



Violent Crime and Unemployment in Nigeria: An ARDL Bound Test Cointegration.

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Abstract

This study attempts to examine whether there is a long-run relationship existing between crime rates and unemployment in Nigeria for the period 2004 to 2016. The autoregressive distributed lag (ARDL) bounds testing approach was used to determine the cointegration between unemployment and crime rates. The results show that unemployment and crime (murder, armed robbery, robbery, assaults, sexual offense, and cultism) are cointegrated. The empirical findings show that the unemployment rate and violent crime, such as; armed robbery, robbery-murder, assaults, sex violence, and cultism are all cointegrated. The long-run coefficients results indicated that the unemployment rate has a positive and significant effect on murder, sex violence, assaults, and cultism.

Keywords: Crime, Unemployment, ARDL

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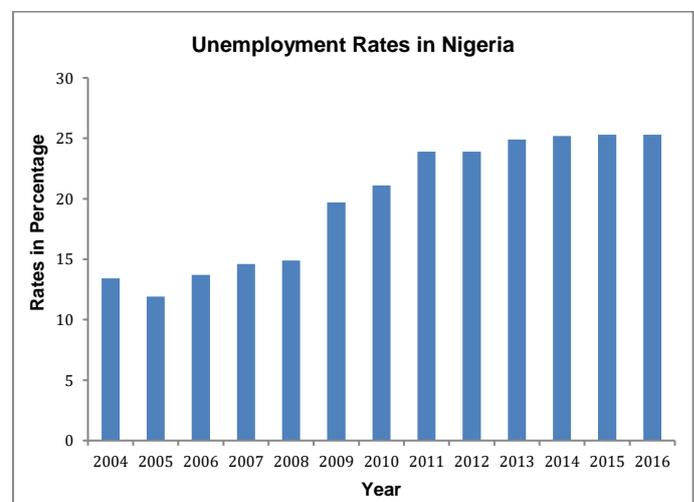
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INTRODUCTION

Theoretical literature argues that criminal offenders are rational individuals who derived their utility by committing crimes. An individual will choose whether to involve in criminal activities by weighing the costs and benefits of committing the crime (Becker, 1968). The probability and punishment can change the criminal's mind to involve in crime (Becker, 1968). The study by Becker (1968) was later expended by Ehrlich (1973) by adding the opportunity cost between legitimate and illegitimate activities in the model. Therefore, if legitimate income opportunities of an individual's become less to the benefits derived from crime, according to Becker and Ehrlich model there will be an increase in crime. An economic factor that could encourage people into criminality is unemployment. The unemployment behavior is the basic ground that instigates the individuals to respond to reward. High decrease in income and earnings is related with involuntary unemployment raises the returns to illegitimate activity (Raphael & Winter-Ebmer, 2001). Therefore, economic condition indicates that unemployment is a significant determinant of criminal activity.

One of the determinants of a country's standard of living is the level of employment the country had recorded. The higher level of unemployment means the low standard of living while a higher employment level emaciates a better standard of living. People without a job cannot contribute to the production of goods and services in an economy. Although a certain level of unemployment is a normal phenomenon in an economy with thousands of firms and millions of labor force. Keeping workers fully employed as possible will achieve a higher level of GDP. However, when the majority of the labor force is idle it may lead to social unrest. Because people rely on labor earning to enhance their standard of living and a sense of personal accomplishments.

In Nigeria, unemployment is a serious issue that needs to be addressed urgently. In general, unemployment in Nigeria is relatively high compared with other developing countries. Between 2004 and 2016, which is also the period under this study, unemployment increased by more than 90 percent from 13.4 percent of the total labor force in 2003 to 26 percent of the total labor force in 2016, (National Bureau of Statistics (NBS) Abuja, 2017). This is a huge increase in the rate of unemployment. Figure 1.5 shows the trend of unemployment measured by the percentage of an unemployed labor force to total labor force in Nigeria from 2004 to 2016

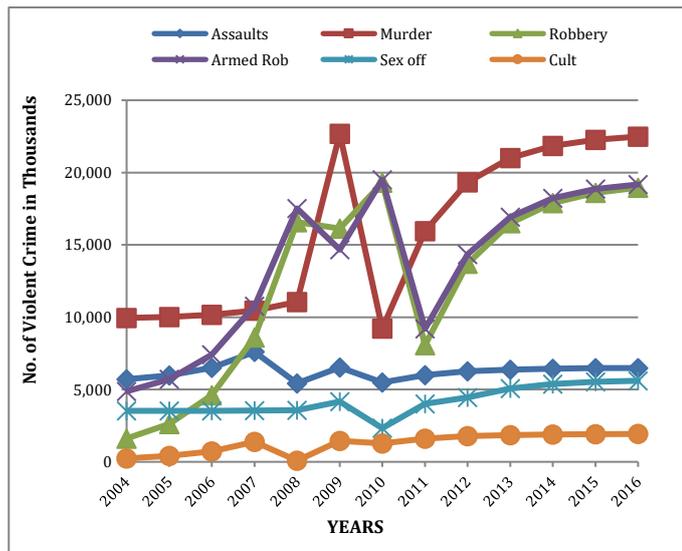


Source: NBS (2017)



Nigeria is not clear free from criminal offenders where the occurrence of crime rates had received urgent attention and the level of criminal activity has been airing on the social media at daily basis such as; armed robbery, robbery, assaults, cultism, and sexual violence and murder are common criminal offenses in Nigeria. It looks that since the financial meltdown, violent crime has rapidly increased in Nigeria. Despite the alarming rates, Nigeria’s criminal activities have not received adequate attention from policymakers and economic crime studies developed by Becker (1968) and Ehrlich (1973).

Crime, whether violent or property is determined by various macroeconomic factors such as income inequality, unemployment, urbanization among others as reported by United Nation Office of Drugs Crime (UNODC), (2014) for this reason, this study used unemployment so as to examine their impact on violent crime in Nigeria.



Source: (NBS, 2017)

The motive behind the current study is to fill this missing gap in the study by providing some empirical studies on the relationship between the violent crime rates in the third world economy, especially in Nigeria and the economic factor measured by the unemployment rate. In Nigeria, the agency responsible for monitoring the rate of unemployment and relate it to the high level of violent crime and unemployment. Our purpose of an investigation is to determine the long-run relationship exist between the rate of violent crime and unemployment in Nigeria.

REVIEW OF RELATED LITERATURE

Most of the socio-economic studies indicated that unemployment within the economics of crime studies is positively related to crime. Committing crime without failing while unemployed has a higher reward (Burdett, Lagos, & Wright, 2004). Unemployment shows lack of opportunity for participation in the labor market and the acquisition of legitimate earnings (Freeman, 2005). The exclusion from legitimate income opportunities raises the expected returns from crime, the economics of crime theories have confirmed.

Edmark (2005) conduct a study on the relationship between unemployment and crime in Sweden for the period 1988 – 1999. The findings reveal that unemployment has a positive and significant cause of some violent and property crimes. Bandyopadhyay et al. (2015) investigated the effect of unemployment on six different categories of crime across 43 police districts in the United Kingdom. The results show that unemployment raised crime but the higher populated areas. Also, Entorf and Spengler (2015), investigate the significance of unemployment on crime in Germany. They employ the Ordinary Least Squared (OLS) method. The results show that unemployment and violent crimes have a positive relationship. Omotor, (2010) conducted a study using a panel dataset for Nigeria for the period 2002-2005. He

employed the Pooled Ordinary Least Squares and Pooled EGLS to determine the relationship among the socioeconomic, demographic and institutional quality variables. The results indicate that per capita and population density are positively and significantly related to all categories of crime, except that the institutions are found to be weak (rule of law) in controlling the crime. Anwer et al (2015), also conducted a study to determine the social and demographic relation to crime in the province of Punjab in Pakistan using the panel data for the period 2005-2012. They employed fixed effect (FE) and random effect (RE) methodology to determine the existing relationship. They found that deterrence variables have a positive significant relationship to all categories of crime in Pakistan In regard to violent crime, economists have not considered much attention and there are few empirical studies on socioeconomic determinants and violent crimes Saridakis (2004). Moreover, there are many studies carried out to determine the effect of unemployment on the violent crime rate. The existing studies recommend that higher unemployment is connected with the occurrence of higher crime, the studies that found negative relationship between unemployment and violent crime such as; Saridakis and Splengler (2012); Saridakis (2004) and Raphael and Winter-Ebmer (2001). Saridakis (2004) determine the effect of socio-economic and demographic determinants on violent crime in the United State (U.S) on time-series data for the period of 1960-2000. The findings show that there is no long-run effect of the unemployment rate on violent crime, but in short-run are statistically significant related. Still, Saridakis (2011) used the United Kingdom time-series data for the period of 1960-2000 in England and Wales. He used the cointegration model to determine the effect of the unemployment rate, beer consumption, and deterrence on all the categories of violent crime. The results show that unemployment insignificant with a serious crime rate except that of assault in the long-run. This is contrary to the finding of Carmichael and Ward (2001) who found a positive and significant effect on unemployment on burglary crime in the United Kingdom for the period of 1989-1996, but there is a negative relationship between unemployment and violent crime. , In another study, Saridakis and Spengler (2012) examined the relationship between unemployment on both property and violent crime for the period of 1991 and1998 in Greece. They employed the GMM method. The results show that unemployment has an effect on property crime and negative effect on violent crime. Haddad and Moghda (2011), conducted a study in Iran for the period 1997-2005. Using panel data, the results revealed that economic variables such as unemployment, income inequality, real GDP and family income are the main determinant of property crime such as burglary and for violent crime such as rape and murder are insignificantly related. Moreover, Sokram et al, (2009), conduct a study in Trinidad and Tobago using the time-series data for the period of 1970-2007. They employed the VAR model to analyses the impact of a socio-economic determinant on crime rates such as murder and kidnapping. The findings show that during the period of the study the socio-economic determinants have a strong impact on violent crime. Their findings show that unemployment and crime are positively connected, an increase in unemployment show that the lack of opportunities for legitimate work, and thus set down the opportunity to commit criminal activities. Whereas, another study from the Philippines revealed that unemployment is the main determinant of violent crime rate mostly on rape Gillado and Tan Cruz, (2004). In relation to the insignificant effect of unemployment and crime rate, Aric (2007) has shown that there is no strong argument that unemployment makes individuals to inclined to crime, even at the macroeconomic level, rising unemployment is the prerequisite to an increase in criminal activity. In a related study, Arvermite and Defina, (2006) conduct a panel data study in United States for the period of 1986-2000. Their findings revealed that the relationship is an insignificant and negative effect of the unemployment rate on property crime and robbery rate for the period of the study. On the other side, Weatherborn (2001) found that there is no significant relationship between unemployment and crimes such as breaking, motor vehicle theft and stealing in Australia for the period of the study.



METHODOLOGY AND MODEL SPECIFICATION
METHODOLOGY

In this study, we based on Becker (1968) and Ehrlich (1973) to estimate violent crime and unemployment equation for Nigeria. The empirical model in this study is then modified as follows:

$$viocrm_t = \beta_0 + \beta_1 unem_t + \epsilon_t \tag{1}$$

where *viocrm* is the violent crime rate, *unem* is the unemployment rate and ϵ_t is the error term, all the variables indicate are in natural logarithm. β are the parameters to be estimated. The unemployment rate has a positive effect on violent crime. The unemployed are individual are likely motivated to involve in criminal activities because they lack income and stay redundant at home. When unemployment rate is reduced, more

In this study, we determine the cointegration test and the ECM model; we use the bounds test developed by Pesaran et al. (2001) which is applicable for a small sample size. Pesaran and Shin (1998) indicate that with ARDL approach, OLS estimators for the short-run coefficients in small sample observation and the ARDL procedure are the based estimators of the long-run coefficient in small sample sizes. Later, Narayan (2005) developed critical values for small sample studies.

To test for cointegration by employing the ARDL bounds testing procedure and unrestricted error-correction model (UECM) for the violent crime and unemployment equation.

$$\Delta viocrm_t = \beta_0 + \sum_{i=1}^p \beta_{1i} \Delta viocrm_{t-i} + \sum_{i=0}^q \beta_{2i} \Delta unem_{t-i} + \beta_1 viocrm_{t-1} + \beta_2 unem_{t-1} + \epsilon_t \tag{2}$$

Where *p* and *q* are the lag length of the variable chosen, β_0 is a constant term and ϵ_t is the error term or disturbance term in the violent crime equation. Pesaran et al. (2001) indicate that the coefficient of the lagged level of the F-test for test for the equation (2), show that the null hypothesis for no cointegration between variables in the equation, is $H_0: \beta_1 = \beta_2 = 0$ against the alternative $H_0: \beta_0 \neq \beta_0 \neq 0$; are used to bounds test cointegration or the long-run relationship between violent crime and unemployment. The rejections of the null hypothesis signify the cointegration between violent crime and unemployment; therefore, show the long-run effect of violent crime. However, Narayan (2005) for instance, provided critical values for sample as small as 30-80 observations.

The asymptotic critical values are all integrated at *I*(0) and *I*(1) and mutually cointegrated. Because the critical values are integration depends on the test of the variables, *I*(*d*), where $0 \leq d \leq 1$, the test of the values is not exceeding the range of rejection, therefore, when the value is less than the range is an evidence of no rejection, and within the range are evidence of inconclusive. In the other hand, when the F-statistics greater than the upper critical values, its show that there is a long-run relationship between the variables and if the F-statistics is less than the lower case of critical values, we cannot reject the null hypothesis and the estimation continue as there is no long-run relationship. If the F-statistics fall within the range of lower and upper case of critical values, the findings are inconclusive. Therefore, if $\beta_1 < 0$, the long-run relationship exists between the level of violent crime and unemployment (H. H. Pesaran & Shin, 1998). From the equation (2) found that violent crime and unemployment are cointegrated, the estimation of ARDL-ECM model will establish as follows

$$viocrm_t = \beta_0 + \sum_{i=1}^p \beta_1 viocrm_{t-i} + \sum_{i=0}^q \beta_2 unem_{t-i} + \epsilon_t \tag{3}$$

The lag length in the equation (3) is choosing using the Schwartz Bayesian Criterion (SBC) as determined by Pesaran et al. (1998). The equation of the ARDL-ECM model can be transformed as follows:

$$\Delta viocrm_t = \beta_0 + \sum_{i=1}^p \beta_0 \Delta viocrm_{t-i} + \sum_{i=0}^q \beta_1 \Delta unem_{t-1} + \delta ECM_{t-1} + \epsilon_t \tag{4}$$

Where ECM is the error correction term as modified as follows:

$$ECM_t = viocrm_t - \left[\beta_0 + \sum_{i=1}^p \beta_1 viocrm_{t-i} + \sum_{i=0}^q \beta_2 unem_{t-i} \right] \tag{5}$$

From the equation (4) above, the significant of the coefficient δ indicate of the cointegration, long-run, and exogeneity of violent crime, therefore, the coefficient δ measure the speed of adjustment.

EMPIRICAL RESULTS

The results of the integration order of each variable are presented in table 1. When the variables are integrated either *I*(0) or *I*(1). If the estimated variables are non-stationary, the regression results with these non-stationary variables will be spurious (Granger & Newbold, 1974). Therefore, it is important to determine the stationarity and other of integration, to avoid spurious results. In this study, we used both Augmented Dickey-Fuller (ADF) and Philips-Perrons (PP) approaches to test for stationarity. The results of these unit root tests are indicated in Table 1 below.

Table 1. Result of the Unit Root Tests

Variables	ADF		PP	
	Level <i>I</i> (0)			
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
UNEM	-0.704720	-1.460813	-0.687378	-1.766539
ARMED ROB	-1.877372	-2.733866	-1.877372	-2.733866
ROBBERY	-1.742927	-2.197476	-1.704493	-2.172688
MURDER	-1.793354	-3.266717	-1.793354	-11.02392
ASSAULTS	4.074920	-3.869320	-4.109165	-3.888748
SEX VIOL	-1.054463	-0.326242	-0.808350	-2.527545
CULTISM	-1.337883	4.939143	-1.812936	-7.106484
FIRST DIFFERENCE <i>I</i> (1)				
UNEM	-3.752109	-3.940571	-3.681991	-4.017433
ARMED ROB	-5.108346	-4.988443	-5.088754	-5.138706
ROBBERY	-3.987910	-3.949193	-3.986144	-4.029249
MURDER	-3.214237	-2.817464	-13.82630	-12.95879
ASSAULTS	-6.305366	-2.593320	-7.357141	-6.769620
SEX VIOL	-5.059129	-5.054477	-5.240404	-9.019849
CULTISM	-3.910824	-3.852137	-14.03427	-18.72946

Augment Dickey-Fuller (ADF) and Phillips-Perron (PP) test. (Dickey and Fuller, 1979) and (Philips and Perron, 1988). The optimal lag length is selected by Schwarz Information Criterion (SIC) and Newey-West Bartlett Kernel. All the critical values are determining from MacKinnon (1996) for both ADF and PP tests. The entire unit root tests were carryout using (Eviews 10).

The ADF test indicates that all the variables are integrated at first difference *I*(1), on the other size, PP test indicates that all variables non-stationary at level *I*(0),but stationary at *I*(1). Thus, the ADF and PP test results re not consistent. According to Obben (1998) when there is an inconsistency between ADF and PP, the conclusion from the PP result is more applicable for small sample studies. Therefore, we conclude that all the variables are integrated at *I*(1). With these results, we can proceed to the cointegration test to examine the long-run relationship.



Table 2. Results of Bounds Test Cointegration

T 13 (Narayan, 2005)	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	6.02	6.76	4.09	4.66	3.30	3.79
Violence crime categories	ARDL(p, q)			F-statistics		
Total violent	1,0			2.27		
Armed robbery	1,0			2.05		
Robbery	1,0			3.63		
Murder	1,0			6.23**		
Assaults	1,0			5.13**		
Sex violence	1,0			1.87		
Cultism	1,0			9.32***		

Notes: *** and ** indicate significant level at 1% and 5% respectively. (Using Eviews 10) and Unrestricted intercept and no trend.

Our focus is to determine the sign and the long-run size of the parameter estimates, β_1 in equation (5). Table 3 below shows the optimal lag length use for the ARDL model to arrive at the long-run model as indicated in equation (5).

Table 3. Results of long-run coefficients and ECM model

Dependent Variables	ARDL (p, q)	β_1	ECM (t-statistics)
Armed robbery	1,0	-0.5733(0.3615)	-2.127480
Robbery	1,0	-0.2828(0.2701)	-3.164133**
Murder	1,0	-1.2021(0.2861)***	-1.983989
Assaults	1,0	-1.2201(0.3128)***	-2.269247**
Sex violence	1,0	-0.6627(0.3032)**	-1.356864
Cultism	1,0	-1.3152(0.2526)***	-2.632854**
Total violent	1,0	-0.3246(0.3133)	-2.405878**

Notes: *** ** and * indicate significant level at the 1%, 5% and 10% of p-values respectively.(Using Eviews 10)

The result of the long-run coefficients shows that unemployment rates are statistically significant at 1 percent and 5 percent level. The findings show that there is a negative relationship between unemployment and violent crime such as; murder, assaults, sex violence and cultism. For instance, 1 percent increase in the unemployment rate, induce a 1.2 percent decrease in murder and assaults. Therefore, 1 percent increase in unemployment, decreases sex violence by 0.6 percent.

CONCLUSION

This study investigates the long-run relationship between unemployment level and various categories of violent crime in Nigeria for the period 2004 and 2016. We use the Autoregressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran et al. (2001) which is more applicable for a small sample size. In this study, we used six categories of violent crime such as; murder, armed robbery, robbery, assaults, sex violence, and cultism.

The results of bounds test cointegration indicate that unemployment rate shows a long-run relationship with murder, assaults, and cultism. All the variables are stationary at I(1). The long-run model indicates unemployment has a positive effect on murder, assaults, sex violence, and cultism. This implied that unemployment is the most important criminal motivation factor in Nigeria. Moreover, empirical evidence implies that Nigeria’s crime rate is caused by unemployment. This empirical evidence sheds more light than the policymakers could reduce the crime rate in Nigeria by controlling the level of unemployment especially the youths.

The limitations that restricted to this study and will be indicated as follows. First, the findings may not capture the overall criminal behaviors in Nigeria. There are other macroeconomic variables that mitigate peoples to commit crime. Therefore, unemployment rate should not neglect as an irrelevant policy in curbing criminal activities. Second, disaggregate data analysis on violent crimes is more

comprehensive that property crimes, thus the future investigation can be extended to other categories of violent and property crimes.

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