)**	40.07757
At most 1	69.09940 (0.0570)**	69.81880	22.94981 (0.5343)**	33.87687
At most 2	46.14969 (0.0717)**	47.85613	17.59951 (0.5288)**	27.58434
At most 3	28.55018 (0.0691)**	29.79707	13.00013 (0.4522)**	21.13162

Trace statistic and the Max-Eigen value indicate 1 cointegrating equation at the 0.05 level; **MacKinnon-Haug-Michelis, p-values

Table 4: Parsimonious error-correction results: dependent variable = Δlcr

Variables	Coefficient	SE	t-statistic	Prob.
C	0.4872	0.299	1.628	0.124
$\Delta lpop$	-2.4720	4.304	-0.574	0.574
$\Delta lpop (-1)$	-8.4190	4.755	-1.770	0.097
$\Delta lsec$	-1.2210	0.739	-1.654	0.119
$\Delta unem$	0.0840	0.042	2.007	0.043
$\Delta unem (-1)$	-0.0410	0.042	-0.977	0.344
$\Delta dlcpI (-1)$	-0.9740	0.812	-1.200	0.249
$\Delta lgdg (-1)$	1.0690	0.788	1.358	0.195
$Ecm (-1)$	-0.6460	0.246	-2.629	0.019

$R^2 = 0.642$; Durbin-Watson = 2.081; F-statistic = 3.364; Prob (F-statistic) = 0.021

Table 5: Causality test between Δlcr and $\Delta dcmf$

Variables in equation	Dependant variables	
	Δlcr	$\Delta dcmf$
$\Delta lcr (-1)$	-0.03750 (-0.1412)	-0.25833 (-0.28290)
$\Delta dcmf (-1)$	-0.02949 (-0.5183)	-0.11554 (-0.53919)
ECM_{t-1}	-0.15212 (-0.7365)	-0.59920 (-2.49480)
F-test	0.40696 (0.80130)	2.93417 (0.047900)
R^2	0.07	0.38
N	24	24
D-W	1.8733	2.120

Values in parentheses are the t-statistics

though weakly significant, impels increasing crime rate. Fourthly, crime in Nigeria may not be added to cost of living; but rather to a social disconnect as wealth is not necessarily a function of hard work, honesty and legitimacy. This is further corroborated by the insignificant and wrong signing of the income variable.

Causality test between Δlcr and $\Delta dcmf$: As reported in Table 5, the error correction term in the Δlcr equation rejects the causality running from $\Delta dcmf$ to Δlcr . The error-correction term, though negative, it is statistically insignificant. However, the causality from Δlcr to $\Delta dcmf$ is accepted in the $\Delta dcmf$ equation. It can be concluded therefore, that for Nigeria, there is uni-directional causality running from Δlcr to $\Delta dcmf$. This is partially in contrast with Egunjobi (2007) findings.

Although, the literature is not definite on the direction of causality between security and discomfort (inflation and unemployment), the uni-directional causality reported by this result has some policy implications for Nigeria. First, there is the implication that insecurity causes unemployment cum inflation. This may not be incontrovertible as some multinational corporations have left the shores of Nigeria basically because of insecurity.

Secondly, sequel to the first implication that insecurity creates enabling conditions for discomfort, threat to life and property reduces productivity and increases the cost of safety and production. This may further fuel inflation and overall discomfort as macro-economic instability damages supply-side of the economy.

CONCLUSION

In this study, we estimated the dynamics of socio-economic determinants of crime in Nigeria using population level, literacy, unemployment, inflation and income. The direction of long-run causality between security and discomfort was equally examined. Discomfort was proxied by the sum of unemployment and inflation; while security or crime was measured as expenditure on internal security including the Police. To achieve the set objectives of the study, a dynamic error-correction model was estimated in addition with an error-correction based Granger causality test.

The results in its parsimony indicate that unemployment in the long-run seems to be the most significant determinant of crime or insecurity. The error-correction Granger causality estimation found evidence of insecurity unidirectionally Granger causing discomfort. This is partially in contrast with some existing literature that used other models, while tending to establish causality between cointegrated variables of crime and unemployment.

- Cointegration guarantees the existence of Granger causality between the series in at least one direction. However, if series are integrated but not stationary, causality test may be implemented by estimating a Vector Auto Regression (VAR) for the differenced series to achieve stationarity.
- It is thus natural that we test the unit roots of the series, and if they are integrated of the same order, then test for cointegration.

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